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Nicola Gennaioli and Ilia Rainer

CESifo
Poschingerstr. 5, 81679 Munich, Germany
Phone: +49 (89) 9224-1410 - Fax: +49 (89) 9224-1409
office@CESifo.de
http://www.cesifo.de

The Modern Impact of Pre-Colonial Centralization in Africa

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Nicola Gennaioli[*] Ilia Rainer[**]

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Abstract

Using anthropological data we find that centralized pre-colonial political institutions fostered the provision of public goods such as education, health and infrastructure in colonial and post-colonial Africa. Historical evidence suggests that the main virtue of centralized polities was greater accountability of local chiefs, disciplined by competition for higher office. In a model we show how centralization can expand the political arena and reduce local capture by boosting competition among entrenched local elites. We estimate the model and provide evidence consistent with our view that increased accountability was a major benefit of indigenous centralization in Africa. The paper documents the importance of pre-colonial institutions for the success of modernization policies and stresses the desirability of political centralization when local capture undermines the implementation of socioeconomic reforms.

[*]Institute for International Economic Studies, Stockholm. E-mail: Nicola.Gennaioli@iies.su.se.
[**]Harvard University. E-mail: rainer@fas.harvard.edu.
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1. Introduction

The comparative literature on institutions holds that the different strategies of conquest and rule adopted by the colonizers are important determinants of the observed variation in the quality of government among former European colonies.[1] This paper shows that this view is incomplete. It documents the crucial role played by the *centralization* of the *pre-colonial* political institutions of African ethnic groups in shaping the performance of colonial and post-colonial African governments.

We define an ethnic group as centralized or fragmented depending on the number of jurisdictional levels transcending the local community in its pre-colonial political organization. Using anthropological data, we find that African countries where a larger share of the population belongs to ethnic groups with centralized (rather than fragmented) pre-colonial institutions display superior capacity to provide public goods such as health, education and infrastructure between 1960 and 2002. This empirical association can neither be explained by a country's physical endowment (e.g. climate or land usage) nor by cultural or demographic factors (e.g. nomadism, population density) that may affect both the political organization of a group and its public goods provision.

The history of African ethnic groups confirms the crucial role of pre-colonial institutions in the adoption of European policies and technologies (Pratt 1965, Schapera 1970, Boone 2003). Moreover, it suggests that greater accountability of local chiefs in centralized systems was an important factor behind their success (Apter 1961, Burke 1964, Tosh 1978).

Our results, coupled with historical evidence, deliver two main messages. First, they suggest that the consideration of pre-colonial institutions is essential to fully understand the quality of government in developing countries. Second, they disconfirm – at least in Africa – what we call the "central capture" view, holding that *decentralization* fosters public goods provision by *increasing* the accountability of local administrators (Tiebout 1956, Besley and Case 1995, Seabright 1996). Our findings support instead the opposite, "local capture", view, holding that in developing countries democratic mechanisms often fail at the local level, leading to policy capture by local elites interested in blocking socioeconomic reforms (Riker 1964, Bardhan and Mookherjee 2000, Blanchard and Shleifer 2001).

This last observation raises an empirical issue as well as a theoretical one. The evidence of an overall benefit of centralization cannot alone validate the "local capture" view. A popular view in economics stresses that a main advantage of centralized polities lies in their ability to foster

[1] La Porta et al. (1999) focus on the legal origin of the colonizer, while Acemoglu et al. (2001, 2002) look at the settlement patterns of the Europeans.

coordination (Oates 1972).[2] Our regression results could then arise under two different scenarios: either inter-regional spillovers were so important that centralization was beneficial because of coordination, or centralization fostered public goods provision by limiting the ability of local elites to distort policies to their own advantage. Empirically, we thus need to distinguish the "externality" from the "local capture" view. Moreover, from a theoretical standpoint it is interesting to understand through which mechanism centralization can undermine local capture.

To address both issues, we present a model of the benefits of centralization. Motivated by the history of African political systems (Schapera 1956, Apter 1961, Bates 1983), we propose a theory in which centralization undermines local capture by inducing regional *Elites* to compete for the central office. To win the contest, the *Elites* need the support of the local *Masses*, which they obtain by providing more public goods to the local community. By expanding the political arena, centralization alleviates the underprovision due to local capture. The model also suggests how to separate empirically the coordination and political competition benefits of centralization. This goal is achieved by introducing into the analysis a further dimension of African ethnic groups – the degree of social stratification at the local level, measuring the presence of permanent class distinctions among the members of the local community.

According to our theory, the externality benefit of centralization is common to both stratified and egalitarian communities, but the benefit of political competition is only available to stratified societies, in which entrenched *Elites* capture local government. Thus, our model implies that while under the "externality" view social stratification does not affect the impact of centralization on public goods, under the "local capture" view the benefit of centralization is larger in stratified societies.

Bringing our model to the data, we find that for education and infant mortality, centralization has a large and positive impact within stratified ethnic groups, but not within egalitarian ones. In contrast, the benefit of centralization on paved roads and immunization is unrelated to class stratification. These results support the "local capture" view. When, as in the case of education, the divergence of preferences between the *Elite* and the *Masses* is likely to be large relative to spillovers, local capture leads to underprovision and the "political competition" effect is strong. This effect disappears when, as in the case of paved roads, inter-jurisdictional externalities are likely to be large relative to intra-jurisdictional conflict.

These results, showing that increased accountability is a major benefit of centralization, are new to the empirical literature (Fisman-Gatti 2002, Treisman 2000 and 2003), which has only

[2] In Oates (1972), centralization leads to more public goods in the presence of positive inter-regional spillovers. Centralization can also reduce corruption by eliminating the rent dissipation associated with double marginalization. See Shleifer and Vishny (1993).

looked at the overall effect of centralization on public policies, without identifying the nature of its costs or benefits. In addition, the existing literature uses cross-country measures of centralization that are contemporaneous to policies, so its conclusions may display reverse causality problems.[3] Our variable, being predetermined at the onset of modernization, constitutes a more exogenous source of institutional variation.

Overall, our analysis of African indigenous institutions parallels Riker's (1964) classic work on federalism. The lack of accountability in politically fragmented ethnic groups is in line with Riker's assertion that, rather than encouraging freedom, federalism often leads to local tyranny. Moreover, our emphasis on the disciplining effect of inter-elite competition for higher office is analogous to his idea that a strong party system can improve the effectiveness of government by providing career incentives to local politicians.

This brings us to the broader implications of our analysis. In policy circles decentralization is widely believed to make government more responsive and efficient. However, the arguments in favor of decentralization ultimately rely on the crucial assumption that the local political system is able to maintain a meaningful democratic process. Yet the evidence from around the world -- from Russia to India to Latin America[4] -- casts doubt on the validity of this premise and shows how local power holders can subvert politics and distort public policies to their own advantage. We suggest that under such circumstances political *centralization* is desirable, as it increases the bargaining power of the masses at the local level.

To summarize, our analysis contributes to the economic literature on institutions with two main ideas. First, differently from the existing works in this field, we view the ability of *pre-colonial* institutions to adopt western technologies as a fundamental determinant of the quality of government in former colonies. Second, our paper shares Riker's (1964) concern that decentralization may lead to ineffective government and argues that political centralization can be a tool to undermine the power of local elites and promote better policies.

The paper is organized as follows. In Section 2 we describe the data and show that indigenous centralization boosted public goods provision in Africa. In Section 3 we present historical evidence suggesting that greater accountability was the main virtue of centralized polities. In Section 4 we build a model in which social stratification allows us to separate the political competition and the externality benefits of centralization. In Section 5 we bring our model to the

[3] For example, more corrupt societies can endogenously choose centralized systems to solve the double marginalization problem described by Shleifer and Vishny (1993). This could explain the negative association between fiscal decentralization and corruption found by Fisman and Gatti (2002).

[4] See Shleifer and Treisman (1999) on Russia; Lieten (1996) and Mathew and Nayak (1996) on India; Fox (1990) on Latin America.

data and confirm the validity of the "local capture" view. In section 6 we empirically test our story against alternative hypotheses. Section 7 concludes.

2. Indigenous Centralization and Public Goods Provision

Sub-Saharan Africa is populated by several hundred ethnic groups, which varied tremendously in their pre-colonial political organization. This fact, coupled with the relatively uniform colonial history, makes the African continent a perfect place to study the impact of traditional institutions on modernization. Anthropologists (Fortes and Evans-Pritchard 1940) stress that in Africa the main distinction is between societies indigenously organized around centralized institutions and those characterized by fragmented political structure.[5]

In this section we evaluate whether differences in public goods provision across Africa can be explained by the degree of pre-colonial political centralization of its ethnic groups. Ideally, we would like to perform the analysis at the ethnic group level, but the lack of comparable sub-national data on modern public goods prevents us from doing so. Therefore, we do a cross-country analysis. Our main independent variable is the share of a country's non-European population belonging to groups that had centralized political institutions before the arrival of Europeans.

2.1. The Data

Between 1962 and 1967, the anthropological journal *Ethnology* published several installments of the *Ethnographic Atlas*, a database of around 60 variables describing the social, economic and political traits of 1270 ethnic groups around the world. The data, coded by the Yale anthropologist George P. Murdock, summarize the information of a multitude of individual field-studies done between 1850 and 1950.[6] Murdock pinpointed every ethnic group to the earliest period for which satisfactory data existed in order to avoid as much as possible the acculturative effects of contacts with Europeans.

Murdock's *Jurisdictional Hierarchy* variable measures the degree of centralization of indigenous institutions, and gives for each ethnic group the number of jurisdictional levels transcending the local community. The variable attributes value 0 to groups "lacking any form of centralized political organization", 1 for "petty chiefdoms", 2 for "large paramount chiefdoms/small states" and 3 or 4 for "large states". For our purposes, we define "fragmented" an ethnic group falling in categories 0 or 1 and "centralized" a group scoring 2, 3 or 4 in Murdock's variable.

[5] Anthropologists use the "state/stateless" distinction for the same categories. We do not use this terminology because the term "stateless" can misleadingly suggest that fragmented societies lack politics. The centralized/fragmented dichotomy corresponds much better to the exact definition of the coded variable we are going to use.
[6] For a complete description of the Ethnographic Atlas see Murdock (1967) and World Cultures (1986).

Our "fragmented" category includes groups lacking any political integration above the local community such as the Tonga of Zambia, and groups such as the Alur of Eastern Africa where petty chiefs rule over very small districts. Our "centralized" category comprises truly centralized kingdoms such as the Swazi in Southern Africa as well as less centralized political entities such as the Yoruba city-states in Southern Nigeria and the Ashanti confederation in Ghana.

