HISTORICAL DETERMINANTS OF GOVERNMENT FRAGMENTATION: A CROSS COUNTRY ANALYSIS

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Comments are welcome

Historical determinants of government fragmentation: a cross country analysis[1]

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ABSTRACT

This paper aims to explain the large differences in the number of local jurisdictions and of government levels across the countries of the world by looking at how historical events shape the populations' preferences for general public goods, more efficiently provided by higher tiered, larger jurisdictions, and local public goods, better supplied by smaller, lower tiered jurisdictions. Previous analyses explained these influences away by using fixed effects specifications. We instead find that a history of foreign invasions decreases the number of local jurisdictions and raises the number of government tiers, the same effect found for internal risks such as natural calamities. The shape of the land and linguistic fragmentation also generate preferences for local goods and increases horizontal fragmentation. The type of government also matters, as dictatorial regimes are flatter and less fragmented than democracies. All these results mark significant innovations with respect to the literature that explained government fragmentation only in terms of country size, population and preferences for accountability.

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Keywords: Vertical and horizontal fragmentation of government; number of government tiers; number of jurisdictions; historical determinants; cross country empirical analysis

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"And now, let us proceed to legislate with a view to perfecting the form and outline of our state. The number of our citizens shall be 5,040-this will be a convenient number; and these shall be owners of the land and protectors of the allotment. The houses and the land will be divided in the same way, so that every man may correspond to a lot". Plato, Laws, Book V.

"Divide et impera". Flavius Josephus, The Wars of the Jews (*De bello Judaico*, Book I, 169-170).

1. *Introduction*

Why does Italy, with a population roughly the same as neighboring France, have 8,109 municipalities, while the French ones are 36,781? Why, instead, do they have the same number of government levels? And why do Switzerland and Austria, on the other hand, have roughly the same number of bottom tier jurisdictions (2636 and 2359 municipalities, respectively) but differ so much in terms of upper tier jurisdictions (26 Cantons in Switzerland vs. 9 Bundeslander in Austria)? And why do we find similar discrepancies in all the regions of the world – for instance Peru and Bolivia, of roughly the same size and population, which until 1839 were also united in a single state (the Confederación Peru-Boliviana) now have 4 government levels and 1833 jurisdictions (Peru) and 6 tiers and 2988 jurisdictions (Bolivia)? In short: what explains the large differences in the number of local jurisdictions and of government levels across the countries of the world?

Figure 1a and 1 b about here

That these differences exist and are considerable, there is no question: figure 1a and 1b report cartograms for, respectively, the number of government tiers (vertical fragmentation) and the number of total jurisdictions (horizontal fragmentation) in all the 227 countries of the world in 2012. The descriptive statistics (Table A1 in the Appendix) show that the number of lowest level jurisdictions (generally municipalities) range from 1 (e.g., the Virgin Islands) to 75,244 (Indonesia), while the government tiers vary from 1 (e.g., Aruba) to 6 (e.g., the Philippines). Such large variations have called the attention of political economists and of public finance scholars, who have proposed theoretical explanations based on two fundamental drivers: one is the trade-off between the satisfaction of heterogeneous preferences and the exploitation of economies of scale in the delivery of public goods and redistribution (Oates, 1972; Alesina and Spolaore, 1997; Alesina et al., 2004); the other is the improvement of government accountability (Brennan and Buchanan, 1980; Seabright, 1996; Tiebout, 1956). Empirical analyses of the determinants of both the vertical and horizontal fragmentation of governments, besides being very few, found that only population, country size and, in some cases, indicators of heterogeneity of the preferences of the population carry some explanatory power (Gomez-Reino and Martinez-Vazquez, 2012). The empirical models adopted in these studies, however, *de facto* explain away the remaining considerable cross country heterogeneity in government fragmentation via the use of fixed effects. The justification for resorting to country or continental fixed effects is that they capture country (or continent) specific

institutional characteristics or, more precisely, institutional responses to factors and events that have characterized the history of that country. But what are these events? Can we go beyond the detection of their existence, that the fixed effect allow, and identify types of events that mould the vertical and horizontal fragmentation of governments, as efficiency-enhancing institutional responses, as in Putnam (1993)?

The goal of this paper is to try to answer this question, theoretically and empirically. To this end we bring history explicitly into the analysis, in order to extract explanatory power from the fixed effects. Specifically, we examine whether, and to what extent, the series of events that characterized the history of each country had an impact on the vertical and horizontal fragmentation of its government and can explain the cross country variation in the number of government tiers and jurisdictions. To see how history shapes institutions, we provide a very simple theoretical model, where both horizontal and vertical fragmentations are institutional responses to a fundamental problem that governments must solve, namely: which public goods and services to provide to citizens and at what cost. These goods and services are broadly characterized as either general, nonrivalrous public goods, such as defense; or rivalrous private services, such as public transportation, garbage collection and the like. The degree of rivalry in consumption determines the minimum efficient scale in the production of the service, hence the size of the jurisdictions and horizontal fragmentation. The more citizens prefer nonrivalrous public goods over rivalrous private services, the larger should be the size of the jurisdictions, all other things being equal. The history of the nation affects the weights that the population attributes to the provision of each type of government services in their utility function. Citizens of a country with a history of foreign invasions, for instance, will attribute considerable importance to defense that, being a nonrivalrous public good, is more efficiently supplied by large jurisdictions. Holding country size constant, then, a history of wars and invasions should produce countries with fewer jurisdictions. On the other hand, citizens of a country with a record of political stability and few outside threats will be more interested in the supply of more rivalrous public services from the government, such as public transportation and garbage collection. As the minimum efficient scale of these services will tend to be smaller, we can expect that that country will be characterized by a relatively larger number of jurisdictions. Administrative and agency costs place an upward bound on the process of disaggregation, thus yielding optimal values.

The logic explaining vertical fragmentation is similar. As Oates (1972) argues, vertical fragmentation arises when individual preferences for public goods and services significantly differ from those of the median voter. These differences are likely to be greater for rivalrous public goods and services than for non rivalrous ones. Only when such heterogeneity in preferences becomes important should a lower tiered government be created, or be given the responsibility to supply the service. Again, the larger is the weight that citizens attach to nonrivalrous public goods over rivalrous one in their utility functions, the lower should be the number of government tiers, and vice versa. Just like for horizontal fragmentation, we posit that historical events determine the weights in the citizens' utility functions. And even in this case, costs of internalization of

spillovers, of administration and of control of public officials place an upper bound to the vertical division of government.

The rest of the paper is organized as follows. Section 2 reviews the theoretical and empirical literature on government fragmentation. In section 3 we sketch the theoretical model, and provide some alternative explanations for it. Section 4 discusses the empirical strategy, the specification of the empirical model and illustrates the variables. In section 5 we present the results of the estimates. Section 6 summarizes the main conclusions.

2. *Literature review*

Oates (1972) is widely recognized to be the first theoretical structure to explain the determinants of government fragmentation. His model envisages a trade-off between the efficiency gains attained from tailoring local public good provision to local preferences, which is likely to be enhanced by government fragmentation, and economies of scale in service delivery, which can be better exploited in larger jurisdictions, or by a higher government tier. A quite similar theoretical structure is developed in the recent literature on endogenous jurisdictions formation (Alesina and Spolaore, 1997, 2003; Bolton and Roland, 1997), where a trade-off between size and population heterogeneity is an important explanation of the number and size of nations[2].

Most of the empirical tests of these models have been carried out on U.S. data, which present the convenient institutional feature that special purpose districts (such as school districts) coexist with general purpose governments (counties, cities, municipalities, etc.). As special purpose districts are, in principle, easier to create and modify than general purpose governments, it should be easier to detect the impact of heterogeneity of local preferences and costs on the number of jurisdictions in that context. In his study of the determinants of government fragmentation in the U.S., Nelson (1990) finds that the number of jurisdictions is positively correlated with the degree of heterogeneity of individual preferences, measured by income and age dispersion; this finding, however, is not conclusive, as racial heterogeneity is associated with lower fragmentation, a result that runs counter the previous ones. Nelson considers all types of governments listed in the U.S. census, including both elected general purpose governments (counties, cities, municipalities, etc.) and special districts. Expectedly, he finds that the correlation between heterogeneity and fragmentation is stronger in the case of special districts than. In hiss historical analysis of the formation of local governments in America, Burns (1994) argues that tax avoidance and racial exclusion have been the most important drivers of the creation of new jurisdictions in the U.S. In

[2] The theoretical foundations for the potential benefits to be derived from subnational government fragmentation can be traced back to Tiebout's (1956) idea that taxpayers relocate to jurisdictions that best represent their preferences for services and taxes. Tiebout assumes that an adequate supply of local governments exists, which in fact assumes away the problem of fragmentation, but 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. Hence, a certain level of fragmentation would be efficiency enhancing, because a diversity of preferences requires a diversity of government service packages.

line with that argument, Martinez-Vazquez *et al.* (1997) find that increasing racial heterogeneity of a state population increases the number of school districts, supposedly to satisfy their preference for disassociation. More recently, Alesina *et al.* (2004) provide a comprehensive analysis of the creation of political jurisdictions as a response to the trade-off between economies of scale and the costs of a heterogeneous population, looking at the effects of heterogeneity in income, race, ethnicity and religion, again on school district data. Contrary to Nelson (1990), they find strong evidence of a trade-off between economies of scale and racial and income heterogeneity, but little evidence that ethnic or religious heterogeneity shapes jurisdictions. Most of these empirical studies, however, eschew samples based on traditional or general purpose governments, especially in cross country settings, where, as Gomez-Reino and Martin-Vazquez (2012, p. 21) put it, jurisdictional fragmentation may be affected not only by these "main economic arguments", but also 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".

A second major trade-off critical in the definition of the "optimal" jurisdictional size is that between administrative costs and local government accountability. Brennan and Buchanan (1980) were the first to set this point at the center of the scientific debate, when they argued that government fragmentation tax competition *à la* Tiebout were the most effective institutional response to limit the appetites of a Leviathan government. More recently, Seabright (1996) offers a transaction costs version of this idea. He points out that the relationship between accountability and government decentralization takes on different meanings depending, first, on whether we look at democracies or not; and within this type of government, voter's capacity to influence the election (and actions) of their local representatives is largely dependent on the extent to which the powers to spend and tax have been devolved to subnational governments, on whether elections are being held at the subnational tiers of government and on the quality of the election systems. In this context, Tommasi and Weinschelbaum (1999) identify three channels through which smaller jurisdictions are able to exert improved control over their political representatives. First, they reduce the incentives to free-riding, which becomes more visible in smaller groups – a classical application of Olson's (1965) logic of collective action. Second, for a given country size, a larger number of (smaller) jurisdictions improves the functioning of yardstick competition (Padovano and Petrarca, 2012), by introducing additional benchmarks for comparing political performances. In a similar line of reasoning, policy diffusion models (Berry and Berry, 1990) 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, via reduced transaction costs. Specifically, Tommasi and Weinschelbaum (1999) argue that physical proximity increases the probability that agents interacting in multiple venues, which allows for opportunities for punishment and thus introduces incentives for politicians to comply. Franzese (2001), instead argues that, insofar as physical proximity multiplies the number of government tiers, information

costs that voters must incur to effectively monitor their elected representatives increase, which reduces the efficiency in the agency relationship.

The suggested correlation between the demand for greater accountability and the creation of smaller jurisdiction comes mainly from historical and anectodical evidence. A possible indirect evidence of this correlation could be that accountability elicits greater participation of citizens in government activities. Yet, given the inconclusiveness of the studies relating voting turnout to jurisdictional dimension and more generally, the difficulty of solving the voting paradox (Blais and Young, 1999), no empirical study is able to confirm this relationship[3]. In a cross country sample, Gomez-Reino and Martinez-Vazquez (2012) find that preferences for political accountability lead to smaller jurisdictional size and a larger number of governments. They control for heterogeneity of preferences and economies of scale, and are able to confirm that preferences for political accountability lead to smaller jurisdictional size and to a larger number of governments, but not with more government levels. In their analysis the vertical structure of government is mostly related to "size" variables, like population and country size. As already said, they make no attempt at explaining how the historical background of the country affects vertical and horizontal fragmentation. This is what we now set out to do.

3. A theoretical explanation

The following model sketches the argument that will try to test in our empirical estimates. Assume a country with fixed surface *S*. The central government is in charge for providing public goods, distinguished as 'common interest public goods' g_C and 'local public goods' g_L. Common interest public goods differ from local public ones insofar as they are non-excludable and non-rival, like national defense and public security, while local public goods are partially rivalrous, like in the case of roads, schools, hospitals (Tiebout, 1956).