Having classified more than 300 African ethnic groups, we matched them with the groups listed in the *Atlas Narodov Mira* (Atlas of the Peoples of the World). This Atlas, published in 1964 by the Miklukho-Maklai Ethnological Institute in the Soviet Union, provides the most comprehensive division of the world's population into different ethnic groups.[7] We used the countries' ethnic composition from the Soviet Atlas to calculate the share of each country's non-European population belonging to the centralized ethnic groups. This share represents our country-level index of indigenous political centralization and we call it "Centralization".[8]

Our sample consists of 42 countries in Sub-Saharan Africa.[9] Table A1 shows our Centralization index. The measure displays a wide cross-country variation, ranging from the value 1 for Lesotho (both of its ethnic groups, the Sotho and the Zulu are highly centralized) to the value 0 for Liberia (both the Kru and the Peripheral Mande lack political integration).

Since traditional institutions play a particularly important role at the local level, we look at outcomes that are mainly determined away from capital cities. Our dependent variables measure country-level provision of local public goods such as education, health services and basic infrastructure. Infant mortality and percent of infants immunized against DPT (diphtheria, pertussis and tetanus) represent our health outcomes. Adult illiteracy rate and average school attainment proxy for education. Percent of roads paved (as a share of total roads) is our measure of infrastructure[10]. These variables come from the 1960-2002 period depending on data availability. Tables A2-A4 show descriptive statistics, pairwise correlations between our dependent variables and between Centralization and the controls we use. Our basic regression specifications have the following form:

$$Y_i = \alpha_0 + \alpha_1 * Centralization_i + \alpha_2 * \ln(initialGDP/cap)_i + X_i'\gamma + \varepsilon_i$$

[7] Easterly and Levine (1997) built their ethnolinguistic fractionalization index using the Atlas. Recently, Alesina et al. (2003) and Fearon (2003) criticized the Atlas, using alternative ethnic partitions. Their critique does not appear to be relevant to Sub-Saharan Africa, so we have continued to use the Atlas because of its better coverage of the ethnic groups in our anthropological data.

[8] We excluded Europeans to avoid the spurious correlation that would arise if Europeans in Africa enjoy more public goods for reasons unrelated to their centralization. However, including them does not affect our empirical results.

[9] We dropped Mauritius, Seychelles, Cape Verde and Sao Tome and Principe from the sample created by Robert Bates. These islands, uninhabited before the establishment of slave trade and colonization, do not have truly indigenous political institutions.

[10] We tried *life expectancy at birth* and not surprisingly all the results were virtually identical to those for *infant mortality*. Using *percent of infants immunized against measles* (rather than DPT) also yields very similar results.

Y_i is one of our outcome measures in country *i*, $Centralization_i$ is the value of our index for that country, $\ln(initialGDP/cap)_i$ controls for initial income differences across countries and X_i' denotes a set of other possible controls. Our parameter of interest is α_1, measuring the effect of indigenous centralization on public goods provision.

2.2. Basic Empirical Results

Table 1 presents our basic empirical results. Odd-numbered columns show the bivariate relationship between Centralization and different public goods outcomes, even-numbered columns include initial per capita GDP as a control. Figures 1-5 show the results graphically.

Columns 1 and 2 show that centralization has a large and statistically significant impact on the quality of infrastructure. A change from 0 to 1 in our index[11] (corresponding to a move from a country entirely populated by fragmented ethnic groups to a country entirely populated by centralized groups) increases the percent of roads paved by 21 percentage points, corresponding to 1.5 standard deviations in our sample. This impact is much larger than the (marginally significant) effect of doubling per capita income.

Comoros, with a score of 1 in our Centralization index, is a leading example of an African country with a high percentage of paved roads (74 percent). At the other end of the spectrum, Central African Republic, scoring only 0.144 in Centralization, fares poorly on roads (2 percent).[12] Our regression results suggest that pre-colonial institutions played an important role in determining these differences in the quality of roads.

Looking at public health measures, Centralization affects a country's ability to implement immunization programs. As columns 3 and 4 show, percent of infants immunized against DPT is 36 percentage points (almost two standard deviations) larger in countries populated by centralized ethnic groups. More generally, the impact of Centralization on infant mortality, very large and statistically significant, suggests that it was beneficial for other health policies as well. The coefficient in column 6 implies that in centralized societies 42 fewer infants (out of every 1000) die in the first year of life. This effect is equivalent to a reduction of 1.5 standard deviations and is twice as large as that of doubling initial GDP per capita.

Columns 7 and 8 show a significant negative association between adult illiteracy and our index. The effect is economically large: when we control for initial income level Centralization

[11] When we discuss the size of the coefficient on *Centralization*, we always refer to a change in the index from 0 to 1.
[12] The centralized Swahili group lives in Comoros, the fragmented Banda and Baya groups live in Central African Republic.

reduces the illiteracy rate by 24 percentage points, a decrease of more than one standard deviation. This effect is twice as large as the effect of doubling the initial level of a country's per capita GDP.

Similar results hold for average years of school attainment (columns 9 and 10). The coefficient on Centralization, again economically and statistically significant, indicates that it increases average years of schooling by 1.24 (slightly more than one standard deviation).

The relationship between indigenous centralization and education is best illustrated by the following comparison. Lesotho, one of the most successful African nations in terms of education, had an average adult illiteracy rate of 25 percent in 1970-2002 and an average of 3.26 years of schooling in 1960-1990. Mali lies at the other extreme with an illiteracy rate of almost 83 percent and just 0.6 years of average schooling over the same time period. While the Centralization index gives 1 for Lesotho, it gives just 0.115 for Mali, whose population mostly comes from the politically fragmented Nuclear Mande and Voltaic ethnic groups. Our regression suggests that differences in traditional institutions predict a 21-percentage-point lower illiteracy rate and 1.1 more years of average school attainment in Lesotho, accounting for more than a third of the observed differences between the two countries.[13]

The main message of Table 1 is that countries populated by centralized ethnic groups enjoy better provision of a wide array of public goods. The impact of Centralization is large and statistically significant. Yet, before claiming that indigenous centralization *caused* the observed differences in policies, we must address two obvious econometric concerns. The first is reverse causality; the second is omitted variable bias.

Reverse causality is not a problem for our analysis. The political organization of African ethnic groups certainly evolved over centuries, but it was predetermined at the end of the 19th century, when the massive European colonization began. Historians almost unanimously agree that the technologies for providing education, health and infrastructure were first introduced by the colonizers[14] and laid the foundation for further improvements in the post-independence period from which our data come. It is then difficult to see how differences in public goods could have affected our Centralization index. Cross-country studies of centralization use measures of federalism (Treisman 2000), fiscal decentralization (Fisman and Gatti 2002) and administrative subordination (Enikolopov and Zhuravskaya 2003) that, being contemporaneous to public goods outcomes, are likely to be endogenous. Our index of political centralization is far less prone to this problem, and thus improves on this empirical literature.

[13] (1-0.115)*(-23.77)=-21.04 percentage points; (1-0.115)*1.24=1.1 years of schooling.

[14] European administrators built the first road and railway networks and together with missionaries developed the system of formal education and built public-health facilities. See for example, Bauer (1975) or Duignan and Gann (1975).

The mere absence of reverse causation does not imply that our results are driven by pre-colonial centralization per se. Factors omitted from our regressions, but affecting both our dependent and independent variables, may generate a spurious correlation between Centralization and public goods. To address this concern, we must understand what forces can potentially drive our index.

We identify three main factors that could determine the observed variation in indigenous political systems among African ethnic groups: geography, culture and demography.[15] Such factors may plausibly have facilitated or impeded the formation of centralized polities in the past and can directly affect our dependent variables today. In Section 6, we discuss at length the role geography, culture and demography may have potentially played and control for them in our regressions.

In Section 6 we also talk about possible *indirect* effects of centralization and control for the variables through which they might work. We include two broad sets of such intermediate outcomes, one related to the strategies of colonial powers, the other to national level political characteristics. The empirical analysis confirms the important direct role of indigenous institutions. However, in order to draw a lesson from these results, we must understand *why* centralization helped to better absorb the new methods of public goods delivery brought by the Europeans.

So why was indigenous centralization so important? What role did centralized institutions play? In the rest of the paper we will try to answer this question beginning, in the next section, by revisiting the colonial history of some African ethnic groups.

3. Historical Evidence

The colonial history of Uganda provides a very good starting point to examine the role of pre-colonial centralization in modernization. Scoring 0.634 in our Centralization index, Uganda displays a considerable variety of pre-colonial institutions *within* its borders. The South and the West of the country cover the territory of the pre-colonial kingdoms of Buganda, Bunyoro, Toro and Ankole. In contrast, the North of Uganda is entirely populated by indigenously fragmented ethnic groups such as Lango, Acholi, Karamoja, Madi, Alur and Lugbara. Finally, in the East one finds centralized Busoga as well as fragmented Teso and Bugisu societies. Map 1 shows the regional distribution of Ugandan ethnic groups and the degree of their pre-colonial centralization.

The territory of Uganda was colonized by England between 1890 and 1910. The British understood the importance of native authorities for the implementation of their policies and heavily relied on traditional chiefs for building roads, organizing schools, improving sanitation and for many other activities (Pratt 1965). The British administrative personnel never spread below the

[15]Social scientists have little to say on this issue. Many of the theories of state formation stress factors (conflict, for instance) that are hard to relate to any truly exogenous variable. See Claessen and Skalnik (1978).

district commissioner and his assistants. Beneath them a purely African infrastructure was employed and reliance was placed almost entirely upon hierarchies of African chiefs (Low 1965).

The British dealt with centralized groups by signing agreements with native authorities, who accepted the payment of tribute to the British Administration. In exchange, their indigenous system of government was upheld. The Kabaka (traditional king) and his ministers remained at the top of the Ganda hierarchy of government, which continued to administer the kingdom of Buganda.[16] A similar strategy was followed in the kingdoms of Bunyoro, Ankole, Toro and Busoga.

In traditionally fragmented districts, the British yielded local power to appointed chiefs, selected from men of local standing (clan leaders, village headmen). Such chiefs were the direct subordinates of the Colonial Administration. In Lango, Teso, and in the other fragmented districts, the absence of a territorially articulated indigenous administration forced the British to be more directly involved in the system of government.[17] However, the paucity of European officers, allowed local chiefs in these regions to exercise a good deal of unsupervised power (Low 1965).

In sum, in Uganda the colonial period was characterized by a strong continuity of traditional political institutions. Such continuity allowed pre-colonial political systems to shape the adoption of European policies and technologies in Ugandan territory.

Table 2 compares the quality of public goods across Ugandan regions using several different measures of infrastructure, health and education circa 2000. The figures confirm, *within* Uganda, our cross-country regression results. The Central and the Western Regions inhabited by centralized ethnic groups enjoy much more public goods than the North of the country inhabited by fragmented ethnic groups; the "mixed" Eastern Region tends to have intermediate values.

Historical accounts of Uganda document the crucial role played by the traditional institutions of Ugandan ethnic groups during the colonial period. Abundant evidence documents how centralized institutions fostered the introduction of new agricultural technologies (Richards 1960, Ehrlich 1965), religion and education (Low, 1965), and health improvements (Pratt, 1965).

The regressive role of fragmented institutions in Uganda is also confirmed by historical evidence. In his study of the Lango, a fragmented group from Northern Uganda, Tosh (1978, p. 182) writes that *"the chiefs increasingly exploited their office for personal or factional ends; and the ordinary population became alienated from the administrative structure".* The abusive behavior of Lango chiefs in turn distorted, among other policies, the administration of justice as well as reforms aimed at expanding education and agricultural productivity.

[16] Although the British restricted the power of the Kabaka, he still retained many crucial functions, the most important of them being the appointment of local administrators.

[17] To facilitate administration, the British sometimes rearranged territorial entities, giving chiefs authority over wider regions than those they traditionally controlled. However, coherent with the traditional organization, such units were much smaller than those administered by higher-ranking chiefs in centralized groups.

This picture is confirmed by the colonial history of the Teso (another fragmented Ugandan group) whose local chiefs are depicted as absolute tyrants. More generally, it reflects the reality of all fragmented groups in Uganda, where chiefs – accountable only to a distant colonial office – were relatively free to exploit their subjects (Burke 1964). This leads Burke to conclude (p. 37) that in Uganda arose *"…in the non-kingdom districts a system of effective but completely autocratic chieftainship. This contrasted with the situation in the kingdoms where the chiefs were restrained by the accountability of traditional authority"*.

The accountability of local chiefs in traditionally centralized systems emerges from accounts on the Buganda, Bunyoro, Toro and other centralized Ugandan groups (Apter 1961, Richards 1960, Burke 1964). Local chiefs abusing their power and blocking modernization were promptly replaced by higher traditional authorities. The kingdom of Buganda, for instance, maintained a dynamic political system with significant chances of promotion from office to office. Local chiefs were appointed by the Kabaka (the king), or by lower level administrators, and could be abruptly dismissed if the performance of their district was not satisfactory (Apter 1961, Low 1971).

The greater accountability of administrators in centralized systems contrasts with the idea, which we call the "central capture" view, that decentralization *increases* accountability by fostering people's mobility (Tiebout 1956), by improving voters' information (Besley and Case 1995), or by enhancing their ability to replace misbehaving politicians (Seabright 1996). These factors, which would associate centralization with low public goods provision, were of minor importance or absent in the African reality where entrenched local interests captured power for personal gain.[18]

Our empirical findings support instead the opposite notion, which we call the "local capture" view, warning of the political dangers of decentralization. Its proponents suggest that in developing countries democratic mechanisms often fail at the local level, leading to policy capture by local elites. They also argue that centralization may undermine local capture if it increases electoral competition (Bardhan and Mookherjee 2000) or if the center is committed to reforms (Blanchard and Shleifer 2001).

Our historical evidence suggests that rather than being the product of full-fledged electoral competition, the accountability of African centralized institutions resulted from the process of administrators' appointment followed by the central apparatus. But does such accountability simply reflect the preference of traditional central rulers for greater provision of public goods as in Blanchard and Shleifer (2001) or is it an intrinsic property of administrative centralization?

[18] As we will see, this is especially true when the allocation of (local) power is based on ascription, not on competition. As for migration, mobility costs are typically large in underdeveloped countries (Bardhan 2002). More interestingly, our evidence suggests that: a) Hostile relations between villages discouraged migration; b) Some politicians skillfully manipulated the incentive of people to move to their own advantage by banning or facilitating migration (Tosh 1978, Southwold 1964). We thus find some evidence of the so-called "Curley effect" (Glaeser and Shleifer 2003).

An important insight to this question is offered by the history of the Buganda, which illustrates the pervasive struggle between local power holders in order to influence the king's appointment decisions and make their way up the chiefly hierarchy. In this struggle, the political support of a man (the number of his followers) was a major factor determining his power and status.[19] A man with a larger following could better influence the king through bribes or protest.[20] Since the size of his constituency determined a man's prestige and hence his chance to be appointed, it ultimately behooved him to rule in the interest of his community (Apter 1961).

This effect is vividly described by Low (1971, p. 141): "*The ordinary peasant attached himself as a client-follower to a chief whom he undertook to supply freely and serve faithfully, so long as the association between them lasted. The chief for his part was expected to provide for his client by political advancement (if that was desired), by the allotment of land, and by the provision of largesse… Although the jurisdictions of chiefs could be very authoritative, the relation between chiefs and people does not seem to have been as autocratic as that between the Kabaka and his chiefs. For while chiefs were frequently on the move from one position to another, and while they were as liable to rapid disgrace as to rapid promotion, the people were free to attach themselves to a popular and successful chief, and equally free to desert (or intrigue against) an unpopular and unsuccessful one.*"

In short, Buganda centralization increased competition between local power holders and enhanced their accountability to local communities (and hence the quality of government). It did so by expanding the political arena and by creating a hierarchy of chiefly offices to compete for. In contrast, abusive behavior of Lango chiefs was a direct result of the fragmented nature of local politics (Tosh 1978).

To summarize, by revealing the continuity of pre-colonial institutions in colonial Uganda, the historical evidence we presented shows the crucial role they played in the adoption of European policies and technologies. The evidence also supports the view that the greater accountability of local administrators in centralized systems was an important factor behind their success. Finally, it suggests that a reason for such accountability may have been the stiffer political competition faced by local power holders in centralized systems, which undermined local capture, the plague of decentralization.

Further evidence confirms this picture for other African countries. The colonial history of the Tswana of Botswana testifies not only that the centralized institutions supported modernization but also that their main virtue was the accountability of local chiefs, disciplined by competition

[19] Higher echelons of the central apparatus directly tested the popularity of a chief by consulting the local people (Richards 1960).
[20] An important source of influence was the ability of a local lord to satisfy the king's need for soldiers (Apter 1961).

(Schapera 1970, Wylie 1990).[21] This view is also confirmed by the accounts of the Sotho of Lesotho (Ashton 1967, Breytenbach 1975)[22] and by the more general descriptions of centralized groups of Southern Bantu including the Swazi of Swaziland or the Venda of South Africa among others (Schapera 1956, Stayt 1931).[23] Relating some of this historical evidence to our empirical analysis, it is probably not surprising that Botswana, Lesotho and Swaziland are among the best countries in the continent in terms of their public goods outcomes.

More broadly, Bates (1983, p. 41-42) viewed the intense political competition as a general feature of traditionally centralized African societies. He also hinted at the economic benefits it could potentially bring: "*But, to win and retain political power, political aspirants must attract followers, and to do so they must offer advantages, such as the opportunity to prosper.*"

The historical evidence presented so far suggests that the strong empirical link we find between indigenous political structure and recent measures of public goods probably has its origins in the formative colonial period when the major European innovations were first introduced and the seeds of modernization were laid. According to this interpretation, centralized African groups had already jumped ahead in terms of their education, health and infrastructure by the 1960s and the gap persisted for forty years after independence. In fact, the data provide some support for this hypothesis of early divergence: if we rerun our cross-country regressions using the earliest available numbers for infant mortality (1960), adult illiteracy (1970) and schooling (1960) we obtain results very similar to those reported in Table 1 for the post-colonial period as a whole.[24]

However, it is unlikely that the effects of indigenous centralization on modernization were limited to the colonial period. Some African countries, such as Botswana or Swaziland, reveal a clear continuity between modern political leaders and pre-colonial rulers, as traditional patterns of politics influenced the nature of the post-colonial state (Potholm 1977, Picard 1987). Elsewhere, the structure of indigenous institutions continued to shape political and economic outcomes at the local level, where post-independent African regimes (like their colonial predecessors) could not achieve

[21] As in Buganda, political competition among the Tswana was pervasive and chiefs rose and fell in the social hierarchy depending on their success in building a large group of followers. The power of the chief depended on the support of his men and his quality was judged by how generously he spread the benefits of modernization throughout his realm. (Wylie 1990)

[22] In the Sotho kingdom the commoners could effectively influence the king's policy of local placing of chiefs through the system of pitsos (or people's gatherings). By offering to the commoners the opportunity to voice their interests and to make demands to the central authorities, local pitsos served as a traditional check on political abuses. (Breytenbach 1975)

[23] Among all Southern Bantu the power of rulers, of whatever rank, depended on the numerical strength of their following. Thus, by ruling unjustly a local chief risked alienating his own followers, falling foul of the paramount ruler and being deposed. (Schapera 1956)

[24] The results are available from the authors.

their objectives without the cooperation of traditional power holders (van Rouveroy van Nieuwaal 1987, Boone 2003).

Returning to the theoretical implications of our analysis, although our basic regression results suggest that pre-colonial centralization was beneficial for public goods provision in Africa, they cannot alone be interpreted as supportive of the "local capture" view. Economic theories of centralization also stress its ability to foster coordination (Oates 1972), leading to the internalization of interregional spillovers and hence to higher public goods provision.

As a result, the empirical findings of Section 2 can arise under two different scenarios. First, it may be that centralization was beneficial due to its ability to foster coordination (perhaps swamping the cost of "central capture"). Second, the "local capture" view could be the correct explanation for our results. Thus, to understand why indigenous centralization was beneficial in Africa, one must empirically distinguish between its "local capture" and pure "externality" effects.

In the next section, we present a model of the benefits of centralization. Its goals are twofold. The first is to provide a theoretical foundation for the greater accountability of local administrators in centralized systems. Inspired by the colonial history of African ethnic groups we base our argument on a "political competition" effect. The second goal of the model is to separate the "externality" and the "local capture" views of centralization. We do so by introducing into the analysis the degree of social stratification at the local level. In Section 5 we bring our model to the data and confirm the empirical relevance of the "local capture" view in the African context.

4. A Model of Centralization and Social Stratification

The economy is divided into two geographically distinct districts.[25] A continuum of citizens of measure one lives in each district $i \in \{1,2\}$, where the amount g_i of a local public good (schools, roads, etc.) is provided. Citizens have quasi-linear utility in public goods and money. The preferences over public goods of citizen *j* in district *i* are

$$\lambda_j\left[(1-k)\ln g_i + k \ln g_{-i}\right]$$

λ_j is the taste parameter. $k \in [0,1/2]$ measures inter-district spillovers of the public good, higher k indicating larger spillovers.[26] Let us study how g_1, g_2 depend on political centralization by first looking at the outcome under decentralization.

4.1. Decentralization

[25] In the context of this paper, the "economy" represents an ethnic group, *not* a country.
[26] Later, we will argue that *k* is likely to be small for some public goods (e.g. education) and large for the others (e.g. roads).

A local government sets the level of public goods in each community. Expenditures are equally shared among local residents, but the degree of local stratification determines who wields political power to set *g*.

- Stratified districts

In stratified districts there are two social groups, the *Elite* and the *Masses*. Share $\alpha < 1/2$ of residents belong to the *Elite*, the rest to the *Masses*. The taste for public goods of each member of the *Elite* is λ_E, while members of the *Masses* value them λ_M. We assume that the *Elite* values public goods less than the *Masses* so that $\lambda_M > \lambda_E$ [27].

Although the *Elite* represents a minority of the local population, its resources allow it to capture the local government and wield political power. In stratified societies under decentralization, the amount of public good in district *i* is then chosen so as to:

$$\max_{g_i} \lambda_E \left[(1-k)\ln g_i + k \ln g_{-i}\right] - g_i$$

As a result, the supply of public goods under decentralization is $g_i = g_{-i} = (1-k)\lambda_E$.