The production of pure public goods is represented by the following Cobb-Douglas functions:

$$g_C = A_C(V_c^{\alpha} I_C^{1-\alpha}) \quad (1)$$

$$g_L = A_L(V_L^{\alpha}\, I_L^{1-\alpha}) \quad (2)$$

[3] Analysts have adopted indirect empirical strategies to assess the link between jurisdiction size and measures of government accountability, by looking at assessment of citizens' satisfaction about the performance of governments that are 'further' or 'closer' to them. In the U.S., this evidence is provided mainly by studies of citizens' involvement in participatory planning and in performance budgeting (Jordan and Hackbart, 1999; Melkers and Willoughby, 2005; Riverbank and Kelly, 2006). At the international level, there is scattered evidence that residents appear to receive higher levels of satisfaction from the services received from local governments than those received from the central government: beside the results of the regular surveys of the CIS, Dasgupta *et al.* (2009) find that this is indeed the case in Indonesia. In the domain of the happiness literature, Frey and Stutzer (2000, 2002) show that happiness is higher in Swiss cantons where direct democracy is more widespread, which is usually negatively related with the dimension of the jurisdiction.

where A scales the technology of production, $V^{\alpha} = K_c^b L_c^{1-b}$, K is the input capital (including physical and institutional capital), L is the labor force and I is the 'institutional input', namely the jurisdiction that administers the territory where public goods and services are supplied. While K and L can change in the short period, the factor I does not.

The preferences of the population determine the levels of production of both goods, as illustrated in Figure 2.

Figure 2 about here

The negatively sloped line represents the public budget constraint:

$$p_{g_C} g_C + p_{g_L} g_L = \sum_{i=1}^{N} t y_i \quad (3)$$

where p is the price of the good, $i=1,...,N$ is the continuum of individuals in the population, t is the tax rate and y_i is individual's income. The convex curves W_1 and W_2 provide two alternative characterizations of the aggregate utility of the population with respect to the national and the local public good. In particular, if aggregate utility is described by W_1, the population attaches relatively greater importance to the consumption of national public goods; while if W_2 describes aggregate utility, the population preferences weight relatively more local public goods. The individual utility function is specified as follows:

$$U_i = a_i ln g_C + (1 - a_i) ln g_L + c_i \quad (4)$$

where $0 \leq a \leq 1$ is a parameter measuring the weight attached to national public goods rather than local public goods. The value of a depends on historical events that shaped the preferences of the population towards the alternative types of public goods. As an example, a history of frequent invasions or of internal political instability leads people to care relatively more about national public goods, like defense and internal security. On the other hand, the historical presence of ethno-linguistic minorities in the country's territory, or a longer history of stability may determine, *ceteris paribus*, a greater weight associated with the provision of heterogeneous public goods, more efficiently provided at the local level[4]. Finally, $c_i = y_i - t y_i$ is the consumption of private goods. The function is concave in both g_C and g_L since $U'_{g_C} = \frac{a}{g_C} > 0, U''_{g_C} = -\frac{1}{g_C^2} < 0$ and $U'_{g_L} = \frac{a}{g_L} > 0, U''_{g_L} = -\frac{1}{g_L^2} < 0$.

The aggregate utility function is therefore:

$$W = a ln g_C + (1 - a) ln g_L \quad (5)$$

where $a = \sum_{1=1}^{N} a_i$, N denoting the size of the country's population.

The allocation chosen by the central government depends on the level of democracy in the country. If the country is democratic, in the broad sense that government is responsive and

[4] This point will be more exhaustively discussed in the section explaining our empirical strategy.

accountable to the demands of the citizens, the government will tend to choose the allocation that grants him re-election. We can interpret such allocation as the one that maximizes the utility of the median voter: $\{g_C^{med}, g_L^{med}\}$. If, on the other hand, the government is non democratic, as in the case of dictatorships or of the autocratic regimes of the past centuries, they would maximize their power through repression and loyalty (Wintrobe, 1998) by choosing $\{A, 0\}$.

$$U_{gov} = \theta W + (1 - \theta)(\pi) \tag{6}$$

where $0 \leq \theta \leq 1$ is the degree of democracy of the country and π is government's power.

Given the technology of production A, the government faces an average cost function for the national public good of the type:

$$AC_{g_C} = \frac{C(g_C)}{g_C} = \frac{w_V\left(\frac{g_C}{A}\right)^{1/\alpha} I^{-(1-\alpha)/\alpha} + w_I I}{g_C} \tag{7a}$$

where w are factor prices. For the local public good, instead, we have:

$$AC_{g_L} = \frac{C(g_L)}{g_L} = \frac{w_V\left(\frac{g_L}{A}\right)^{1/\alpha} I^{-(1-\alpha)/\alpha} + w_I I}{g_L} \tag{7b}$$

The average costs of producing g_C and g_L are minimized when the quantities supplied correspond to the minimum efficient scale, that is the conditions $\frac{\partial ACgc}{\partial g_C} = 0$ and $\frac{\partial ACgL}{\partial g_L} = 0$ are met:

$$\left(\frac{1}{\alpha}\frac{1}{A}\frac{w_V}{w_I}\right)^{\frac{1}{\alpha}} = \frac{I}{g_C^{-1-5\alpha} - g_C^{1-4\alpha}} \tag{8a}$$

and similarly

$$\left(\frac{1}{\alpha}\frac{1}{A}\frac{w_V}{w_I}\right)^{\frac{1}{\alpha}} = \frac{I}{g_L^{-1-5\alpha} - g_L^{1-4\alpha}} \tag{8b}$$

The right hand side in equation (7a) and (7b) describe a non linear relation between the institutional factor I, that measures the degree of fragmentation of the government level that provides the good, and the MES levels g^*_C and g^*_L. This relation is characterized by a positive sign associated to low values of α and a negative sign otherwise. The negative sign implies that when jurisdictions want to produce efficiently a larger quantity of the public good, the degree of fragmentation I must be lower, implying either shifting the production to a higher government level with less jurisdictions of larger size, or by enlarging the size of the jurisdictions, e.g., through a process of mergers. A positive sign, on the other hand, indicates that a larger demand of the good is produced efficiently - *ceteris paribus* - with a higher degree of fragmentation. To better understand this result, consider that the production of local public goods and national public goods is characterized by different values of the α parameter. In particular, as local public goods are subject to congestion, the technology for producing them reasonably associates a large share of the output, α, to every unit of I. On the contrary, as the consumption of the national public good is characterized by a lower degree of congestion, the size of the jurisdiction producing the good g_C

has a smaller impact on the production; hence α takes small values. Following this reasoning, we expect a large α in equation (7a), hence a negative relation between I and g^*_C; and a small α in equation (7b), thus a positive relation between I and g^*_L. This result predicts that, when a larger quantity of national public goods g_C is demanded, the degree of fragmentation I decreases; conversely, when a larger quantity of local public goods g_L is demanded, the degree of fragmentation I increases.

Furthermore, given that local public goods are characterized by a positive degree of rivalry in consumption, while national public goods are not, the quantity of local public good that makes the average per capita cost null is expected to be lower than the one for the general public goods. This result can be demonstrated formally through equations (8a) and (8b), because since $\alpha_{gL} < \alpha_{gC}$, the minimum efficient scale (MES) of the production of public goods is characterized by $g^*_C > g^*_L$. This inequality states that the central government cannot produce efficiently both types of goods because their different MES are satisfied by two jurisdictions of different sizes, which are not present in a fully centralized country. Since these goods must be delivered to the entire population of the country, the jurisdictions of different sizes cannot belong to the same horizontal government level. To ensure efficiency in production the central government must create two government tiers, hence vertical fragmentation. The higher government tier will produce the public good with large MES, here g_C, while the lower tier will be responsible for the supply of the more rivalrous public good g_L. Figure 3 illustrates the process.

Figure 3 about here

The g_C-g_L space includes the solution to the optimal allocation problem of the government. Assuming that the welfare function is represented by the curve W_1, the optimal production allocation for the government is $E1 = \{g_{C1}, g_{L1}\}$. The short term average cost functions AC_{g_C} and AC_{g_L} have different shapes and positions, depending on the technology A and the institutional factor I, which varies only in the (very) long run. When technology improves, the short period cost function shifts outwards and determines larger values of the MES.

In figure 3 the level of the good g_{C1}, which corresponds to the equilibrium level E_1, is larger than the MES level g^*_C, while the level of the good g_{L1} equals g^*_L, i.e., the optimum. In such a situation, the central government pays the price of its efficiency in the production of g_L by being inefficient in the production of g_C. In particular, the inefficiency in the production of g_C is generated by a sub-optimal allocation of the short-period variable inputs K and L. To solve the problem, the government may choose two alternative courses of action. One is to reduce the use of variable inputs and produce a lower amount of g_C. This would decrease the utility of the government however, either because, in the case of the democratic government, that would lower the welfare of society to a level below W_1, and, with that, the electoral popularity of the government; or because, if the government is dictatorial, the power of the regime would be reduced. The alternative course of action is to maintain the optimal level of production g_L and reaching, at the same time, the optimum for g_C by changing the institutional factor I that was kept constant in the

short run. This move involves the creation of an additional administrative level with jurisdictions of larger size. Since both goods are demanded by the entire population, the two different sizes cannot apply to jurisdictions belonging to the same government level. The change in the institutional factor I in the production of g_C generates vertical fragmentation. In particular, the government will fragment the country in a number of jurisdictions of different sizes to match the sizes of the MES of production of both g_L and g_C. The central government creates first a larger sub-national administration, named $t=1,...,T$, of size g_C^*, that should provide the national public good; then, it would define a number of territorial subdivisions within t, labeled $j=1,...,J$, of size equal to g_L^*, that are in charge to produce g_L.

Horizontal fragmentation, on the other hand, arises when the level of the public good demanded is large relative to its MES. This is most likely to happen in the provision of the rivalrous public good g_L. In this case, the number of local jurisdictions needed to produce g_L efficiently multiplies, resulting in more horizontal fragmentation, i.e., a larger number of jurisdictions belonging to the same government tier.

This intuitive theoretical structure provides three relevant insights about the degree of fragmentation of a country. First, the larger the differences in the MES that characterize the production of the two goods, the larger will be the number T of sub-national government tiers that the central government must establish, i.e., the more pronounced will be the vertical fragmentation[5]. Second, the larger is the difference between the MES of any particular public good (more likely the rivalrous ones) and the quantity demanded by the entire population of the country, the larger will be the number of jurisdictions J, i.e., the larger will be horizontal fragmentation. Third, since I is an institutional input that changes only in the long run, in the short run the government cannot reasonably reach the efficient level of production for each type of good it produces. In this situation the decentralized governments change the levels of production of public goods and services by changing the employment of the variable inputs K and L, although that entails not reaching the cost-minimizing production of the quantity demanded, or the quantity demanded itself[6]. The institutional change I is introduced only when the cost of the inefficiencies become too large to be sustained.

4. *Empirical strategy*

In order to bring this theoretical structure to the data, we must find proxies for a, the weights that individuals attach to the types of goods that g_C and g_L that the different government levels may produce; for the costs of producing them, ACg_C and ACg_L; for θ, the degree of democracy of

[5] We can imagine that this process of vertical fragmentation has an upward bound provided by administrative and coordination costs, as in the models of political economy of taxation *à la* Hettich and Winer (2005).

[6] These inefficiencies might take the form of common pool situations, excessive production of local services or suboptimal amounts of redistribution, all of them entailing a loss of popularity for the democratic government or a suboptimal amount of resources available to maximize power in the case of a dictatorial regime.

the government; for the individuals' utility function U, as well as for a variety of control factors $\boldsymbol{Z}$ identified in the literature. Finally, we must also find measures for the phenomena we are interested to explain, namely, the number of jurisdictions J and of government tiers T for every country in the sample.

Finding proxies for horizontal and vertical fragmentation is not so easy as it seems. Counting the number of government levels and of horizontally aligned general purpose jurisdictions, such as municipalities, regions, states etc., has the advantage of intuitiveness and clarity, but begets the fundamental problem of measuring the size of these jurisdictions, which is especially relevant for horizontal fragmentation[7]. The empirical literature (Nelson, 1990; Gomez-Reino and Martinez-Vazquez, 2012) therefore considers multiple indicators for horizontal fragmentation. We follow this path and examine three proxies for J, namely, the total number of jurisdictions, the ratio between population N and J and the ratio between country size S and J. Vertical fragmentation is easier to make operational, and we consider only the number of government tiers T.

Equation (9) summarizes the specification of the empirical model:

$$Y_i = \beta_0 + \beta_1 BASIC_i + \beta_2 EXTRISK_i + \beta_4 INTRISK_i + \beta_5 COST_i + \beta_6 HETPREF_i + \beta_7 INSTIT_i + \beta_8 GEO_i + \varepsilon_i \quad (9)$$

where the vector Y_i includes the dependent variables specified as above. The subscript i denotes the country; data availability limit the estimate of equation (9) to 227 countries in a given year, specifically 2010[8]. With respect to the empirical analysis closest to ours, namely Gomez-Reino and Martinez-Vazquez (2012) we have a larger number of countries, although this difference somewhat decreases as the number of covariates included in the estimates increases. The main innovation that we introduce with respect to that study is that we examine the impact of a large array of historical events on government fragmentation; in Gomez-Reino and Martinez-Vazquez (2012) these effects are left unexplored in the fixed effects. Appendix A1 explains the construction of the individual series ; appendix A2 lists the variables, the data availability and the sources.