- Egalitarian districts

In egalitarian districts citizens have homogeneous preferences over public goods with taste parameter $\overline{\lambda} = \alpha\lambda_E + (1-\alpha)\lambda_M$ [28]. No matter who wields political power, the quantity of public goods in these districts under decentralization is $g_i = g_{-i} = (1-k)\overline{\lambda}$.

Hence, capture by local *Elites* induces a lower provision of public goods in stratified societies ($\lambda_E < \overline{\lambda}$) as entrenched *Elites* distort public policies in their favor.

4.2. Centralization

A government representing districts 1 and 2 sets both public goods, financed by taxing all citizens uniformly. Two politically active groups (one per district) compete for central power. In each district *i*, the locally active group forms a coalition of residents who bargain to set (g_i^i, g_{-i}^i) in case of victory. The coalition with larger (local) support wins the contest at the central level and implements (g_i^i, g_{-i}^i). If regional coalitions are equally sized, each wins with probability 1/2.

[27] This can be the case if the *Elites* are richer than the *Masses* and public goods are financed with a uniform tax on wealth. The same holds if public goods allow the *Masses* to produce income and the *Elite* can extract only a tiny part of it. In addition, some public goods (education) induce political turbulence, threatening the power of the *Elite*.

[28] The results of the model are not sensitive to this assumption. The same level of *g* would prevail on average if classes are set ex-ante and power is randomly allocated between them. The preferences of residents are instead equal to the average valuation in stratified localities if in egalitarian districts social classes are randomly set after *g* is chosen.

- Stratified districts

In stratified districts, *Elite* is the politically active group. To win the political competition for central office, each local *Elite* seeks to build a coalition with its own *Masses*. In such a coalition, the policy agreed upon depends on the bargaining power of the groups and on the expected political equilibrium. Bates (1983, p. 42) emphasizes the importance of such coalition formation in traditionally centralized African polities: "*Contestants for office had to gather a following; and, in competing for supporters, they used their elite positions to generate benefits for the citizenry and made pledges of further benefits in the event they should acquire power.*"

If the *Masses* have full bargaining power, centralization induces in equilibrium (average) public good levels $g_1 = g_2 = \lambda_M$ as opposed to $g_1 = g_2 = (1-k)\lambda_E$, chosen under decentralization. Centralization boosts public goods provision not only by internalizing spillovers, but also by stimulating political competition and inducing the local *Elites* to cater to the preferences of the *Masses*.

To see why this is the case, consider the political bargain in district *i*. For an expected platform (g_i^{-i}, g_{-i}^{-i}) chosen by the competing coalition, *Masses* propose a policy vector (g_i^i, g_{-i}^i) that solves:

$$\max_{g_i^i, g_{-i}^i} \lambda_M \left[(1-k)\ln g_i^i + k \ln g_{-i}^i\right] - (g_i^i + g_{-i}^i)/2$$

$$s.t.$$

$$\lambda_E \left[(1-k)\ln g_i^i + k \ln g_{-i}^i\right] - (g_i^i + g_{-i}^i)/2 \geq \lambda_E \left[(1-k)\ln g_i^{-i} + k \ln g_{-i}^{-i}\right] - (g_i^{-i} + g_{-i}^{-i})/2$$

Intuitively, *Masses* set (g_i^i, g_{-i}^i) to maximize their utility in case of victory, subject to the *Elite*'s participation constraint, which says that *Elite* prefers to collude with local *Masses* and enjoy (g_i^i, g_{-i}^i) than to lose to the other district and have (g_i^{-i}, g_{-i}^{-i}) implemented. In equilibrium both districts coalesce fully, so each of them wins with probability 1/2.

Policies $g_i^i = 2\lambda_M(1-k)$, $g_{-i}^i = 2\lambda_M k$ and $g_i^{-i} = 2\lambda_M k$, $g_{-i}^{-i} = 2\lambda_M(1-k)$ represent the political equilibrium. Interestingly, such policies are the unconstrained choices *Masses* would make. *Elite* accepts the deal, as it prefers to empower local *Masses* (who distort policies in favor of its own district) rather than those from other localities. Summarizing:

Proposition 1 *If within a coalition Masses have full bargaining power, the equilibrium under centralization displays the average public goods levels* $g_1 = g_2 = \lambda_M$.

The proof is in Appendix 3[29]. Inter-district conflict prevents collusion among the *Elites* and there is no equilibrium in which they "run alone" for central power. To gain support, political competition forces the *Elites* to "talk" to the local *Masses*, who benefit from being included into policy-making. The more harmful is for the *Elites* the victory of other districts, the more generous are their concessions to the *Masses*. By widening the scope for political competition, centralization acts as a mechanism leading to the formation of encompassing regional coalitions that undermine local capture.

This "political competition" effect, working through the formation of local coalitions, is a novel feature of our model. Unlike the previous theoretical literature on centralization, we emphasize the role of stratification in determining the extent of capture and affecting the desirability of centralized political institutions. We therefore provide a foundation for the idea that in Buganda (and elsewhere in Africa) "*the hierarchical system obliterates exclusivism based upon an aristocratic principle*" (Apter 1961, p. 104).

Political competition boosts public goods provision by reducing the *intra-district bias* (local capture), but centralization also allows better internalization of spillovers. Politicians from different localities alternate in power, softening the *inter-district bias*.[30] This last result is also in Besley and Coate (2003).[31]

- Egalitarian districts

In egalitarian societies there is no conflict within districts. However, the alternation of local coalitions in power still helps to internalize spillovers. Policies $g_i^i = 2\overline{\lambda}(1-k), g_{-i}^i = 2\overline{\lambda}k$ and $g_i^{-i} = 2\overline{\lambda}k, g_{-i}^{-i} = 2\overline{\lambda}(1-k)$ are implemented and lead to average provision $g_1 = g_2 = \overline{\lambda}$.

4.3. Centralization, Stratification and Public Goods

By introducing social stratification, the model disentangles the externality and political competition benefits of centralization. The matrix below summarizes the predictions of the model:

[29] The result depends on the (extreme) assumption that the *Masses* have all the bargaining power. In the appendix we show that for intermediate levels of bargaining power, centralization still allows the *Masses* to tilt policies in their favor. In reality, in centralized African groups "*the bargaining power of the masses, relative to the elites, was strong, and to retain power the elites had to serve the interests of their followers, if only because they would otherwise lose their followers, physically or politically, or other elites would displace them*" (Bates 1983, p. 42).

[30] Indeed, Apter (1961, p. 16) stressed a "*volatile character of politics in Buganda*", where a successful politician could be on top one day and rejected another.

[31] While Besley and Coate (2003) focus on inter-district taste differences, we focus on intra-district conflicts of interest.

	Stratified	Egalitarian
Centralized	λ_M	$\overline{\lambda}$
Fragmented	$\lambda_E(1-k)$	$\overline{\lambda}(1-k)$

This centralization-stratification matrix illustrates the provision of g_1 and g_2 under all possible configurations. From left to right we measure whether the local community is stratified or not, from top to bottom whether it is administered through centralized institutions or not.

Consistent with the results of Section 2, the model predicts that centralization is always good. This is due both to the "externality" and the "political competition" effects. In egalitarian societies there is no conflict among citizens, so the benefit of centralization $\overline{\lambda}k$ is entirely due to the first effect. In stratified societies centralization adds a political competition benefit ($\lambda_M - \lambda_E$), reflecting the reduction of local capture, to its pure externality benefit ($\lambda_E k$).

The model generates distinct predictions for the impact of centralization on *different types* of public goods. Consider two polar cases. For a public good without inter-regional spillovers ($k = 0$), centralization is only beneficial for stratified societies, as it undermines local capture. For public goods where social classes have similar preferences ($\lambda_M = \lambda_E = \overline{\lambda}$), capture is no longer an issue and the political competition benefit of centralization disappears: stratification does not matter anymore and centralization uniformly increases the supply of public goods in all societies. In Section 5 we use this distinction between "low externality/high conflict" and "high externality/low conflict" types of public goods to empirically identify the benefits of centralization in Africa.

So far, we treated colonization as merely a "technological shock", making modernization policies available: their implementation was left to traditional institutions. Since colonial governments surely played a more active role, before testing the model, we extend the analysis to see what changes if colonialists directly invest in public goods.

4.4. Indigenous Centralization and Colonization

We posit that the colonial government sets and finances (g_1, g_2), while traditional leaders have the power to extract bribes locally by taxing public goods expenditures. Indigenous authorities set tax rates τ_1, τ_2, determining investment costs for the colonial government $(1+\tau_1)g_1$, $(1+\tau_2)g_2$. Colonizers' utility is $\lambda_C[\ln g_1 + \ln g_2]$, where λ_C is their taste for public goods.[32]

[32] Notice that the colonial government internalizes inter-regional spillovers because it cares about both districts.

The colonizers choose to provide the amounts $g_1 = \lambda_C /(1+\tau_1)$ and $g_2 = \lambda_C /(1+\tau_2)$ of public goods, where the equilibrium tax rates depend on the degree of centralization and local stratification of indigenous political system. We then find that:

Proposition 2 *If the colonial government actively invests in public goods, the same centralization-stratification matrix of Section 4.3 prevails.*

The proof is in Appendix 3. The result is intuitive: traditional authorities tax the colonial government on the Laffer curve inducing their preferred supply of local public goods. Hence, intra-district and inter-district conflicts over τ_1, τ_2 are the mirror image of the previous conflicts over spending.[33] We now bring the model to the data and estimate its centralization-stratification matrix.

5. Estimating the Benefits of Centralization

5.1. Empirical Strategy

To estimate the centralization-stratification matrix, we add to our earlier analysis a measure of social stratification. We use the *Class Stratification* variable from Murdock's *Ethnographic Atlas*, which codes the degree of class differentiation at the local level for each indigenous society. The variable contains five mutually exclusive categories.

Three of them concern the type of stratification. "Elite", "dual" and "complex" stratification are characteristic of groups where the elite derives its superior hereditary status from control over scarce resources (e.g. land), from traditionally ascribed nobility and from occupation, respectively. All three categories comprise societies with some class distinction, so we group them together and call "stratified" the ethnic groups belonging to any one of them.

Other ethnic groups either "do not have any class distinctions" or have wealth distinctions, which are "not crystallized into distinct and hereditary social classes". Since under both definitions social classes are absent, we call "egalitarian" the groups belonging to either of the two categories.[34]

Combining the class stratification of African ethnic groups with our previous centralized-fragmented distinction, we allocate each of them to one of the four cells of our centralization-stratification matrix.[35] We then find, for every country in our sample, the shares of its non-European

[33] In this context the "externality" effect is similar to that in Shleifer and Vishny (1993): decentralized polities neglect interregional spillovers and impose excessive taxes, leading to underprovision of public goods.
[34] See Appendix 1 for the precise definitions of different categories of the *Class Stratification* variable.
[35] Fried (1967) related stratification to centralization. Their correlation within the African groups of the *Ethnographic Atlas* is high (0.64). However, being far from perfect, it allows us to empirically separate the two dimensions.

population that falls into each of the four types of indigenous political systems.[36] We then estimate the following OLS regressions:

$$Y_i = \beta_0 + \beta_1 * Centr\&Strat_i + \beta_2 * Fragm\&Strat_i + \beta_3 Centr\&Egal_i + \delta * \ln(initialGDP/cap)_i + X_i'\gamma + \varepsilon_i$$

Y_i is a public good outcome in country *i*. $Centr\ \&\ Strat_i$, $Fragm\ \&\ Strat_i$ and $Centr\ \&\ Egal_i$ are the shares of centralized and stratified, fragmented and stratified and centralized and egalitarian ethnic groups in country *i*. $\ln(initialGDP/cap)_i$ controls for a country's initial income and X_i' is a set of other possible controls.

The share of fragmented and egalitarian ethnic groups is omitted from our regressions, so β_1, β_2 and β_3 represent the quality of public goods in other indigenous political systems, *relative to that benchmark*. Going back to the theoretical matrix of Section 4 we have:

	Stratified	Egalitarian
Centralized	$\beta_1 = \lambda_M - \bar{\lambda}(1-k)$	$\beta_3 = \bar{\lambda}k$
Fragmented	$\beta_2 = (\lambda_E - \bar{\lambda})(1-k)$	0

We present our empirical results in the format of this centralization-stratification matrix. We also report estimates and standard errors of $(\beta_1 - \beta_2)$ and $(\beta_1 - \beta_2 - \beta_3)$. This allows us to compare the benefits of centralization for stratified and egalitarian societies and to separate its externality and political competition effects.

In our specification β_3 captures the effect of political centralization in egalitarian ethnic groups, while $(\beta_1 - \beta_2)$ does the same for stratified ones. Therefore, $(\beta_1 - \beta_2 - \beta_3)$ tells whether centralization is more beneficial for stratified or egalitarian groups. Coefficient β_2 estimates the effect of introducing stratification into a fragmented political system and can be naturally interpreted as measuring the extent of local capture.

The separation between the externality and political competition benefits of centralization is best illustrated by comparing the empirical predictions of our model for two polar types of public goods. Consider a public good where only the "externality" effect is at work. For such a good we expect β_2 to be zero, due to the absence of local capture. More importantly, we expect $(\beta_1 - \beta_2)$ and β_3 to be positive and have similar magnitude, implying that $(\beta_1 - \beta_2 - \beta_3)$ should be zero. Thus, we get the following empirical matrix M1:

[36] Table A5 shows these shares for each country in our sample.

M1	Stratified	Egalitarian
Centralized	+	+
Fragmented	0	0

Roads can be a good example of such a "high externality/low conflict" public good: by facilitating mobility across districts, they naturally involve large inter-regional externalities. Moreover, underprovision of roads in fragmented societies is unlikely to be a result of local capture because the *Elites* may enjoy roads even more than the *Masses*. In this case, we should then obtain the empirical pattern shown in matrix M1.

Consider instead a public good with no spillovers but where the conflict between the *Elites* and the *Masses* is strong, so that only the "political competition" benefit of centralization is present. For such a good local capture should be reflected in a negative β_2. In this case $(\beta_1 - \beta_2)$ must be positive but β_3 zero, implying a positive and significant $(\beta_1 - \beta_2 - \beta_3)$. We then get the following empirical matrix M2:

M2	Stratified	Egalitarian
Centralized	+	0
Fragmented	-	0

Educational outcomes can be interpreted as an example of such a "low externality/high conflict" public good. Having more schools in a district is unlikely to dramatically benefit members of other districts.[37] In addition, the *Elites* are likely to be reluctant to invest in mass education, as it can undermine their economic and political power.[38] In this case, we should then expect an empirical matrix like M2.

The classification of our health measures is somewhat less straightforward, but the following distinction seems reasonable. The infectious nature of diphtheria, pertussis and tetanus implies that to protect themselves the *Elites* must to some extent also immunize the *Masses*, which makes infant immunization against such diseases a "low conflict" good. The possibility of widespread epidemics creates large inter-district spillovers in the provision of DPT immunization, so the results for this variable are likely to be consistent with those for other "high externalities/low conflict" goods.

Infectious diseases are only one cause of infant mortality. Other diseases are less transmittable across groups. More importantly, factors limiting their impact (availability of medical

[37] Empirical estimates of low external returns to education confirm this view. See Acemoglu and Angrist (2000).
[38] For instance, missionary education often attempted to supplant African values with Western ones.

supplies, trained doctors as well as access to clean water and modern sanitation facilities[39]) are both locality-specific and can easily be targeted to a specific group within the community. This last aspect reduces the incentive of the *Elites* to provide better health to everybody and suggests that, unlike immunization, more general measures of public health belong to the "low externalities/high conflict" category.

To summarize, for education and infant mortality we expect centralization to be mainly beneficial in stratified societies as it undermines local capture. In contrast, for paved roads and DPT immunization we expect the externality effect to dominate and political centralization to have a uniform benefit regardless of social stratification.

5.2. Empirical Findings

Our empirical findings are very consistent with the model. Table 3 presents the estimated centralization-stratification matrices for our public goods measures. Panel A reports the estimates when we do not control for initial income; Panel B shows the results obtained when initial per capita GDP is included. Because of the similarity of the results, we focus our discussion only on those reported in Panel B.

Columns 1 and 2 describe our findings for paved roads and DPT immunization of infants. The results, highly consistent with the "high externality/low conflict" nature of these goods, mimic the pattern predicted by matrix M1. For both of them β_2 is statistically indistinguishable from 0, suggesting that there is no evidence of local capture. Consistent with the pure "externality" effect, the benefit of centralization is uniform across stratified and egalitarian societies. Both β_1 and β_3 are large and statistically significant. They indicate a 22-percentage-point increase in paved roads and a 37- to 42-percentage-point increase in DPT immunization, associated with the greater coordinating ability of centralized polities.[40] $(\beta_1 - \beta_2 - \beta_3)$ is very insignificant, suggesting that for this category of public goods the benefit of centralization is uniform across stratified and egalitarian societies.

The matrices in columns 3, 4 and 5 show our findings for the "low externality/high conflict" public goods we consider: infant mortality, illiteracy rate and schooling. The results drastically differ from those of columns 1 and 2. As our theory would predict, parameter estimates are now highly consistent with matrix M2.

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[39] As shown in Table A3, the correlation in our sample between infant mortality and the DPT immunization rate is about 0.31, indicating that around 90% of the variation in infant mortality is associated with other factors.

[40] Estimates of (β_1 - β_2) in columns 1 and 2 are noisy, with low statistical significance. However, since β_1 and β_3 are similar in size and β_2 is not different from 0, we do not conclude that centralization has no externality benefits in stratified societies.

For all these public goods β_2 is statistically significant. Its sign suggests that introducing class stratification into fragmented societies deteriorates public policies aimed at expanding education and health services. In fragmented groups, stratification increases infant mortality by 74, raises illiteracy rate by 36.39 percentage points, and reduces average school attainment by 2.17 years.

These effects are extremely large (equivalent to a change of about 2 standard deviations in our dependent variables). Taken together, they suggest that elites play a regressive role at the local level. When localities are separated from one another, the power of local lords may be virtually unchallenged. In these cases, in line with our theory, political centralization may work as a competitive mechanism reducing the extent of local capture.

Consistent with the predictions of our model, the estimates of $(\beta_1 - \beta_2)$, large and highly significant (at the 1% level) for all the three variables, show the benefit that centralization brings to communities with an unequal power structure. Centralization reduces by 100 the number of infants who die (out of 1000), cuts illiteracy by 57.65 percentage points and increases schooling by 3.18 years. All the effects are huge, larger than 3 standard deviations in magnitude.

For all the three variables β_3 is very small and not statistically distinguishable from 0, implying that for this category of public goods centralization does not play any role in egalitarian societies. In addition, the highly significant $(\beta_1 - \beta_2 - \beta_3)$ suggests that for "low externality/high conflict" goods the benefits of centralization come entirely from stratified ethnic groups.

Overall, the evidence presented in Table 3 provides strong empirical support for our model, and allows us to draw two conclusions. First, for "high externality/low conflict" public goods (roads, immunization), indigenous political centralization in Africa was beneficial because it improved coordination, allowing better internalization of the large spillovers involved. Thus, the traditional "externality" view has some bite for public goods where spillovers are important.

The second and more important point, however, is that the externality effect is not the only benefit of indigenous centralization because it cannot account for the observed differences in the provision of "low externality/high conflict" public goods (education, general health). The data show that with respect to this category of goods the benefit of centralization is asymmetric and available for stratified communities only. This provides econometric support for the greater accountability of local power holders in centralized systems, documented by the historical evidence of Section 3. As both African case studies and our model emphasize, by expanding the political arena and enhancing inter-elite competition, centralized traditional institutions eliminate policy distortions associated with local capture.

6. Evaluation of Alternative Hypotheses

We started our analysis by finding a positive relationship between indigenous centralization and the provision of public goods in Africa. We interpreted it as evidence for the *direct* effect of centralization on public policies. As we acknowledged in Section 2, two other types of explanations can rationalize our basic results.

One concern is that we found a spurious relationship, driven by some omitted variables. Another possibility is that pre-colonial centralization affects public goods' quality, but does it through *indirect* channels that are outside our model. In this section we evaluate the robustness of our results to both of these concerns. Although the findings of Section 5 are not easily explained by either omitted variables or indirect effects, we want to further strengthen our conclusion that centralization is directly beneficial to public policies in Africa.

We take care of omitted variables by considering three potential determinants of indigenous centralization: geographic, cultural and demographic factors. As for indirect effects, we focus on whether centralization affected public policies by influencing: a) the strategies of the colonizers, b) political and social outcomes at the *national* level. We first evaluate the strength of our basic empirical findings to these alternative explanations and then study their consequences for our centralization-stratification matrix. This second stage is especially important to check the validity of our local capture story: even if our level results are weakened, we are still confident in our theory as long as the patterns in the matrix remain unaffected.

In the empirical analysis below, we pick proxies for each alternative story we want to test and introduce them one at a time into our regressions, in which we continue to control for initial income. We begin by looking at different theories of indigenous centralization.

6.1. Determinants of Indigenous Centralization

- *Geographic factors*

Braudel (1972) argues that variation in agricultural productivity across regions explains their ability to afford a centralized political apparatus. According to Lenski (1966), transportation costs shape political organization. He gives the example of tropical forests, a major obstacle to state formation in Africa, as they limited the ability of central governments to move men and goods throughout the realm. Polanyi (1957) and Gluckman (1965) claim that environments favorable to trade (e.g. harbors, rivers) may induce the establishment of centralized enforcement agencies to make trade prosper. Finally, Wittfogel's (1957) "irrigation hypothesis" or Carneiro's (1970) geographical circumscription theory also emphasize geographic sources of state formation.