In equation (9) the covariates are grouped in vectors of homogenous variables. β_0 is a vector of continental dummies, usually considered in the literature, with Europe as the base group. *BASIC* is a vector of measures of the dimensions of the country, in terms of population, area and density of the population. These variables, plus some indicators of heterogeneity of preferences in the

[7] As an example, the 20 Italian regions and the 22 French ones may appear roughly of the same average size in terms of the population they administer (on average, 2,7 vs. 3 million per region), but they are quite different when they are normalized by the size of their territories (23k square kilometers vs. 15k).

[8] The creation of general purpose government units is a slow moving process, that often changes in structural breaks determined by constitutional reforms, wars, demise of the state and the like. It would be quite interesting to compare contemporaneous data with those of one or two decades ago, to capture the evolution of this process; unfortunately, this information is not available.

population, that we will explain later, are the ones that show up statistically significant in the analysis of Gomez-Reino and Martinez-Vazquez (2012); as such, they constitute "what we know so far" in terms of determinants of government fragmentation in a cross country sample. In the context of our model the hypothesis under test is that, when the population of the country increases (*lnpop*), the budget line shifts outwards, and a larger amount of resources becomes available to produce public goods. The rivalry that characterizes the consumption of local public goods, however, congests their consumption, increasing their marginal utility with respect to the one associated to the national public goods. As a consequence, the number of jurisdictions J is bound to increase, while the number of tiers T and the average size of the jurisdiction are expected to decrease with the size of the population. The same argument is tested by the variable *lndensity*, as more densely populated countries suffer more from congestion in the consumption of the local public good; hence, a positive relationship is expected with vertical fragmentation and a negative one with horizontal fragmentation.

To these variables, we add more possible conditioning phenomena. In line with our theoretical structure, we look at the determinants of a, the weights that individuals (or a dictatorial government) attach to the provision of general public goods g_C or, alternatively, to rivalrous ones g_L. Lacking direct information about the arguments in the utility function U, we claim that history shapes these individual preferences. If a country's past is punctuated by recurring invasions, wars, foreign threats, the citizens will give relatively more importance to – and demand relatively more - g_C-type public goods, like those associated to defense, which are generally provided by the central government; similarly, if the country suffers of recurrent social and political unrests and internal instability, citizens will demand more protection of property rights, order, law enforcement and the like, that given their MES tend also to be more efficiently provided by the central government. They might so far as to accept an all-encompassing, highly centralized dictatorial regime, as argued in Hobbes' *The Leviathan*. On the other hand, citizens of stable countries, with remote foreign menaces, will attribute relatively more importance – and demand relatively more – g_L-type public goods and services, such as transportation, education, health care, garbage collection, amenities and the like[9]. The greater degree of rivalry that characterizes these services make them liable to be more efficiently provided by lower tiered, smaller jurisdictions. To test whether these hypotheses affect the vertical and horizontal fragmentation of a country, we consider two types of historical events, labeled as external risks (vector *EXTRISK*) and internal ones (vector *INTRISK*). Among the *EXTRISK* variables, we examine the impact of the *year of the last invasion*, and of the *number of invasions* in two alternative specifications: invasions after World War II, to include a larger set of countries, and invasions since the XVI century, to capture long lasting collective memories. These events should be associated with a smaller number of J and of T. As these events

[9] In his *The Prince*, Machiavelli reproached the Italian States of the Renaissance period for having invested too much in g_L type goods, such as monuments, culture, services for the industries, and too little in defense from external threats. Their small size was one of their main structural shortcomings, that would lead to their eventual demise, especially when compared with the size of the then-emerging nation states such as France that, because of their larger size, were able to raise more powerful armies. This conviction lead Machiavelli to support the Cesare Borgia's attempt to create a larger state in central Italy.

affect also the risk aversion of the population, we consider the possibility that they are either linearly or nonlinearly related with the measures of fragmentation Y_i. We also control for the number of neighbors (*nrneigh*), that is liable to be directly associated to a higher risk of being invaded. The history of Europe provides a good example in support of this argument. When more countries are border with each other, political disputes, expansionistic desires or other relevant issue increase the probability of inter-state conflicts. Beside this, the nature of the national border determines the efficiency in defense of a country: coastal borders (*coastline*) are in fact more difficult to attack, witness the history of Great Britain; on the other hand, longer terrestrial borders (*kmborder*) are characterized by a larger risk of violation, as in the case when a unified Germany shared a long border with France.

Public provision of goods and services are also a kind of insurance against a risk coming from within (vector *INTRISK*). When the supply of the goods does not suffer from congestion, as in the case of calamity relief programs, the citizens demand a national insurance to pool the risk of disasters. We consider the share of population hit by natural catastrophes (*calamity*), averaged over the period 1990-2009 to account for the recent history of the country. As calamities engender institutional responses only if they are serially correlated, there is no need to look for data about natural disasters that took place in a more distant past, which are also difficult to find. The more widespread a catastrophe is, the larger is the demand for national public goods, increasing the number of tiers of government required to supply calamity relief programs, and decreasing the number of jurisdictions in the country. Internal risks, however, may not have a natural origin, but a social and political one. We measure internal social unrest as the number of revolts and rebellion in a country since 1946 (*revrebcsp*). Events of violence and disorder within a country affect the preference of the society for either a larger production of general public goods, like the protection of order and property rights, or a more diversified one, leading to larger fragmentation, in a sort of "*divide et impera*" strategy; on the other hand, they generate a larger supply of repression and security to restore the order, and therefore a "flatter" government. A good example of this process could be the social unrest that followed the end of WWI in Italy and Germany, which led to the replacement of democratic institutions by fascist dictatorial regimes. The sign of this variable, therefore, is not predetermined. When revolts are led by military officials backed by the army, they often reverse the government and limit the degree of freedom and democracy in the country. A history characterized by many *coups d'état* (*coupscsp*), therefore, is associated to a large supply of order and autocracy, associated to smaller fragmentation.

Contrary to most of the models of government fragmentation, that examine the effects of preferences heterogeneity, our long run perspective on the determinants of institutions is expressed in terms of cost differences. Hence we introduce in the estimations also some expenditure variables in the vector *COST* to control for the position and slope of the public budget constraint. A country with a larger per capita general government expenditure, x*p_cgpc*, is expected to be associated to a higher level of production for both g_C and g_L, increasing both the dimensions of fragmentation. If we consider the composition of the public budget, a large share of

expenditure for national public goods as defense (*milxp_cxp*) should be associated with lower fragmentation, both vertically and horizontally. Conversely, a larger share of expenditures for congested public goods, like as education (*eduxp_cxp*) and health (*heaxp_cxp*), should be correlated with greater values in both measures of fragmentation.

As previous empirical studies found that the heterogeneity of the population's preferences for public goods and services plays an important role in explaining government fragmentation, we control for that in the same way as in the rest of the literature (Gomez-Reino and Martinez-Vazquez, 2012; Alesina *et al*. 2004). Specifically, in the vector *HETPREF* we consider three variables indicating the age concentration (*ahv*), income inequality (*gini*) and linguistic fractionalization (*aleelf*)[10]. A more heterogeneous population is associated to more heterogeneous preferences, therefore with a more fragmented country - both vertically and horizontally.

The institutions of the country (vector *INSTIT*), namely the transmission mechanisms that relate (or not, in the case of dictatorships) preferences to political decisions, are relevant control variables as well, since they describe the relation between the supply of public goods and services of the government and the citizen's preferences. In the context of our model, they can be thought of as proxies for the parameter θ. If a country scores low in terms of political rights and civil liberties (*freedom*)[11], it should be characterized by a larger degree of government fragmentation because civil liberties allow the expression of the preferences of the population and political rights make the government responsible to citizens. Similarly, we expect that countries that experienced a longer period of democracy (measured by *age_dem*) are associated to a larger fragmentation, whereby the countries that have been autocratic for a long time in their history (*age_aut*) are associated to smaller fragmentation. The degree of democracy, in fact, determines the utility function of the government as defined in sections 3: a democratic government cares about the populations' preferences while a dictatorial one aims at maximizing his power through repression and loyalty. We use the number of years under each of these types of government to account for the recent history of a country and for the possibility that it accumulated the so called democratic capital[12] (Persson and Tabellini, 2009). The legal system (*commonlaw*), the system of government (*parliamentary*, *presidential*) and the presence of sub-national elections (*sl_elec*) are included as additional controls. This vector of variables essentially test the vision that government accountability affects government fragmentation.

[10] Race and religious heterogeneity were also considered but, as it is often the case in cross country regressions, they never turned out significant. These factors prove relevant in the sample of the U.S. single-purpose government units, such as school districts (Nelson, 1990; Alesina *et al*., 2004).

[11] The original data from the DPI record as less free a country with a high index of *freedom*. To be consistent with the data source, we maintain this sorting and this interpretation.

[12] Democratic capital is defined as a gradual appreciation of democracy as an accumulation of a stock of civic and social assets that takes place through a country's learning from its own historical experience or from its neighboring countries (Persson and Tabellini, 2009).

Finally, a further institutional feature that is important to control for in the context of the present analysis is the multi-dimensionality of government fragmentation. To account for that we included the number of tiers in the regression of horizontal fragmentation, and the number of jurisdictions in the regression using vertical fragmentation as dependent variable. There is no prior on the sign of this coefficient, as our model does not predict a specific equilibrium design of a country - few tiers and many jurisdictions, or many jurisdictions and a few tiers. We expect, however, that these two dimensions are somehow related with each other because they share some common determinants (e.g. economies of scale).

To conclude, we included the geographic variables in a separate category (vector *GEO*) from the fixed effects because also the geographical characteristics of the country reflect preferences for national vs. local public goods that the fixed effects do not explain. For instance, an increase in the size of water surface and agricultural land in a country "fixes" the population in a given place, reducing the need for migration and roaming. In a path dependent mechanism, this shifts the preferences of the population towards the production of local public goods (Putnam, 1993; Olson, 2000). We then expect the coefficients of *water_surface* and *agric_land* to be negatively related to the number of tiers and positively related to the number and the size of the jurisdictions.

Table 1 summarizes the expected signs on each of these variables.

Table 1 about here

5. Empirical results

We estimated four sets of regressions where the dependent variable is, alternatively, the number of sub-national tiers (*nrslg*), the number of sub-national jurisdictions at the lowest level of government (*totjur*), population per jurisdiction (*popjur*) and area per jurisdiction (*areajur*).

We provide results from an OLS model for horizontal fragmentation and a Tobit model for vertical fragmentation, since in our dataset the number of tiers is bounded between 1 and 6. The continuous variables are transformed in natural log (*ln*).

We estimated seven models by starting from a basic specification with only fixed effects, β_0, and then we progressively add our covariates according to the vectors of variables illustrated in section 4. These seven models have been estimated with and without the inclusion of the variables that proxy the external and the internal risk of conflict. We come up with sixteen sets of regressions: for each dependent variable there is in fact a set of estimates with both internal and external risk, one with internal risk only, one with external risk only, one with neither of them. The results are consistent across these different specifications, therefore we present here only those including the largest number of covariates, that provide us the full specification. The other sets of estimations, used as robustness checks, are reported in the Tables from A3 to A14 in the Appendix.

Without going into details, for the sake of brevity, these other estimates generally confirm the results of the reported estimates.

Table 2 presents the estimates for the vertical fragmentation.

Table 2 about here

Although data availability constrains the number of observations between 110 and 134, the estimations of Table 2 show a good explanatory power, 0.446, in the most complete model, *xp2*. Our main hypotheses are verified, as an inspection of the signs of the coefficients confirms. To keep the discussion as close as possible to the test of the empirical predictions of our model, the comments will focus on the variables that are significant at least at the 10% level.

The negative relation expected between fragmentation and the size of population is verified and indicates an increase of about 0.0025% in the number of tiers associated to a 1% increase of the population. In other words, when the population doubles the number of government tiers increases by 25%. At the same time, a 100% increase of the density of population is associated to a decrease of the number of tiers of about 20%. These results match the predictions, the previous findings of the literature and confirm the presence of congestion in the consumption of local public goods.

The positive sign of the coefficient associated to *lntotjur* indicates that countries with more tiers show, *ceteris paribus*, more jurisdictions at the lowest level. In other words, those countries that supply different types of public goods characterized by different degrees of congestion in their consumption are also the ones supplying a larger quantity of them[13].

The geographic variables, when significant, confirm our predictions; as an example, a larger terrestrial border reduces the number of tiers, while the a larger size of water surface and the share of agricultural land, as proxies for "local" preferences, increase them.

The heterogeneity of the population matters only with respect to linguistic fractionalizations, increasing the number of tiers, as expected. On the other hand, the institutional variables point out that freer countries have more tiers, while more autocratic countries have less tiers. Both results are consistent with the predictions of the model. In particular, one more year of autocracy is associated to a reduction of 0.025 tiers. Presidential countries, finally, have more tiers than non-parliamentary and non-presidential countries, confirming that presidential systems have a more precise division of labor among government levels.