Based on these theories, we picked the following country-level controls: the landlocked dummy, the length of inland waterways and the area of water reservoirs (measuring the abundance of rivers and lakes, respectively), the average height of mountains, patterns of land usage, climate types and the absolute value of latitude.

Panel A of Table 4 shows the coefficients on Centralization and on the specific geographic proxies introduced (one at a time) into our basic regressions. In the vast majority of specifications the effect of Centralization remains large and statistically significant, while the geographic variables do not, in general, have a strong predictive power (except for climate). Only controlling for a country's average elevation weakens our illiteracy and infant mortality results (now only marginally significant) and drastically reduces the effect of Centralization on schooling. This is due both to the significant direct impact elevation has on these public goods and to the strong (0.51) correlation it has with indigenous centralization. It is not clear to us why the mere presence of mountains should improve educational outcomes. Moreover, the inclusion of elevation does not affect the pattern of our centralization-stratification matrix for education and infant mortality, still consistent with that of "low externality/high conflict" public goods.

In fact, in Panel B we check that the predictions of our model are also robust to the inclusion of geographic controls. For brevity we only report the estimates of $(\beta_1 - \beta_2 - \beta_3)$, measuring the differential impact of centralization across stratified and egalitarian societies. Recall that our model predicts that for "low externality/high conflict" goods $(\beta_1 - \beta_2 - \beta_3)$ should differ from zero, suggesting a larger benefit of centralization for stratified groups. In contrast, for "high externality/low conflict" goods we expect $(\beta_1 - \beta_2 - \beta_3)$ to be zero.

As before, the results are consistent with our theory. In all the roads and immunization regressions $(\beta_1 - \beta_2 - \beta_3)$ is statistically indistinguishable from 0, indicating that for these goods externalities dominate. The predictions of our model are also fulfilled for "low externality/high conflict" goods. Education and infant mortality regressions estimate $(\beta_1 - \beta_2 - \beta_3)$ which is significant and has the right sign.[41] Hence, the data support our view that reducing local capture is important to boost the provision of these goods.

- *Cultural and demographic factors*

[41] Land usage and climate types slightly weaken the significance of $(\beta_1 - \beta_2 - \beta_3)$ for Adult Illiteracy. However, even in these specifications centralization is beneficial for stratified groups (($\beta_1 - \beta_2$) is significant at the 5 percent level) but not for egalitarian ones. More generally, all the characteristic features of the centralization-stratification matrix are preserved in all our specifications (results are available from the authors).

A group's political organization may depend on its specific "cultural" characteristics such as its settlement patterns or subsistence activities. For instance, nomadic populations may find it hard to create a centralized political structure as well as to build schools, hospitals or infrastructure.

We use Murdock's *Settlement Pattern* variable and define a group as *nomadic* if it is "fully nomadic", "semi-nomadic", "semi-sedentary" or lives in "compact but impermanent settlements". We define all the other groups as having *permanent settlements*. As for subsistence activities, we use Murdock's *Share of Agriculture in Subsistence Economy* variable, indicating the importance of agriculture relative to animal husbandry, fishing and hunting-gathering. We aggregate[42] the ethnic group data into country-level indexes using the population shares of the Soviet Atlas.

Demographic factors such as population density and urbanization rates may also affect the ability of a society to support political centralization. For instance, many anthropologists argue that since high population density can lead to pressure on resources, some groups of people are likely to attain a more favorable position and may use centralization to keep their power. In addition, urbanized areas may better afford the fixed cost of centralized administrative apparatus. On the other hand, the same scale effect may make it easier to provide modern public goods in densely populated or urbanized regions, so a spurious correlation between Centralization index and our outcomes may arise.[43] We measure these two factors using country-level population density (both relative to total area and to arable land) and urbanization rate in 1960.[44]

Table 5 (both Panel A and Panel B) shows that all of our results are robust to cultural and demographic controls (almost always insignificant on their own).[45] This evidence strengthens the idea that the positive impact of indigenous centralization comes not only from a pure externality effect, but also from the greater accountability of local administrators in centralized polities.

The cultural and demographic factors just considered can certainly play a role in determining a society's political organization, but they may themselves depend on other factors (e.g. geographic ones) or be a function of centralization itself. For instance, settlement patterns and subsistence activities may well depend on agricultural productivity, in turn determined by climate, land usage and so on. Urbanization and population density can also be directly affected by political organization. Centralized polities may witness high urbanization rates insofar as the presence of decision-making centers (capital cities) attracts people from peripheries. Under the latter interpretation, our robustness results can also be viewed as rejecting some indirect channels through which indigenous centralization could have worked.

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[42] See Appendix 1 for the exact definitions of these variables.

[43] Acemoglu et al. (2002) argue that Europeans were more likely to set up extractive institutions in densely populated or urbanized areas. In this case we would expect a *negative* spurious correlation between Centralization and public goods.

[44] Controlling for population density in 1900 produces similar results.

[45] The Centralization index is positively correlated with population density and negatively with urbanization.

There are at least two other sets of indirect explanations for why indigenous centralization played a role. The first deals with the possibility that pre-colonial institutions influenced colonizers' strategies. The second focuses on their impact on the political space of post-independence African countries at the *national* level. In the next section we evaluate the importance of such indirect stories.

6.2. Indirect Effects of Indigenous Centralization

- *Colonial factors*

The economic literature on institutions emphasizes the role the European powers played in shaping the performance of their colonies.

Acemoglu et al. (2001) suggest that Europeans set up better institutions in colonies where they could settle more easily. Centralized pre-colonial systems may have facilitated European settlement, perhaps by allowing them to deal with indigenous populations more effectively. Our regressions would then pick up the effect of Europeans and not that of our theory. To account for this possibility, we control in our regressions for the fraction of a country's population of European descent in 1960.

La Porta et al. (1999) find that English colonies tend to have better governments than the French ones. It may be that, either by coincidence or by choice, the English were more likely to rule over indigenously centralized areas (more suited to their strategy of Indirect Rule). Our basic results would then pick up the benefit of being an English colony, not that of centralization per se. We control for this possibility using the English legal origin variable.

Finally, pre-colonial institutions may have facilitated or rendered more difficult the arrival of missionaries, who brought with them not only their credo but also efforts aimed at improving literacy and health conditions. We measure religion using the share of a country's population belonging to Catholic, Muslim, Protestant or other religions. The results here must be interpreted with caution. The assimilation of religious values may itself be endogenous to education policies and depend on the impact of Centralization on the latter. Although controlling for religion might introduce a downward bias on the coefficient of Centralization, we still want to see how the results are affected.

Panel A of Table 6 shows that our basic results are generally robust to the colonization stories. Only in schooling regressions is the coefficient of centralization weakened when we control for the percent of Europeans or religion shares, since countries with larger European settlements and/or with a larger share of Protestants attain better educational outcomes. We are reassured about the impact of Centralization on education by the results for adult illiteracy (for which we have a

much larger sample), unaffected by the inclusion of those controls. Consistent with the findings of La Porta et al. (1999), the data show that African countries of English legal origin fare better in health and education.

As Panel B shows, controlling for colonial factors does not change the message emerging from the estimation of our centralization-stratification matrix. For roads and DPT immunization the data confirm a uniform impact of centralization due to the externality effect. For "low externality/ high conflict" goods it is still the case that centralization is particularly beneficial for stratified societies. Only for educational outcomes $(\beta_1 - \beta_2 - \beta_3)$ loses its significance when we control for religion, but for adult illiteracy it is still true that centralization benefits stratified but not egalitarian societies ($\beta_1 - \beta_2$ is 5 percent significant, while β_3 is close to zero).[46] In addition, as noted above, the results for education may be downward biased when we control for religion.

- *National factors*

Being centered on ethnic groups' characteristics, our analysis is somewhat related to the literature on the effects of ethnic fractionalization (see Alesina and La Ferrara (2003) for an excellent review of this literature). The standard approach defines ethnicity as based on language. In so doing, it views the costs of fractionalization as coming from cultural barriers in inter-ethnic relations. Instead, we focus on intra-ethnic interaction and explicitly consider a group's political organization as its most salient characteristic. Since centralized political organization may reduce the scope for distinctive cultural differences, we include the Ethnolinguistic Fractionalization index of Easterly and Levine (1997) in our regressions to control for this indirect channel.[47]

The high frequency of civil wars in Africa makes them an important feature of a country's national politics. The probability of having a civil war may depend on the nature of indigenous political institutions. For instance, as suggested by Fearon and Laitin (1996), the degree of inter-ethnic military conflict can be a function of the organization of the groups involved. We control for this channel by including the frequency of a country's civil wars in our regressions.

A country's pre-colonial institutions may have exerted a far-reaching impact on the political regime at the national level. In post-independence African nations, centralized traditional institutions could provide mechanisms of political participation and representation putting

[46] Full results are not shown, but available from the authors.

[47] Scholars recently moved from language to other dimensions of ethnicity. Caselli and Coleman (2002) argue for the salience of physical differences as a determinant of ethnic conflict. Alesina et al. (2003) and Fearon (2003) proposed "identity" based definitions of ethnicity, which are hard to conceptualize into a specific operational criterion.

constraints on the behavior of national political elites.[48] To account for the effects of Centralization on public goods working through this channel, we include in our regressions two standard measures of checks and balances: the indexes of Democracy and Constraints on the Executive.

Table 6 dismisses the channels working through national politics. In Panel A we do not find any evidence supporting the role of Ethnolinguistic fractionalization. The coefficients on Civil Wars, Democracy and Constraints on the Executive generally have the expected sign but are not significant on a consistent basis. More importantly, the results for our Centralization index remain remarkably robust. Likewise, Panel B documents that neither our centralization-stratification matrix is affected by the inclusion of national controls.

Overall, Tables 4 to 6 confirm the two main thrusts of our paper. First, pre-colonial centralization was directly beneficial for public goods provision in African countries. Second, the ability of centralized institutions to soften local capture through political competition is a major benefit they bring.

7. Conclusions

In this paper we document the importance of pre-colonial political institutions for the provision of public goods in colonial and post-colonial Africa. We find that countries with a larger share of their population belonging to ethnic groups with centralized indigenous institutions display significantly better education, health and infrastructure outcomes.

We present historical evidence suggesting that in Africa the main virtue of centralized systems was greater accountability of local power holders, disciplined by competition for higher office. Using a model we demonstrate how centralization can expand the political arena and foster competition among entrenched local elites. This undermines local capture, enhancing the incentives of the elites to cater to the preferences of the masses.

Bringing our model to the data, we show that the local capture approach is indeed essential to fully explain the observed variation in public goods provision across African countries. Therefore, this paper confirms the view that political centralization can be an optimal institutional arrangement when powerful local elites prevent the implementation of socioeconomic reforms.

[48] See Boone (2003) for an analysis along those lines. Instead, Acemoglu et al. (2002) make an opposite argument. In their view, centralized indigenous structure provided the basis for the establishment of extractive institutions by colonial and post-colonial elites.