Interestingly, the variables of internal risk are never significant when included in the empirical specification, and they show instable signs. The only exception is *calamity*, that is positive as expected and significant at the 5% level in model *BASIC* and at the 10% level in the model *INSTIT*.

[13] Evidence of this argument would indicate simultaneity between the number of tiers and the number of jurisdictions, that at this stage of the project we do not consider. We plan, however, to estimate a simultaneous equations model to correct the possible endogeneity of the estimates; at the moment we are searching for valid instruments.

The variables of external risk, on the other hand, are highly significant and associated to the expected signs. The non linear relationship found in the number of invasions reveals that countries react to external risks in a variety of ways. At low levels of external risk the country replies only by mobilizing more resources for defense; once a threshold is passed (around 17 invasions since the XVIth century) the country adapts institutionally to the risk by increasing the number of government tiers, in an attempt to maximize the efficiency in the delivery of both g_L and g_C types of goods. Further research is called to investigate this point; yet we can conclude that the perception of an external risk of conflict positively affects the number of tiers in a country.

Table 3 presents the same sets of estimates as Table 2, using as dependent variable the number of jurisdictions at the lowest level of government.

Table 3 about here

The significant coefficients indicate, as expected, that more populated countries are associated with larger fragmentation at the lowest level of government, while more dense countries, where congestion problems arise sooner, show on average a lower degree of horizontal fragmentation. The magnitude of the coefficients suggests that a 100% increase in the size of population increases the number of jurisdictions by almost 100%, while the same increase in the density of population reduces the number of jurisdictions of about 40%.

The number of tiers, *nrslg*, increase the number of jurisdictions; this result, if matched with the positive coefficient for *lntotjur* in Table 2, describes the average country in our dataset as a complex hierarchical structure in which every tier that is created doubles the number of the jurisdictions at the lowest level.

The geographical variables confirm the empirical predictions and show a positive sign for *coastline* and *water_surface*, and a negative sign for *kmborder*. "Local" poreferences disaggregate the state horizontally, while risks of foreign invasions tend aggregate it, to better supply defence.

Linguistic fragmentation is negatively associated with horizontal fragmentation, a result at odds with the standard predictions and finding of the literature (Gomez-Reino and Martinez-Vasquez, 2012; Alesina *et al*., 2004). This coefficient is positive in Table 2, however, suggesting that diverse populations are associated in countries with a larger number of government levels. Both results are consistent with our theoretical model, however, as a larger linguistic fragmentation may in fact either generate a higher demand for pure public goods as political participation and representation, or represent a risk of internal conflict if the minorities' preferences are not satisfied and the minorities engage in violent revolts. A larger demand for pure public goods increases the number of tiers but reduces the one of jurisdictions at the lowest level of government. Among the other variables a larger degree of *freedom* is, *ceteris paribus*, associated to the expected negative sign; common law systems, on the contrary, bring about greater decentralization with respect to other types of legal institution. Internal risk, once again, shows coefficients that are never significant, while an increase in the external risk increases the centralization of a country, as predicted.

With these results in mind, we now present the last two sets of regressions, that use as dependent variables the size of jurisdictions at the lowest level of government, measured in terms of population (*popjur*) and surface (*areajur*). As the size of the country is fixed, larger fragmentation entails a larger number of tiers and/or jurisdictions, therefore a smaller size of them, and *vice versa*. The estimates are reported in Table 4 and Table 5.

Table 4 and Table 5 around here

Once again, the coefficient of the covariates show the expected signs, and we confirm the pattern of significance across variables that we obtained in Table 2. The main determinants of horizontal fragmentation are thus identified in the nature of the national border, the legal system and the risk of being invaded. Water surface and agricultural land are significantly related to fragmentation only when we use the the surface per jurisdiction specification; this result is motivated with the fact that the higher density of population is observed in urban areas, that not necessarily enjoy a large amount of these natural resources. *Freedom* is significant and positive in Table 4 but not in Table 5, possibly because a higher degree of political rights and civil liberties determines the creation of smaller communities, that is smaller markets for local public goods, in which the efficient allocation is supplied. These communities, however, are not necessarily smaller also in terms of surface. To conclude, the expected positive sign of the coefficient associated to two expenditure variables, that is the per capita general government expenditure, *xp_cgpc*, and the share of health expenditure, *heaxp_cxp*, is significant only in Table 5.

6. Conclusions

This paper has brought history into the analysis of the large differences in the number of local jurisdictions and of government levels across the countries of the world. Historical events, categorized as external and internal risks, shape the populations' preferences for general public goods, more efficiently provided by higher tiered, larger jurisdictions, and for local public goods, better supplied by smaller, lower tiered jurisdictions. When more local public goods are demanded, a higher horizontal fragmentation will be the efficiency enhancing, long run institutional response; the opposite should happen when more general public goods are demanded. When both goods are demanded, differences in the MES for general and local goods produce vertical fragmentation as the efficiency enhancing institutional responses.

We test the implications of this theory, alongside other determinants considered in the literature, using a variety of indicators of vertical and horizontal fragmentation. Data lend support to the hypothesis that a history of foreign invasions decreases the number of local jurisdictions and raises the number of government tiers, the same effect found for internal risks such as natural calamities. The shape of the land and linguistic fragmentation also generate preferences for local goods and increases horizontal fragmentation. The type of government also matters, as dictatorial regimes are flatter and less fragmented than democracies.

All these results mark significant innovations with respect to the literature that explained government fragmentation only in terms of country size, population and preferences for accountability, but left other determinants unexplained into fixed effects.

Figure 1a. Map of the countries in the dataset by the number of tiers of government

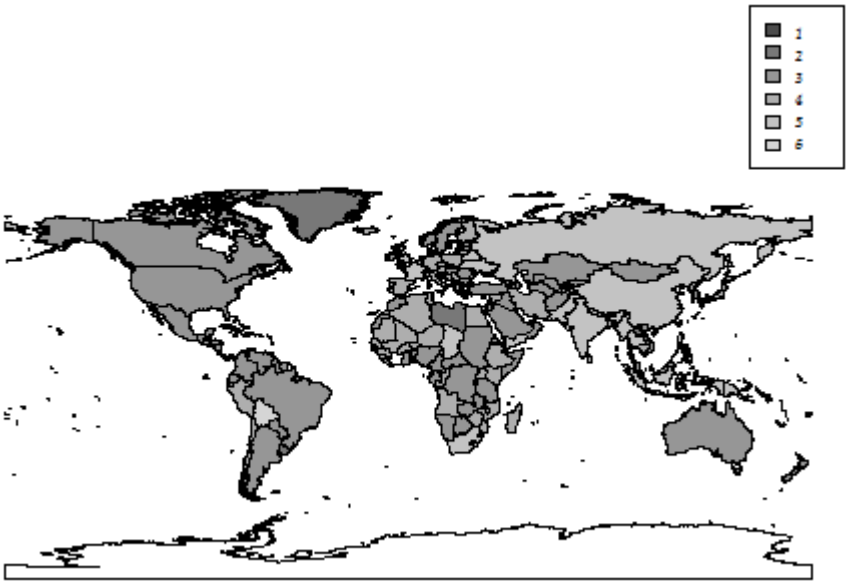

Figure 1b. Map of the countries in the dataset by the number of jurisdictions at the lowest tiers of government

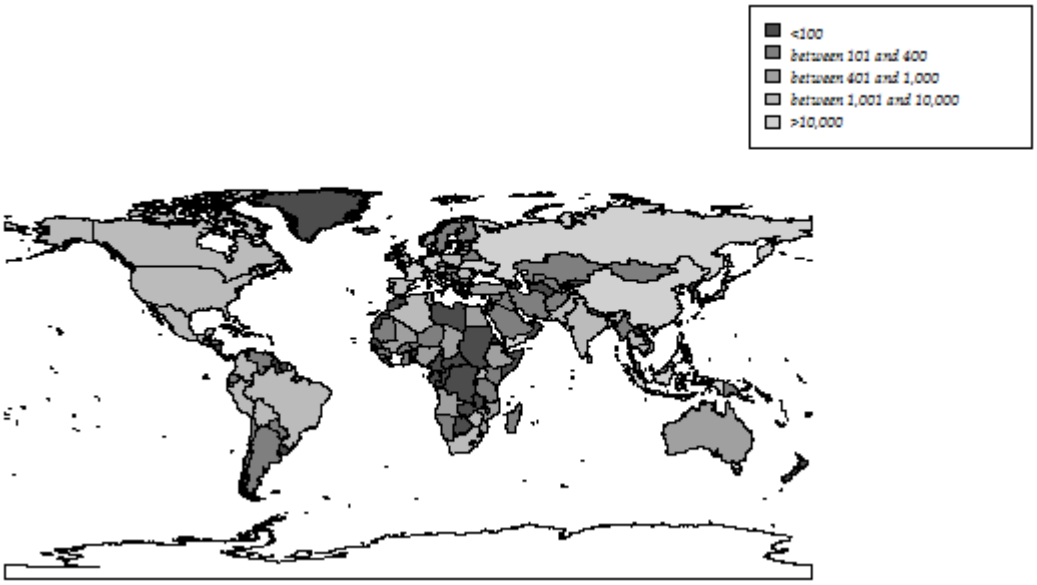

Figure 2. Optimality of the levels of production of the public goods

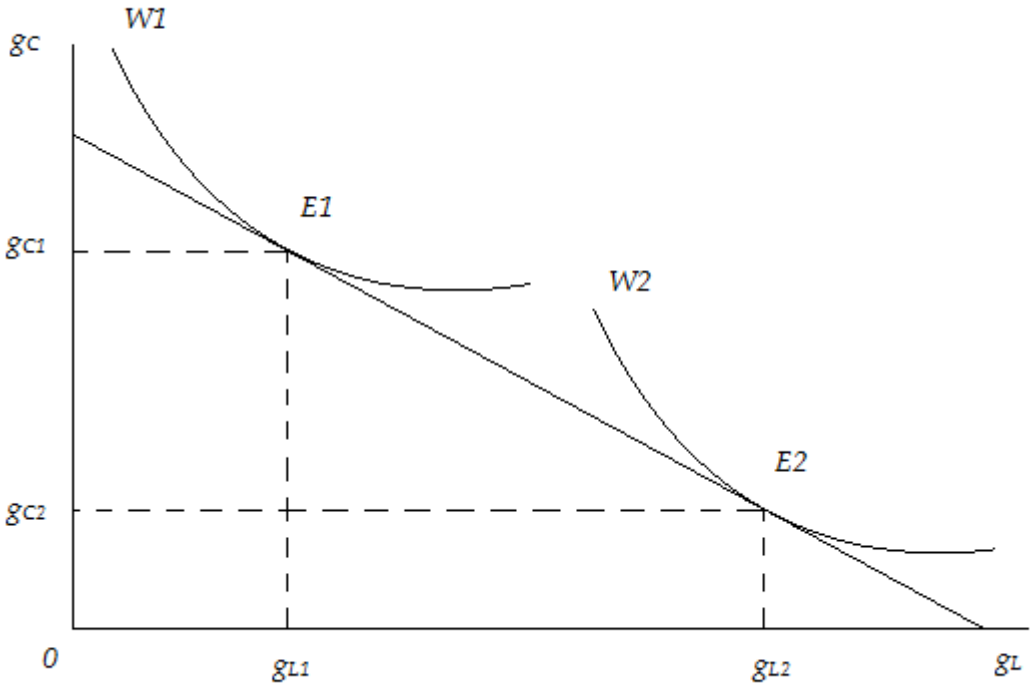

Figure 3. The process of generation of vertical and horizontal fragmentation

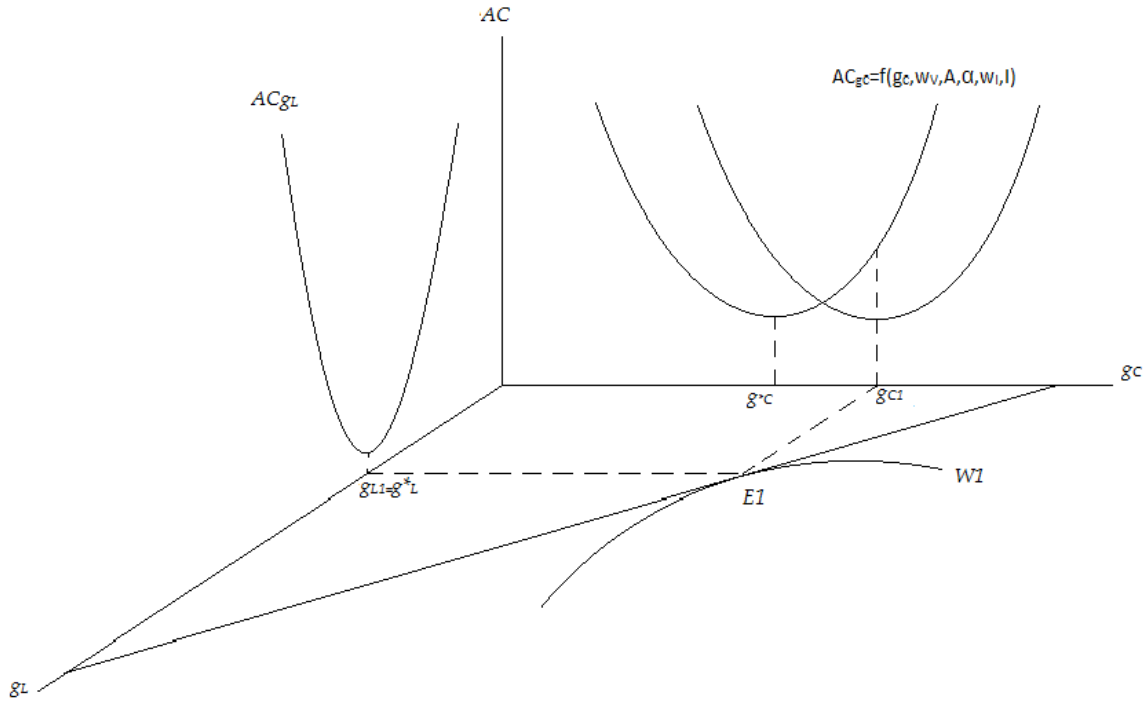

Table 1. Expected signs

	Nr tiers	*Nr jurisdictions*	*Pop/jur*	*Area/jur*
Ln pop	-	+		
Ln area			-	-
Ln density	+	-	+	+
Lntotjur	+			
Nrslg		+	-	-
Nrneigh	+	-	-	-
Coastline	-	+	-	-
Kmborder	+	-	+	+
Water surface	-	+	-	-
Agric_land	-	+	-	-
Ahv	+	+	-	-
Gini	+	+	-	-
Aleelf	+	+	-	-
Freedom	+	-	+	+
Age_dem	+	+	-	-
Age_aut	-	-	+	+
Commonlaw	?	?	?	?
Parliamentary	?	?	?	?
Presidential	?	?	?	?
Sl_elec	?	?	?	?
Xp_cgpc	+	+	-	-
Milxp_cxp	+	-	+	+
Eduxp_cxp	-	+	-	-
Heaxp_cxp	-	+	-	-
Revrebcsp	?	?	?	?
Coupscsp	-	-	+	+
Calamity	+	-	+	+
Last_invasion	+	-	+	+
Inv_all	+	-	+	+

Table 2. Estimation of local fragmentation, number of sub-national tiers of government

Dep. Var.: number of tiers of government (including the central government)														
	fe_rr		*basic_rr*		*geo_rr*		*hetpref_rr*		*instit_rr*		*xp1_rr*		*xp2_rr*	
Oceania	0.123		-0.044		1.098	**	1.224	***	1.058	**	1.176	**	1.181	**
South America	-0.295		-0.529	**	0.135		0.082		-0.259		-0.202		-0.240	
North America	-0.566		-1.301	**	-1.228	**	-1.347	**	-1.934	***	-1.855	***	-1.722	**
Central America	-0.512		-0.395		0.106		0.036		-0.261		-0.535		-0.621	
Asia	-0.121		-0.364	*	0.132		0.112		-0.121		-0.130		-0.087	
Africa	-0.033		-0.187		0.525	***	0.348	*	0.054		0.056		0.184	
Ln pop			0.251	***	-0.189	***	-0.216	***	-0.245	***	-0.246	***	-0.254	***
Ln density			-0.005		0.189	***	0.209	***	0.229	***	0.228	***	0.237	***
Lntotjur					0.354	***	0.367	***	0.371	***	0.365	***	0.373	***
Nrneigh					-0.023		-0.031		-0.043		-0.041		-0.032	
Coastline					0.000		0.000		0.000		0.000		0.000	
Kmborder					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Agric_land					-0.004	*	-0.004	*	-0.004	*	-0.004		-0.005	**
Ahv							-1.681		-2.724		-3.429		-2.755	
Gini							0.001		0.006		0.006		0.008	
Aleeld							0.453	*	0.443	*	0.496	*	0.477	*
Freedom									0.039	*	0.041	*	0.038	
Age_dem									0.002		-0.001		0.001	
Age_aut									-0.025	**	-0.029	**	-0.018	
Commonlaw									0.171		0.132		0.312	
Parliamentary									0.141		0.182		0.082	
Presidential									0.364	**	0.393	**	0.325	
Sl_elec									0.123		0.136		0.142	
Xp_cgpc											0.000			
Milxp_cxp													-0.014	
Eduxp_cxp													-0.004	
Heaxp_cxp													0.007	
Revrebcsp	0.089		-0.015		-0.009		0.004		0.001		0.009		0.038	
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	0.053		0.072	**	0.040		0.034		0.043	*	0.043		0.026	
Last_invasion	0.001	*	0.001		0.001	**	0.001	**	0.001	**	0.001	**	0.001	**
Inv_all	0.005		0.020		0.049	*	0.054	**	0.066	**	0.076	***	0.075	**
Inv_allsq	0.000		-0.001		-0.002	*	-0.002	*	-0.002	**	-0.002	**	-0.002	**
Constant	0.732		-1.777		1.026		1.942		2.198		2.489		1.763	
Sigma	0.725	***	0.662	***	0.500	***	0.491	***	0.470	***	0.467	***	0.469	***
Observations	134		134		130		130		130		128		110	
R^2	0.068		0.143		0.377		0.392		0.429		0.436		0.446	

Note: Tobit estimation robust to heteroskedasticity. Continuous variables in log. Significance levels: * p<.1; ** p<.05; *** p<.01.

Table 3. Estimation of local fragmentation, number of jurisdictions

Dep. Var.: ln number of jurisdictions at the lowest level of government														
	fe_rr		basic_rr		geo_rr		hetpref_rr		instit_rr		xp1_rr		xp2_rr	
Oceania	-0.412		-1.538	***	-2.293	***	-2.644	***	-2.094	***	-2.411	***	-2.233	***
South America	-0.437		-1.584	***	-1.129	***	-1.267	***	-0.729		-0.943	*	-0.872	
North America	2.470	***	-1.143		-0.646		-0.526		0.689		0.735		0.689	
Central America	-1.660	**	-1.080	**	-0.548	*	-0.683		-0.347		-0.394		0.067	
Asia	-0.520		-1.565	***	-1.089	***	-1.119	***	-0.626		-0.646		-0.664	
Africa	-1.109	**	-1.877	***	-1.725	***	-1.492	***	-1.060	**	-1.164	**	-1.448	**
Ln pop			1.089	***	0.840	***	0.872	***	0.897	***	0.907	***	0.954	***
Ln density			-0.220	**	-0.349	***	-0.374	***	-0.401	***	-0.430	***	-0.410	**
Nrslg					1.148	***	1.147	***	1.177	***	1.168	***	1.143	***
Nrneigh					0.054		0.075		0.087		0.083		0.092	
Coastline					0.000	**	0.000	***	0.000	*	0.000	*	0.000	**
Kmborder					0.000	**	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Agric_land					0.008	*	0.007		0.007		0.007		0.010	
Ahv							2.598		2.831		2.211		-0.124	
Gini							0.015		0.005		0.002		0.001	
Aleeld							-1.109	**	-0.980		-1.199	*	-1.327	*
Freedom									-0.087	**	-0.101	**	-0.097	*
Age_dem									-0.004		0.005		-0.003	
Age_aut									0.020		0.032		-0.006	
Commonlaw									-0.635	**	-0.616	**	-0.970	**
Parliamentary									-0.253		-0.250		-0.095	
Presidential									-0.442		-0.507		-0.367	
Sl_elec									-0.176		-0.226		-0.309	
Xp_cgpc											0.000			
Milxp_cxp													0.021	
Eduxp_cxp													0.045	
Heaxp_cxp													-0.027	
Last_invasion	0.002		-0.001		-0.002	**	-0.002	**	-0.002	**	-0.002	*	-0.003	**
Inv_all	-0.104		-0.033		-0.088	*	-0.090	*	-0.108	**	-0.132	**	-0.124	**
Inv_allsq	0.006	**	0.001		0.003		0.002		0.003	*	0.004	**	0.003	*
Revrebcsp	0.330	**	-0.106		-0.031		-0.061		-0.038		-0.034		-0.084	
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	0.019		0.093		-0.010		0.000		-0.007		-0.022		-0.003	
Constant	2.196		-7.031	***	-5.286	***	-7.193	**	-6.973	**	-6.437	*	-4.996	
Observations	134		134		130		130		130		128		110	
R^2	0.212		0.610		0.793		0.807		0.821		0.824		0.838	

Note: OLS estimation robust to heteroskedasticity. Continuous variables in log. Significance levels: * p<.1; ** p<.05; *** p<.01

Table 4. Estimation of local fragmentation, population per jurisdictions

Dep. Var.: ln population per jurisdiction														
	fe_rr		*basic_rr*		*geo_rr*		*hetpref_rr*		*instit_rr*		*xp1_rr*		*xp2_rr*	
Oceania	1.036	**	1.436	***	1.629	***	2.022	***	1.445	*	1.779	**	1.615	*
South America	1.349	***	1.592	***	1.136	***	1.410	***	1.037	*	1.279	**	1.168	**
North America	0.419		1.175		1.541	*	1.578	*	0.284		0.407		0.153	
Central America	1.201	**	1.077	**	0.532	*	0.908	**	0.667		0.865		0.403	
Asia	1.494	***	1.630	***	1.393	***	1.549	***	1.203	**	1.251	**	1.032	*
Africa	1.712	***	1.879	***	1.733	***	1.601	***	1.379	***	1.517	***	1.658	***
Ln area			-0.151	*	-0.044		-0.079		-0.104		-0.118		-0.132	
Nrslg					-0.919	***	-0.931	***	-0.965	***	-0.968	***	-0.969	***
Nrneigh					-0.057		-0.077		-0.078		-0.069		-0.080	
Coastline					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Kmborder					0.000		0.000		0.000		0.000		0.000	
Water surface					0.000		0.000		0.000		0.000		0.000	
Agric_land					-0.002		0.000		0.000		0.000		-0.003	
Ahv							-6.538		-5.627		-5.249		-1.553	
Gini							-0.025	**	-0.014		-0.012		-0.011	
Aleeld							0.852		0.828		0.992		1.314	*
Freedom									0.078		0.089	*	0.099	*
Age_dem									0.005		-0.003		0.005	
Age_aut									-0.022		-0.031		-0.003	
Commonlaw									0.816	**	0.751	**	1.165	**
Parliamentary									0.303		0.341		0.156	
Presidential									0.358		0.407		0.276	
Sl_elec									0.282		0.293		0.388	
Xp_cgpc											0.000			
Milxp_cxp													-0.015	
Eduxp_cxp													-0.040	
Heaxp_cxp													0.023	
Last_invasion	0.001		0.001		0.002	*	0.002	*	0.002		0.001		0.002	
Inv_all	0.048		0.033		0.072		0.072		0.096	*	0.119	**	0.116	*
Inv_allsq	-0.002		-0.001		-0.002		-0.001		-0.002		-0.003		-0.002	
Revrebcsp	0.085		0.136		0.161	*	0.188	*	0.161	*	0.185	*	0.195	*
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	-0.095		-0.100		-0.027		-0.034		-0.032		-0.024		-0.019	
Constant	8.017	***	8.261	***	9.247	***	13.474	***	12.353	***	12.175	***	9.722	**
Observations	134		134		130		130		130		128		110	
R^2	0.215		0.238		0.518		0.555		0.585		0.581		0.648	

Note: OLS estimation robust to heteroskedasticity. Continuous variables in log. Significance levels: * p<.1; ** p<.05; *** p<.01