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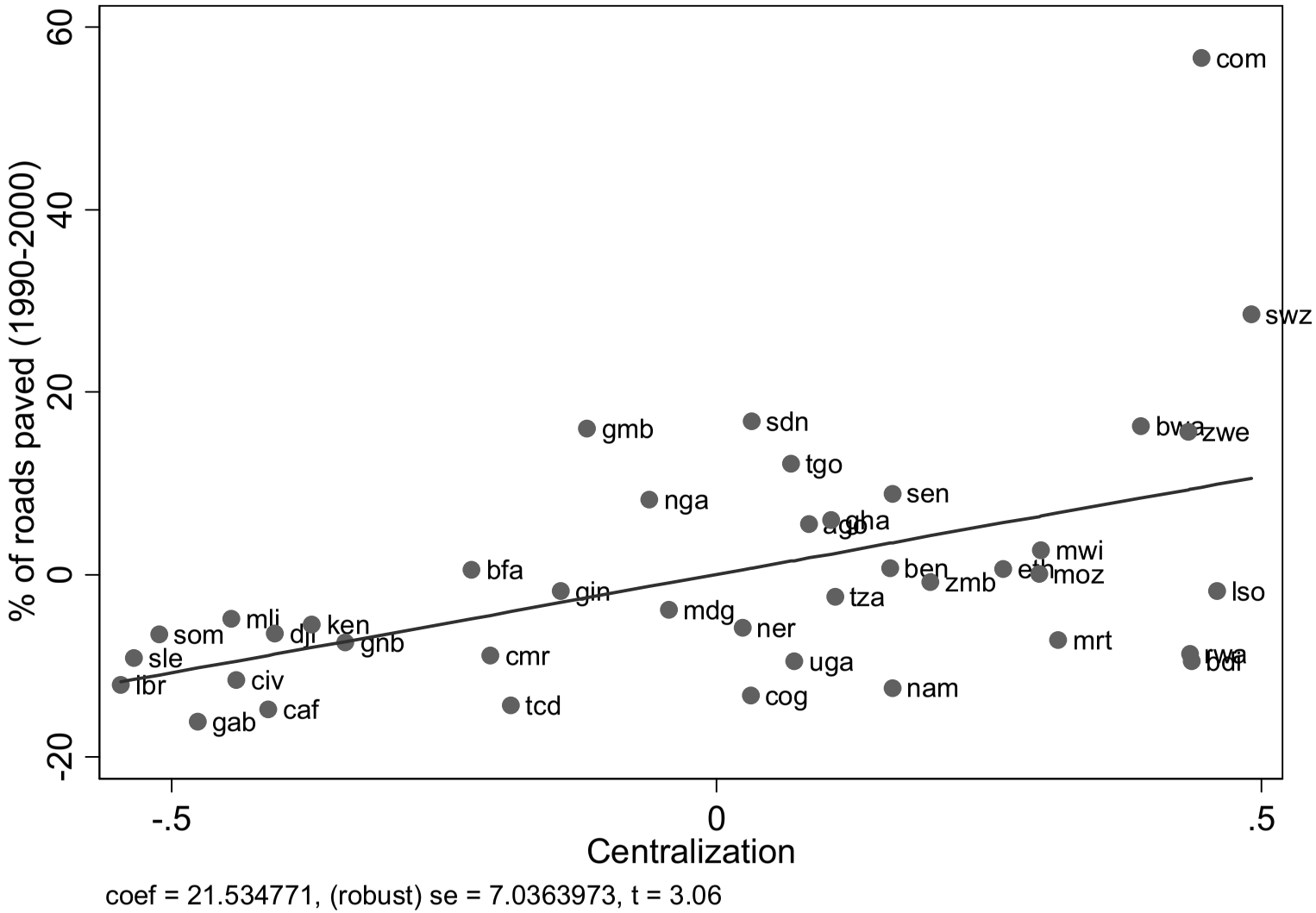
Uganda

Map 1. Distribution of centralized and fragmented ethnic groups across Uganda regions



coef = 21.534771, (robust) se = 7.0363973, t = 3.06

Figure 1: Indigenous centralization and paved roads
(partial relation controlling for log of GDP/cap in 1986)

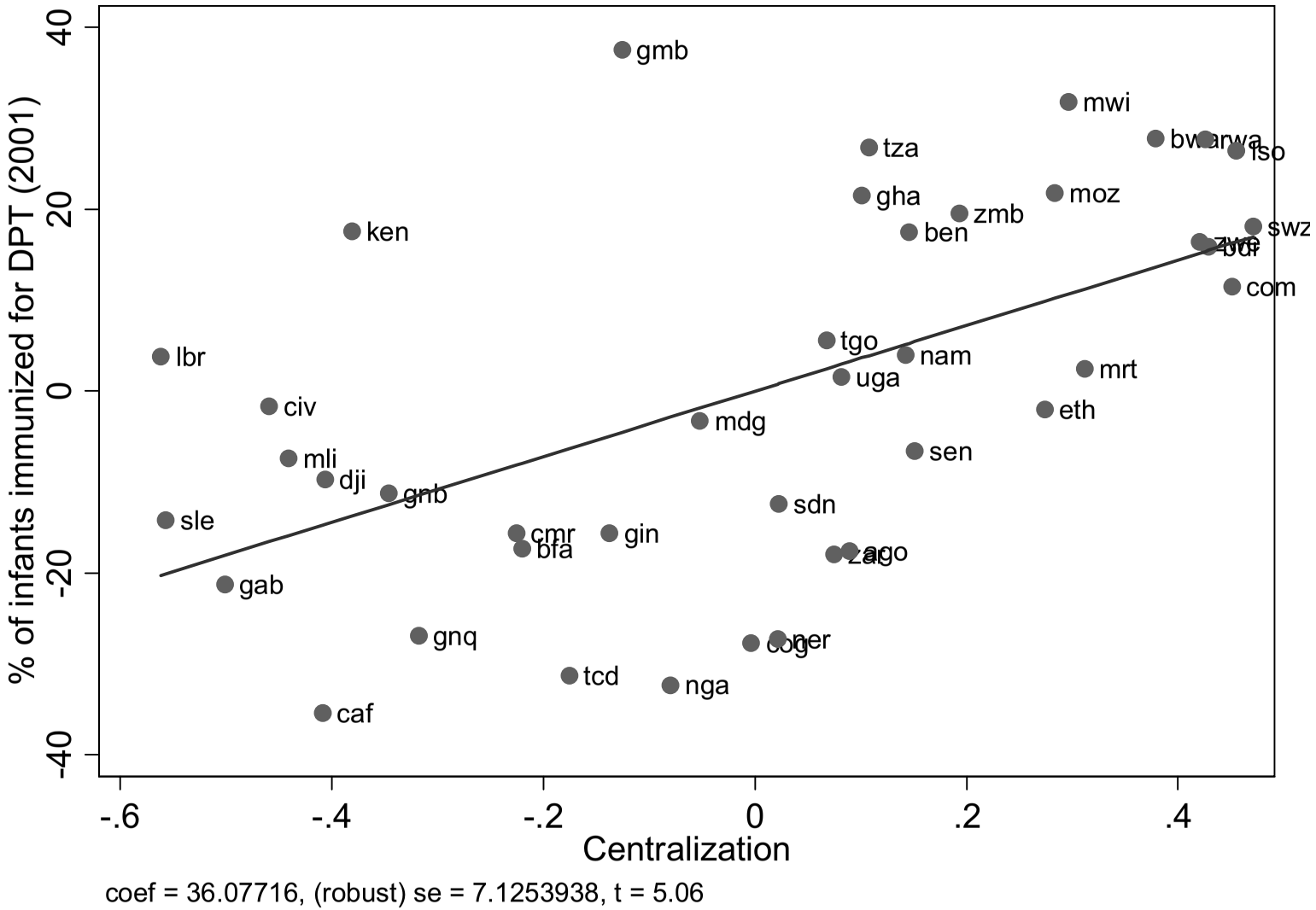


Figure 2: Indigenous centralization and infant immunization
(partial relation controlling for log of GDP/cap in 2001)

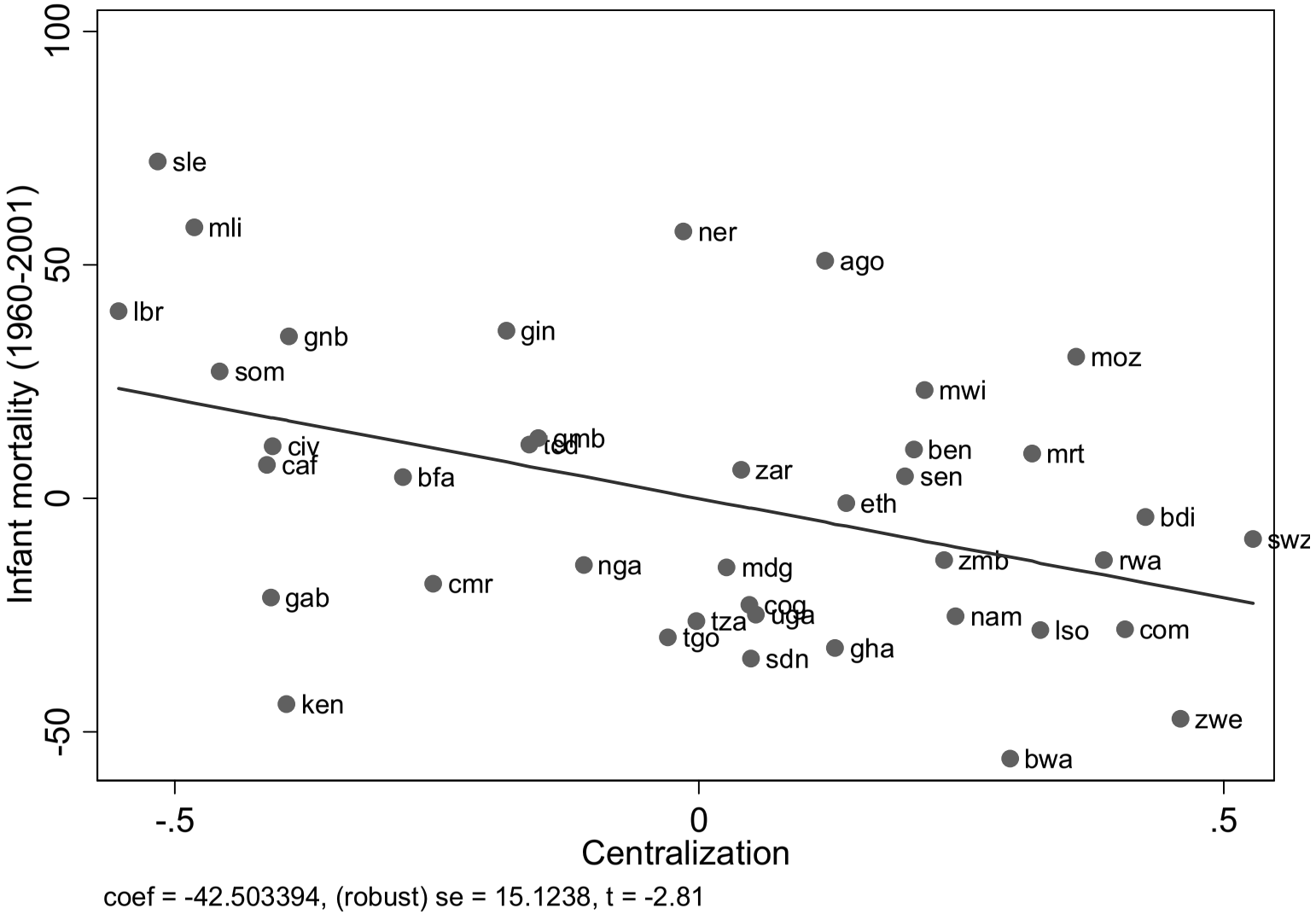


Figure 3: Indigenous centralization and infant mortality
(partial relation controlling for log of GDP/cap in 1960)