Table 5. Estimation of local fragmentation, area per jurisdictions

Dep. Var.: ln area per jurisdiction														
	fe_rr		*basic_rr*		*geo_rr*		*hetpref_rr*		*instit_rr*		*xp1_rr*		*xp2_rr*	
Oceania	3.045	***	3.178	***	4.131	***	4.344	***	3.763	***	4.206	***	4.109	***
South America	1.880	***	2.074	***	1.234	***	1.199	**	0.570		0.932	*	0.718	
North America	2.692	***	3.308	***	-0.046		-0.339		-1.767	**	-1.807	**	-1.843	*
Central America	0.282		0.184		-0.193		-0.265		-0.852		-1.081	*	-1.711	**
Asia	1.322	***	1.529	***	0.722	**	0.649	*	0.275		0.311		0.438	
Africa	2.076	***	2.204	***	1.785	***	1.432	***	0.933	*	1.091	**	1.348	**
Ln pop			-0.213	*	-0.044		-0.046		-0.065		-0.058		-0.087	
Nrslg					-1.292	***	-1.294	***	-1.333	***	-1.323	***	-1.319	***
Nrneigh					-0.042		-0.064		-0.086		-0.083		-0.090	
Coastline					0.000		0.000		0.000	*	0.000	*	0.000	
Kmborder					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					-0.001	***	-0.001	***	-0.001	***	-0.001	***	-0.001	***
Agric_land					-0.012	**	-0.011	**	-0.012	**	-0.011	**	-0.013	**
Ahv							-0.792		-1.045		-0.653		0.997	
Gini							-0.005		0.004		0.007		0.011	
Aleeld							1.209	**	1.147	*	1.537	**	1.564	**
Freedom									0.058		0.083	*	0.046	
Age_dem									0.007		-0.012		0.001	
Age_aut									-0.007		-0.029		0.025	
Commonlaw									0.648	**	0.607	*	0.929	**
Parliamentary									0.494		0.507		0.507	
Presidential									0.984	***	1.098	***	1.029	***
Sl_elec									0.012		0.127		0.140	
Xp_cgpc											0.000	**		
Milxp_cxp													-0.018	
Eduxp_cxp													-0.019	
Heaxp_cxp													0.066	*
Last_invasion	0.003		0.003	*	0.003	**	0.003	**	0.003	**	0.002	*	0.003	
Inv_all	-0.005		-0.017		0.103	*	0.108	*	0.112	**	0.160	***	0.160	**
Inv_allsq	-0.001		0.000		-0.004	*	-0.004	*	-0.004	*	-0.005	**	-0.005	**
Revrebcsp	0.038		0.127		-0.012		0.015		0.014		0.004		0.061	**
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	-0.045		-0.061		0.035		0.025		0.043		0.068		0.023	
Constant	0.242		2.420		4.283		4.777		4.040		3.439		1.471	
Observations	134		134		130		130		130		128		110	
R^2	0.280		0.300		0.675		0.692		0.721		0.735		0.750	

Note: OLS estimation robust to heteroskedasticity. Continuous variables in log. Significance levels: * p<.1; ** p<.05; *** p<.01

Table A1: Descriptive statistics

	Obs	Mean	Std. Dev.	Median	Min	Max
Nrslg	227	3.092511	1.041309	3	1	6
Lowestjur	227	1761.33	7426.197	79	1	75244
Pop	227	30200000	122000000	4975593	5118	1330000000
Area	227	571261.4	1718077	82430	2	16400000
Density	227	397.4016	1806.576	83.39754	0.140424	20284.18
Ahv	227	0.514184	0.0381033	.507361	0.45953	0.7597926
Gini	162	40.96475	9.96029	40.15	23	73.9
Aleelf	188	0.435342	0.2564857	0.4303	0	0.9302
Nrneigh	142	3.901408	2.66128	4	0	16
Coastline	142	4653.369	18372.57	537.5	0	202080
Agric_land	198	38.76168	22.79073	38.45129	0	84.60176
Water_surface	158	249.0608	698.1654	39.7	0	5418
Freedom	197	6.629442	3.965379	6	2	14
Kmborder	142	3155.276	3549.56	2184	0	22117
Age_dem	170	19.48235	22.37978	15	0	80
Age_aut	170	2.552941	7.427768	0	0	41
Commonlaw	222	0.175676	0.381404	0	0	1
Parliamentary	227	0.277533	0.4487713	0	0	1
Presidential	227	0.427313	0.4957816	0	0	1
Sl_elec	167	0.688623	0.5018543	1	0	2
Xp_cgpc	159	11421.88	15714.26	4392.323	120.1284	71923.09
Milxp_cxp	131	9.233133	7.911287	6.367941	0.215007	52.99197
Eduxp_cxp	159	14.91755	5.014763	14.61	3.96	31.11
Heaxp_cxp	161	10.83962	4.199667	10.92698	0.009259	19.9868
Last_invasion	164	1933.78	89.29293	1945	1462	2011
Inv_all	142	8.239437	6.316622	6	0	32
Inv_allsq	142	107.507	168.2264	36	0	1024
Calamity	161	1.195892	1.984301	.2628964	0	9.226586
Revrebcsp	163	1.662577	1.182281	1	0	7
Coupscsp	193	240.8964	1405.662	0	0	13766
Oceania	227	0.0837	0.2775501	0	0	1
Southam	227	0.088106	0.284075	0	0	1
Northam	227	0.026432	0.1607699	0	0	1
Centralam	227	0.101322	0.3024209	0	0	1
Asia	227	0.246696	0.432041	0	0	1
Africa	227	0.242291	0.4294162	0	0	1

Table A.2 Description of the dataset

	DESCRIPTION	SOURCE
DEPENDENT		
Nrslg	Number tiers of government including the central government	Own calculations
Lntotjur	Ln number jurisdiction at the lowest tier of government	Own calculations
Lntotjurpc	Ln number jurisdiction at the lowest tier of government per million of inhabitants	Own calculations
Lnpopjur	Ln population per jurisdiction	Own calculations
Lnareajur	Ln area (square km) per jurisdiction	Own calculations
INDEPENDENT		
Lnpop	Ln population	International database, US census bureau
Lnarea	Ln area square km	International database, US census bureau
Nrneigh	Number of neighbors	Own calculations
Coastline	Km coastline	CIA world factbook
Kmborder	Km border	CIA world factbook
Water_surface	Internal renewable water resources (IRWR) (km3/year): Average annual flow of rivers and lakes	FAO, 2003
Agric_land	Agricultural land (% of land area)	World Development Indicators, World Bank
Ahv	Age Herfindal country value	International database, US census bureau
Gini	Income/xpenditure inequality (scale 0-100, 100 max homogeneity)	UN WIDER database
Aleelf	Ethnolinguistic fractionalization Herfindahl index (scale 0-1, 1 max fragmentation)	Alesina et al., 2003
Freedom	Political rights and civil liberties (scale 2-14, 14 lowest)	Freedom House
Age_dem	Years since when eiec>5	Own calculations from tensys and eiec - DPI
Age_aut	Age of current government if eiec<6	Own calculations from tensys and eiec - DPI
Commonlaw	Legal system dummy	CIA world factbook
Parliamentary	Dummies for govt system	DPI
Presidential	Dummies for govt system	DPI
Sl_elec	Dummy if state-local elections occur	DPI(MUNI+STATE)
Xp_cgpc	Per capita general government expenditure	World Development Indicators, World Bank
Milxp_cxp	Share of public military expenditure over total expenditure	World Development Indicators, World Bank

(continued)		
Eduxp_cxp	Share of public expenditure for education over total expenditure	World Development Indicators, World Bank
Heaxp_cxp	Share of public health expenditure over total expenditure	World Development Indicators, World Bank
Last_invasion	Year of last invasion	Own calculations
Inv_all	Number of invasions since 16th century	Own calculations
Inv_allsq	Square of inv_all	Own calculations
Calamity	Droughts, floods, extreme temperatures (% of population, average 1990-2009)	World Development Indicators, World Bank
Revrebcsp	Number of revolutions and rebellions, decades 1940-2010, excluded WWII events	CSP
Coupscsp	*Coups d'état* occurring in countries with populations >500,000 during the period 1960-2010	CSP
Oceania	Fixed effects, dummies	Own calculations
Southam	Fixed effects, dummies	Own calculations
Northam	Fixed effects, dummies	Own calculations
Centralam	Fixed effects, dummies	Own calculations
Asia	Fixed effects, dummies	Own calculations
Africa	Fixed effects, dummies	Own calculations

Table A3.

Dep. Var.: ln number of jurisdictions at the lowest level of government														
	fe		basic		geo		hetpref		instit		xp1		xp2	
Oceania	-2.390	***	-0.485		-1.789	***	-2.175	***	-1.725	**	-1.722	**	-1.523	*
South America	0.130		-1.009	***	-0.855	**	-1.140	**	-0.729		-0.689		-0.631	
North America	-2.313		-1.030	**	-0.957		-0.917		-0.167		-0.066		-0.025	
Central America	-2.865	***	-1.117	***	-0.517		-0.833	**	-0.682		-0.775		-0.585	
Asia	-0.439		-1.507	***	-1.210	***	-1.271	***	-0.754		-0.730		-0.700	
Africa	-0.687	*	-1.550	***	-1.483	***	-1.431	***	-1.006	**	-1.027	**	-1.209	**
Ln pop			0.756	***	0.729	***	0.765	***	0.773	***	0.797	***	0.803	***
Ln density			-0.142	**	-0.247	**	-0.291	**	-0.310	**	-0.327	**	-0.256	*
Nrslg					1.096	***	1.082	***	1.087	***	1.074	***	1.065	***
Nrneigh					0.029		0.046		0.059		0.062		0.082	
Coastline					0.000	**	0.000	***	0.000	***	0.000	**	0.000	***
Kmborder					0.000		0.000	*	0.000	*	0.000	*	0.000	
Water surface					0.000	***	0.000	***	0.000	**	0.000	**	0.000	*
Agric_land					0.008		0.006		0.006		0.006		0.007	
Ahv							0.822		1.113		1.112		0.011	
Gini							0.024	**	0.020	*	0.019		0.020	
Aleeld							-1.005	**	-0.789		-0.714		-0.837	
Freedom									-0.075	**	-0.077	*	-0.092	*
Age_dem									-0.001		-0.001		0.000	
Age_aut									0.004		0.004		-0.001	
Commonlaw									-0.539		-0.577	*	-0.656	
Parliamentary									-0.030		0.008		0.111	
Presidential									-0.180		-0.197		-0.093	
Sl_elec									0.043		0.016		-0.090	
Xp_cgpc											0.000			
Milxp_cxp													0.006	
Eduxp_cxp													0.040	
Heaxp_cxp													-0.009	
Constant	5.325	***	-5.077	***	-8.543	***	-9.730	***	-9.673	***	-9.830	***	-10.257	***
Observations	227		227		135		135		135		132		113	
R^2	0.163		0.657		0.770		0.788		0.799		0.799		0.804	

* p<.1; ** p<.05; *** p<.01

Table A4.

Dep. Var.: ln number of jurisdictions at the lowest level of government														
	fe_er		basic_er		geo_er		hetpref_er		instit_er		xp1_er		xp2_er	
Oceania	-0.537		-1.543	***	-2.279	***	-2.683	***	-2.260	***	-2.478	***	-2.264	***
South America	-0.301		-1.549	***	-1.154	***	-1.386	***	-0.988	**	-0.989	**	-0.908	*
North America	2.350	***	-1.024		-0.585		-0.480		0.455		0.617		0.698	
Central America	-1.722	**	-1.078	**	-0.609	*	-0.812	*	-0.599		-0.419		-0.003	
Asia	-0.481		-1.600	***	-1.101	***	-1.153	***	-0.734		-0.690		-0.645	
Africa	-1.007	**	-1.732	***	-1.687	***	-1.545	***	-1.188	**	-1.200	**	-1.438	**
Ln pop			1.051	***	0.780	***	0.824	***	0.842	***	0.884	***	0.922	***
Ln density			-0.271	***	-0.313	***	-0.358	***	-0.375	***	-0.422	***	-0.404	***
Nrslg					1.158	***	1.154	***	1.170	***	1.178	***	1.165	***
Nrneigh					0.040		0.067		0.076		0.076		0.081	
Coastline					0.000	**	0.000	***	0.000	**	0.000	*	0.000	**
Kmborder					0.000	**	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					0.001	***	0.000	***	0.000	***	0.000	***	0.000	***
Agric_land					0.009	*	0.007		0.007		0.006		0.009	*
Ahv							1.875		1.968		3.606		2.656	
Gini							0.020	**	0.015		0.009		0.007	
Aleeld							-1.187	**	-1.092	*	-1.040	*	-1.109	*
Freedom									-0.071	*	-0.082	**	-0.098	**
Age_dem									-0.003		0.003		-0.001	
Age_aut									0.011		0.021		-0.018	
Commonlaw									-0.565	*	-0.577	*	-0.990	**
Parliamentary									-0.223		-0.201		-0.088	
Presidential									-0.388		-0.457		-0.401	
Sl_elec									-0.103		-0.159		-0.270	
Xp_cgpc											0.000			
Milxp_cxp													0.024	
Eduxp_cxp													0.029	
Heaxp_cxp													-0.031	
Last_invasion	0.002		-0.001		-0.002	**	-0.002	**	-0.002	*	-0.002	*	-0.003	**
Inv_all	-0.124		-0.072		-0.103	**	-0.100	**	-0.114	**	-0.131	**	-0.141	**
Inv_allsq	0.007	***	0.003		0.003	**	0.003	*	0.003	*	0.004	**	0.004	**
Constant	1.931		-6.942	***	-5.112	***	-6.678	***	-6.613	***	-7.131	***	-6.055	**
Observations	142		142		135		134		135		132		113	
R^2	0.169		0.602		0.792		0.812		0.821		0.824		0.838	

* p<.1; ** p<.05; *** p<.01

Table A.5

Dep. Var.: ln number of jurisdictions at the lowest level of government														
	fe_ir		basic_ir		geo_ir		hetpref_ir		instit_ir		xp1_ir		xp2_ir	
Oceania	-1.217		-1.490	***	-1.812	***	-2.136	***	-1.534	**	-1.574	**	-1.474	*
South America	-0.857		-1.285	***	-0.835	**	-1.023	**	-0.505		-0.575		-0.554	
North America	2.324	***	-0.720		-1.027		-0.942		0.039		0.129		0.259	
Central America	-1.680	***	-1.077	**	-0.487		-0.714		-0.476		-0.674		-0.399	
Asia	-0.777		-1.324	***	-1.189	***	-1.212	***	-0.652		-0.678		-0.695	
Africa	-1.472	***	-1.805	***	-1.530	***	-1.368	***	-0.906	*	-0.956	*	-1.188	*
Ln pop			0.943	***	0.784	***	0.806	***	0.816	***	0.819	***	0.833	***
Ln density			-0.155	*	-0.265	**	-0.297	**	-0.317	**	-0.334	**	-0.273	*
Nrslg					1.077	***	1.075	***	1.086	***	1.060	***	1.034	***
Nrneigh					0.040		0.053		0.070		0.073		0.104	
Coastline					0.000	**	0.000	***	0.000	**	0.000	**	0.000	***
Kmborder					0.000	*	0.000	*	0.000	*	0.000	*	0.000	*
Water surface					0.000	***	0.000	***	0.000	**	0.000	**	0.000	**
Agric_land					0.008		0.006		0.007		0.007		0.008	
Ahv							1.054		1.311		0.327		-3.127	
Gini							0.019	*	0.011		0.010		0.008	
Aleeld							-0.985	*	-0.739		-0.827		-1.116	
Freedom									-0.095	**	-0.100	**	-0.099	*
Age_dem									-0.002		0.000		-0.004	
Age_aut									0.013		0.015		0.018	
Commonlaw									-0.605	*	-0.646	**	-0.668	
Parliamentary									-0.086		-0.044		0.087	
Presidential									-0.211		-0.228		-0.033	
Sl_elec									-0.024		-0.047		-0.162	
Xp_cgpc											0.000			
Milxp_cxp													-0.002	
Eduxp_cxp													0.058	**
Heaxp_cxp													0.000	
Revrebcsp	0.443	***	-0.122		-0.047		-0.067		-0.042		-0.026		-0.063	
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	0.059		0.072		-0.009		-0.007		-0.002		-0.010		0.018	
Constant	5.567	***	-7.848	***	-9.225	***	-10.243	***	-9.903	***	-9.155	**	-8.575	**
Observations	149		149		130		130		130		128		110	
R^2	0.177		0.558		0.771		0.784		0.798		0.799		0.810	

* p<.1; ** p<.05; *** p<.01

Table A.6

Dep. Var.: number of tiers of government (including the central government)														
	fe		*basic*		*geo*		*hetpref*		*instit*		*xp1*		*xp2*	
Oceania	-0.872	***	-0.178		0.914	**	1.012	**	0.872	*	0.788	*	0.765	
South America	-0.033		-0.500	**	-0.006		-0.055		-0.328		-0.431		-0.498	*
North America	-1.786	***	-1.549	***	-1.137	*	-1.240	**	-1.656	**	-1.689	***	-1.686	**
Central America	-1.237	***	-0.561	***	0.092		0.066		-0.125		-0.431		-0.420	
Asia	-0.044		-0.436	***	0.198		0.201		-0.035		-0.079		-0.091	
Africa	0.096		-0.260		0.437	***	0.265		0.008		-0.047		-0.056	
Ln pop			0.280	***	-0.118	**	-0.148	**	-0.153	**	-0.151	**	-0.118	*
Ln density			-0.086	**	0.124	**	0.151	***	0.163	***	0.165	***	0.149	**
Ln totjur					0.336	***	0.346	***	0.348	***	0.339	***	0.330	***
Nrneigh					-0.012		-0.017		-0.029		-0.033		-0.037	
Coastline					0.000		0.000		0.000		0.000		0.000	
Kmborder					0.000	**	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					0.000	**	0.000	**	0.000	**	0.000	**	0.000	**
Agric_land					-0.004		-0.003		-0.003		-0.003		-0.004	
Ahv							-2.257		-2.234		-2.180		-2.071	
Gini							-0.002		0.000		0.001		0.002	
Aleeld							0.404	*	0.370		0.302		0.297	
Freedom									0.034	*	0.031		0.031	
Age_dem									0.001		0.003		0.000	
Age_aut									-0.021	*	-0.017		-0.033	*
Commonlaw									0.146		0.158		0.107	
Parliamentary									0.026		0.055		-0.012	
Presidential									0.202		0.213		0.162	
Sl_elec									-0.007		-0.001		0.026	
Xp_cgpc											0.000			
Milxp_cxp													0.000	
Eduxp_cxp													-0.002	
Heaxp_cxp													-0.008	
Constant	3.298	***	-0.400		2.925	***	4.335	***	4.115	***	4.180	***	3.872	***
Sigma	1.006	***	0.776	***	0.528	***	0.518	***	0.504	***	0.504	***	0.506	***
Observations	227		227		135		135		135		132		113	
R^2	0.071		0.240		0.334		0.350		0.372		0.375		0.389	

* p<.1; ** p<.05; *** p<.01

Table A.7

Dep. Var.: number of tiers of government (including the central government)														
	fe_er		*basic_er*		*geo_er*		*hetpref_er*		*instit_er*		*xp1_er*		*xp2_er*	
Oceania	0.137		-0.073		1.157	***	1.298	***	1.173	***	1.217	***	1.176	***
South America	-0.212		-0.510	**	0.174		0.129		-0.119		-0.171		-0.247	
North America	-0.612		-1.407	***	-1.202	**	-1.329	**	-1.827	***	-1.855	***	-1.818	***
Central America	-0.535		-0.382		0.144		0.087		-0.126		-0.538		-0.616	
Asia	-0.069		-0.351	**	0.166		0.167		-0.021		-0.056		-0.065	
Africa	0.055		-0.114		0.550	***	0.359	*	0.147		0.109		0.162	
Ln pop			0.260	***	-0.172	***	-0.210	***	-0.222	***	-0.240	***	-0.231	***
Ln density			-0.049		0.167	***	0.196	***	0.208	***	0.228	***	0.235	***
Ln totjur					0.356	***	0.369	***	0.370	***	0.364	***	0.370	***
Nrneigh					-0.017		-0.027		-0.037		-0.040		-0.035	
Coastline					0.000		0.000		0.000		0.000		0.000	
Kmborder					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Agric_land					-0.004	*	-0.004	*	-0.004		-0.004		-0.006	**
Ahv							-2.592	*	-2.499		-3.350	**	-3.113	*
Gini							-0.001		0.002		0.005		0.007	
Aleeld							0.497	**	0.525	**	0.475	**	0.436	*
Freedom									0.032	*	0.034	*	0.038	*
Age_dem									0.002		0.001		0.001	
Age_aut									-0.023	**	-0.025	**	-0.018	
Commonlaw									0.166		0.171		0.312	
Parliamentary									0.116		0.153		0.070	
Presidential									0.292		0.338	*	0.299	
Sl_elec									0.069		0.091		0.121	
Xp_cgpc											0.000			
Milxp_cxp													-0.010	
Eduxp_cxp													-0.001	
Heaxp_cxp													0.006	
Last_invasion	0.002	*	0.001		0.001	**	0.001	**	0.001	**	0.001	**	0.001	**
Inv_all	-0.003		0.009		0.048	*	0.054	**	0.063	**	0.069	**	0.073	**
Inv_allsq	0.001		0.000		-0.002	*	-0.002	*	-0.002	**	-0.002	**	-0.002	**
Constant	0.495		-1.842		0.907		2.421		2.102		2.274		1.768	
Sigma	0.750	***	0.675	***	0.503	***	0.489	***	0.473	***	0.467	***	0.467	***
Observations	142		142		135		135		135		132		113	
R^2	0.047		0.134		0.373		0.398		0.425		0.438		0.454	

* p<.1; ** p<.05; *** p<.01

Table A.8

Dep. Var.: number of tiers of government (including the central government)														
	fe_ir		*basic_ir*		*geo_ir*		*hetpref_ir*		*instit_ir*		*xp1_ir*		*xp2_ir*	
Oceania	-0.117		-0.090		0.827	*	0.929	**	0.735		0.684		0.740	
South America	-0.495	**	-0.547	***	-0.049		-0.083		-0.438		-0.502	*	-0.513	*
North America	-0.583		-1.173	**	-1.140	*	-1.235	**	-1.724	***	-1.697	**	-1.662	**
Central America	-0.599	*	-0.458		0.056		0.025		-0.234		-0.470		-0.447	
Asia	-0.144		-0.263		0.162		0.141		-0.123		-0.155		-0.110	
Africa	-0.224		-0.260		0.408	***	0.259		-0.065		-0.123		-0.046	
Ln pop			0.214	***	-0.132	**	-0.151	**	-0.168	**	-0.158	**	-0.140	*
Ln density			0.013		0.135	**	0.155	***	0.172	***	0.161	***	0.151	**
Lntotjur					0.334	***	0.344	***	0.349	***	0.341	***	0.340	***
Nrneigh					-0.018		-0.023		-0.037		-0.036		-0.040	
Coastline					0.000		0.000		0.000		0.000		0.000	
Kmborder					0.000	**	0.000	**	0.000	***	0.000	***	0.000	***
Water surface					0.000	**	0.000	**	0.000	**	0.000	**	0.000	**
Agric_land					-0.004		-0.004		-0.004		-0.004		-0.005	
Ahv							-0.951		-1.984		-2.674		-1.522	
Gini							-0.001		0.003		0.002		0.004	
Aleeld							0.408	*	0.338		0.287		0.350	
Freedom									0.041	*	0.037	*	0.034	
Age_dem									0.001		0.002		0.001	
Age_aut									-0.022	*	-0.021		-0.035	
Commonlaw									0.148		0.128		0.110	
Parliamentary									0.069		0.087		0.002	
Presidential									0.271		0.263		0.167	
Sl_elec									0.039		0.035		0.048	
Xp_cgpc											0.000			
Milxp_cxp													0.000	
Eduxp_cxp													-0.007	
Heaxp_cxp													-0.009	
Revrebcsp	0.134	**	0.001		-0.001		0.008		0.006		0.007		0.030	
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	0.053		0.058	*	0.042		0.039		0.043		0.039		0.014	
Constant	3.443	***	0.194		3.152	***	3.713	**	4.032	**	4.416	**	3.774	**
Sigma	0.754	***	0.699	***	0.526	***	0.520	***	0.504	***	0.505	***	0.509	***
Observations	149		149		130		130		130		128		110	
R^2	0.049		0.111		0.333		0.344		0.370		0.371		0.381	

* p<.1; ** p<.05; *** p<.01

Table A.9

Dep. Var.: ln population per jurisdictions														
	fe		*basic*		*geo*		*hetpref*		*instit*		*xp1*		*xp2*	
Oceania	-0.249		-0.018		0.923		1.336	*	0.763		0.749		0.646	
South America	1.134	***	0.842	**	0.768	*	1.269	***	1.063	*	1.009	*	0.935	
North America	0.255		0.273		1.618	*	1.858	**	1.134		0.984		0.658	
Central America	0.609	**	0.902	***	0.490		1.066	**	1.101	**	1.328	**	1.087	*
Asia	1.853	***	1.691	***	1.521	***	1.737	***	1.363	***	1.328	***	1.029	*
Africa	1.619	***	1.385	***	1.324	***	1.527	***	1.335	**	1.369	***	1.409	**
Ln area			0.114	***	0.066		0.028		0.021		-0.004		0.024	
Nrslg					-0.855	***	-0.846	***	-0.844	***	-0.828	***	-0.859	***
Nrneigh					-0.007		-0.023		-0.025		-0.030		-0.060	
Coastline					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Kmborder					0.000		0.000		0.000		0.000		0.000	
Water surface					0.000		0.000		0.000		0.000		0.000	
Agric_land					-0.001		0.001		0.001		0.001		-0.001	
Ahv							-1.996		-1.333		-0.967		0.149	
Gini							-0.034	***	-0.030	**	-0.028	**	-0.031	**
Aleeld							0.608		0.462		0.370		0.708	
Freedom									0.073		0.073		0.102	*
Age_dem									0.002		0.004		0.002	
Age_aut									-0.001		0.001		0.000	
Commonlaw									0.717	*	0.768	*	0.927	*
Parliamentary									0.113		0.060		-0.098	
Presidential									0.034		0.049		-0.056	
Sl_elec									0.077		0.106		0.213	
Xp_cgpc											0.000			
Milxp_cxp													0.001	
Eduxp_cxp													-0.039	
Heaxp_cxp													0.000	
Constant	9.360	***	8.236	***	12.072	***	14.360	***	13.537	***	13.489	***	13.453	***
Observations	227		227		135		135		135		132		113	
R^2	0.220		0.255		0.453		0.491		0.525		0.510		0.577	

* p<.1; ** p<.05; *** p<.01

Table A.10

Dep. Var.: ln population per jurisdictions														
	fe_er		*basic_er*		*geo_er*		*hetpref_e*	*r*	*instit_e*	*r*	*xp1_er*		*xp2_er*	
Oceania	0.946	**	1.333	***	1.450	**	1.888	***	1.402	*	1.555	*	1.366	
South America	1.304	***	1.566	***	1.170	***	1.606	***	1.423	***	1.407	***	1.291	**
North America	0.302		1.037		1.411	*	1.566	*	0.556		0.396		-0.004	
Central America	1.199	**	1.066	**	0.598	*	1.060	***	1.010	**	0.937		0.542	
Asia	1.622	***	1.751	***	1.494	***	1.692	***	1.423	***	1.381	***	1.052	*
Africa	1.552	***	1.721	***	1.647	***	1.718	***	1.611	***	1.628	***	1.688	***
Lnarea			-0.153	*	0.021		-0.025		-0.043		-0.085		-0.093	
Nrslg					-0.913	***	-0.914	***	-0.933	***	-0.932	***	-0.950	***
Nrneigh					-0.032		-0.058		-0.056		-0.057		-0.072	
Coastline					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Kmborder					0.000		0.000		0.000		0.000		0.000	
Water surface					0.000	*	0.000		0.000		0.000		0.000	
Agric_land					-0.002		0.000		0.000		0.001		-0.003	
Ahv							-3.162		-2.333		-3.513		-2.501	
Gini							-0.031	***	-0.024	**	-0.019		-0.019	
Aleeld							0.893	*	0.907		0.832		1.113	
Freedom									0.065		0.074		0.103	*
Age_dem									0.004		0.000		0.002	
Age_aut									-0.007		-0.015		0.014	
Commonlaw									0.779	**	0.804	**	1.280	***
Parliamentary									0.384		0.347		0.148	
Presidential									0.335		0.390		0.278	
Sl_elec									0.229		0.281		0.393	
Xp_cgpc											0.000			
Milxp_cxp													-0.011	
Eduxp_cxp													-0.024	
Heaxp_cxp													0.021	
Last_invasion	0.000		0.001		0.001		0.002	*	0.001		0.001		0.002	
Inv_all	0.088		0.075		0.099	*	0.089		0.111	**	0.122	**	0.132	**
Inv_allsq	-0.003	*	-0.002		-0.002		-0.002		-0.002		-0.003		-0.003	
Constant	8.601	***	8.970	***	9.331	***	11.978	***	10.998	***	11.373	***	10.332	***
Observations	142		142		135		135		135		132		113	
R^2	0.201		0.229		0.496		0.539		0.565		0.564		0.640	

* p<.1; ** p<.05; *** p<.01

Table A.11

Dep. Var.: ln population per jurisdictions														
	fe_ir		*basic_ir*		*geo_ir*		*hetpref_i*	*r*	*instit_ir*		*xp1_ir*		*xp2_ir*	
Oceania	1.199	***	1.267	***	1.152	*	1.474	**	0.792		0.859		0.789	
South America	1.152	***	1.198	***	0.754	*	1.063	**	0.679		0.780		0.748	
North America	0.560		0.742		1.708	**	1.817	**	0.826		0.882		0.517	
Central America	1.024	**	1.004	**	0.470		0.920	*	0.788		1.171	**	0.844	
Asia	1.340	***	1.365	***	1.400	***	1.560	***	1.121	**	1.168	**	0.970	*
Africa	1.691	***	1.729	***	1.430	***	1.397	***	1.110	**	1.196	**	1.322	**
Ln area			-0.037		0.009		-0.018		-0.027		-0.033		-0.010	
Nrslg					-0.861	***	-0.866	***	-0.874	***	-0.860	***	-0.861	***
Nrneigh					-0.030		-0.040		-0.046		-0.044		-0.079	
Coastline					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Kmborder					0.000		0.000		0.000		0.000		0.000	
Water surface					0.000		0.000		0.000		0.000		0.000	
Agric_land					-0.001		0.001		0.001		0.001		-0.001	
Ahv							-5.031		-4.378		-3.505		1.242	
Gini							-0.027	**	-0.018		-0.017		-0.016	
Aleeld							0.602		0.423		0.459		0.949	
Freedom									0.092	*	0.093	*	0.106	*
Age_dem									0.003		0.002		0.005	
Age_aut									-0.017		-0.017		-0.026	
Commonlaw									0.748	**	0.743	*	0.843	
Parliamentary									0.063		0.056		-0.082	
Presidential									0.045		0.044		-0.095	
Sl_elec									0.136		0.122		0.249	
Xp_cgpc											0.000			
Milxp_cxp													0.004	
Eduxp_cxp													-0.059	*
Heaxp_cxp													-0.004	
Revrebcsp	0.172		0.191	*	0.169	*	0.188	*	0.161	*	0.170		0.168	
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	-0.077		-0.077		-0.019		-0.020		-0.031		-0.029		-0.029	
Constant	9.377	***	9.764	***	12.537	***	16.065	***	15.087	***	14.539	***	12.686	***
Observations	149		149		130		130		130		128		110	
R^2	0.192		0.194		0.478		0.507		0.535		0.528		0.592	

* p<.1; ** p<.05; *** p<.01

Table A.12

Dep. Var.: ln area per jurisdictions														
	fe		*basic*		*geo*		*hetpre*		*instit*		*xp1*		*xp2*	
Oceania	0.40		1.342	**	4.135	**	4.335	**	3.853	**	3.804	**	3.800	**
South America	2.25	**	1.884	**	1.148	**	1.216	**	0.645		0.537		0.288	
North America	4.55	**	4.185	**	0.576		0.286		-0.816		-		-1.162	
Central	0.06		0.793	**	-0.158		-0.047		-0.453		-		-1.192	
Asia	1.67	**	1.201	**	0.926	**	0.878	**	0.465		0.403		0.421	
Africa	2.61	**	2.318	**	1.724	**	1.413	**	0.878	*	0.864	*	0.949	
Ln pop			0.355	**	0.016		0.011		0.016		-		0.008	
Nrslg					-1.217	**	-1.206	**	-1.213	**	-	**	-1.239	**
Nrneigh					-0.015		-0.038		-0.054		-		-0.090	
Coastline					0.000		0.000		0.000		0.000		0.000	
Kmborder					0.000	**	0.000	**	0.000	**	0.000	**	0.000	**
Water surface					-0.001	**	-0.001	**	-0.001	**	-	**	-0.001	**
Agric_land					-0.014	**	-0.011	**	-0.012	**	-	*	-0.012	
Ahv							-0.746		-1.497		-		-1.072	
Gini							-0.017		-0.012		-		-0.001	
Aleeld							1.364	**	1.141	**	0.976		1.100	
Freedom									0.048		0.057		0.045	
Age_dem									0.004		0.000		-0.001	
Age_aut									0.010		0.003		0.008	
Commonlaw									0.566		0.615		0.481	
Parliamentary									0.267		0.214		0.329	
Presidential									0.716	*	0.763	**	0.798	*
Sl_elec									-0.278		-		-0.166	
Xp_cgpc											0.000			
Milxp_cxp													0.001	
Eduxp_cxp													-0.016	
Heaxp_cxp													0.043	
Constant	4.41	**	-0.876		9.361	**	9.922	**	9.844	**	10.61	**	9.298	**
Observations	211		211		135		135		135		132		113	
R^2	0.24		0.342		0.609		0.640		0.666		0.667		0.678	

* p<.1; ** p<.05; *** p<.01

Table A.13

Dep. Var.: ln area per jurisdictions														
	fe_er		*basic_er*		*geo_er*		*hetpref_er*		*instit_er*		*xp1_er*		*xp2_er*	
Oceania	3.054	***	3.054	***	4.319	***	4.545	***	4.103	***	4.238	***	4.065	***
South America	1.873	***	1.873	***	1.311	***	1.345	***	0.854		0.824	*	0.580	
North America	2.606	***	2.606	***	-0.026		-0.329		-1.470	*	-1.675	*	-1.904	*
Central America	0.294		0.294		-0.091		-0.087		-0.537		-1.173	**	-1.740	***
Asia	1.280	***	1.280	***	0.722	**	0.680	*	0.409		0.351		0.344	
Africa	1.982	***	1.982	***	1.773	***	1.442	***	1.019	**	1.031	**	1.199	**
Ln pop					0.006		-0.007		-0.018		-0.056		-0.054	
Nrslg					-1.291	***	-1.288	***	-1.306	***	-1.324	***	-1.337	***
Nrneigh					-0.021		-0.050		-0.068		-0.074		-0.084	
Coastline					0.000	*	0.000		0.000		0.000	**	0.000	
Kmborder					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					-0.001	***	-0.001	***	-0.001	***	-0.001	***	-0.001	***
Agric_land					-0.013	**	-0.011	**	-0.011	**	-0.009	*	-0.013	**
Ahv							-1.503		-2.031		-4.929		-3.606	
Gini							-0.011		-0.006		0.004		0.012	
Aleeld							1.379	**	1.319	**	1.193	*	1.231	*
Freedom									0.042		0.060		0.057	
Age_dem									0.006		-0.005		0.000	
Age_aut									0.000		-0.018		0.026	
Commonlaw									0.560		0.586	*	0.887	**
Parliamentary									0.422		0.414		0.500	
Presidential									0.853	**	0.963	***	1.030	***
Sl_elec									-0.123		-0.002		0.076	
Xp_cgpc											0.000			
Milxp_cxp													-0.020	
Eduxp_cxp													-0.007	
Heaxp_cxp													0.062	*
Last_invasion	0.002		0.002		0.003	**	0.003	**	0.003	**	0.003	**	0.003	**
Inv_all	0.028		0.028		0.118	**	0.120	**	0.115	**	0.146	**	0.169	***
Inv_allsq	-0.002		-0.002		-0.005	**	-0.004	**	-0.004	*	-0.005	**	-0.005	**
Constant	1.173		1.173		4.097	*	5.085	*	4.645		5.580	*	3.290	
Observations	142		142		135		135		135		132		113	
R^2	0.257		0.257		0.658		0.685		0.708		0.722		0.747	

* p<.1; ** p<.05; *** p<.01

Table A.14

Dep. Var.: ln area per jurisdictions														
	fe_ir		*basic_ir*		*geo_ir*		*hetpref_ir*		*instit_ir*		*xp1_ir*		*xp2_ir*	
Oceania	3.022	***	3.021	***	4.018	***	4.208	***	3.547	***	3.665	***	3.761	***
South America	1.991	***	2.005	***	1.082	**	1.097	**	0.413		0.603		0.415	
North America	2.783	***	2.918	***	0.566		0.270		-1.087		-1.137		-1.392	
Central America	0.767	*	0.736	*	-0.226		-0.207		-0.724		-0.787		-1.247	
Asia	1.335	***	1.362	***	0.926	***	0.832	**	0.338		0.381		0.526	
Africa	2.384	***	2.395	***	1.757	***	1.414	***	0.832		0.910	*	1.096	*
Ln pop			-0.047		-0.041		-0.030		-0.026		-0.013		-0.012	
Nrslg					-1.209	***	-1.209	***	-1.232	***	-1.196	***	-1.201	***
Nrneigh					-0.033		-0.050		-0.070		-0.074		-0.109	
Coastline					0.000		0.000		0.000		0.000		0.000	
Kmborder					0.000	***	0.000	***	0.000	***	0.000	***	0.000	***
Water surface					-0.001	***	-0.001	***	-0.001	***	-0.001	***	-0.001	***
Agric_land					-0.013	**	-0.012	*	-0.013	**	-0.013	**	-0.013	*
Ahv							0.845		0.774		1.822		5.472	
Gini							-0.011		-0.003		-0.001		0.004	
Aleeld							1.293	**	1.066	*	1.305	*	1.539	**
Freedom									0.067		0.082		0.040	
Age_dem									0.006		-0.005		0.003	
Age_aut									0.004		-0.008		0.001	
Commonlaw									0.654	*	0.680	*	0.562	
Parliamentary									0.364		0.309		0.341	
Presidential									0.830	**	0.881	**	0.738	*
Sl_elec									-0.153		-0.091		-0.068	
Xp_cgpc											0.000			
Milxp_cxp													0.009	
Eduxp_cxp													-0.034	
Heaxp_cxp													0.040	
Revrebcsp	0.078		0.107		0.006		0.026		0.018		-0.006		0.033	
Coupscsp	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Calamity	-0.038		-0.039		0.028		0.024		0.036		0.055		-0.004	
Constant	4.820	***	5.523	***	10.268	***	9.641	***	8.901	**	7.676	**	5.952	
Observations	149		149		130		130		130		128		110	
R^2	0.247		0.248		0.625		0.646		0.676		0.681		0.689	

* p<.1; ** p<.05; *** p<.01.

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