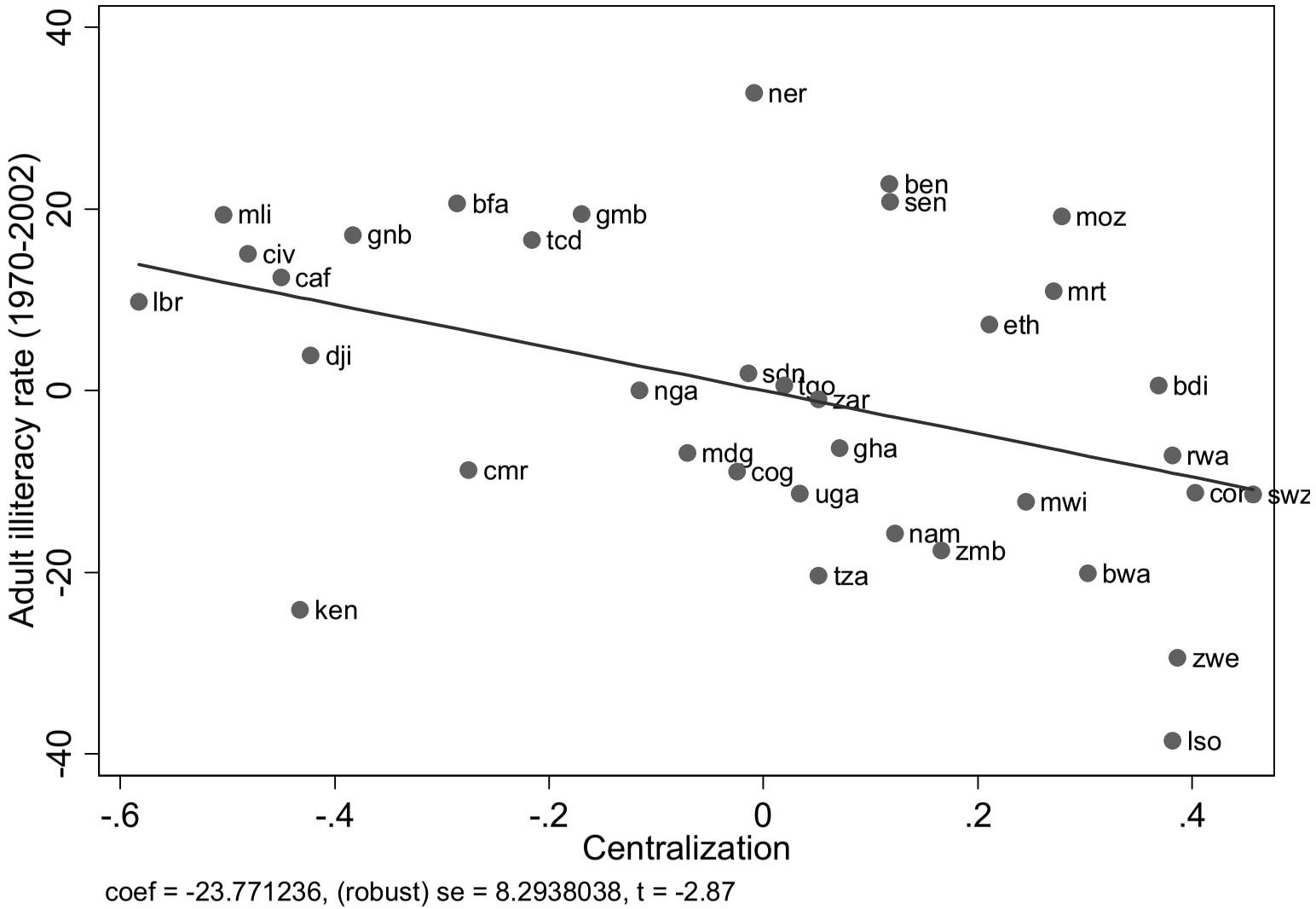


Figure 4: Indigenous centralization and adult illiteracy
(partial relation controlling for log of GDP/cap in 1970)

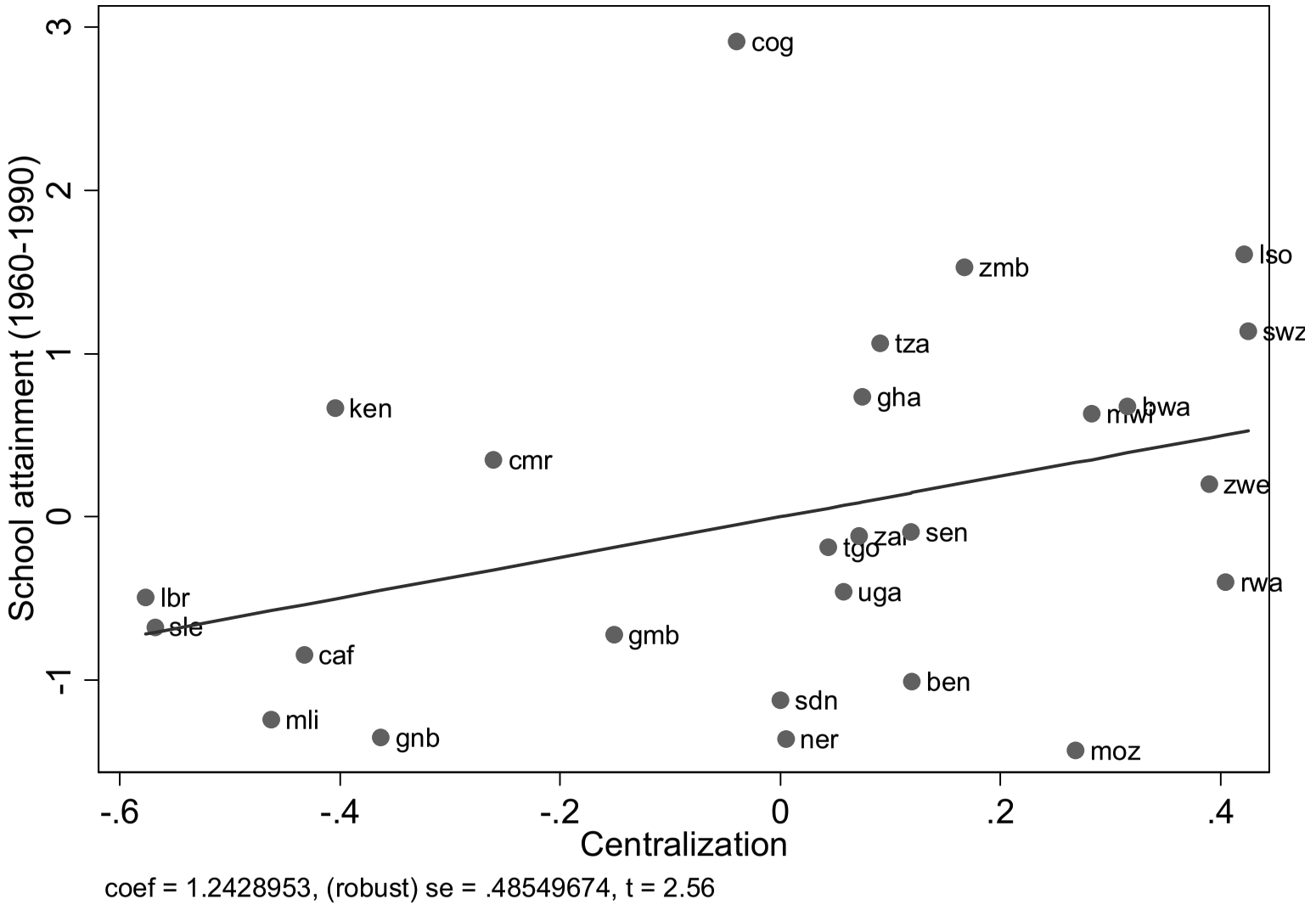


Figure 5: Indigenous centralization and school attainment
(partial relation controlling for log of GDP/cap in 1960)

Table 1: Indigenous centralization and public goods provision

	% of roads paved in 1990-2000		% of infants immunized for DPT in 2001		Infant mortality in 1960-2001		Adult illiteracy rate in 1970-2002		School attainment in 1960-1990	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Centralization	21.02***	21.53***	36.79***	36.08***	-35.24**	-42.5***	-18.74**	-23.77***	1.24**	1.24**
	(7.21)	(7.04)	(6.53)	(7.13)	(14.79)	(15.12)	(9.04)	(8.29)	(0.47)	(0.49)
Log of initial GDP/cap		4.95		0.9		-23.8**		-11.17**		0.36
		(3.38)		(2.5)		(9.26)		(4.56)		(0.61)
Constant	7.12**	-26.72	38.11***	33.22*	146.6***	306.72***	66.94***	145.63***	1.2***	-1.12
	(2.65)	(22.73)	(4.85)	(17.37)	(10.01)	(63.48)	(5.95)	(32.36)	(0.33)	(3.91)
Obs	40	40	42	41	42	40	37	36	26	26
Rsq	0.24	0.27	0.33	0.31	0.13	0.23	0.1	0.26	0.12	0.14

Notes:
(1) OLS estimations.
(2) "Initial GDP/cap" refers to GDP/cap in 1960 for columns 6 and 10, in 1970 for column 8, in 1986 for column 2 and in 2001 for column 4.
(3) Robust standard errors are shown in parentheses.
(4) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 2: Indigenous centralization and public goods in Uganda

Region	Central	Western	Eastern	Northern
Indigenous institutions of ethnic groups	Centr	Centr	Mixed	Fragm
% of roads paved in 2002	13.37	10.32	10.89	1.33
Infant mortality in 2001	71.9	97.8	89.3	105.9
% of children under five years with diarrhoea in 2001	14.5	16	23.3	26.7
Availability of sewerage system in 2000 (% of households)	15	14	9	6
Piped water inside house in 2000 (% of households)	10	10	8	5
Availability of latrine or human waste disposal service in 2000 (% of households)	96	86	77	67
Adult literacy rate in 1997	72	61	54	54
Adequacy of facility & equipment at primary schools in 2000 (% of households satisfied)	62	72	55	51

Sources: Uganda Bureau of Statistics (1999, 2003), Uganda Bureau of Statistics and ORC Macro (2001)

Table 3: Indigenous centralization, class stratification and public goods provision

Panel A: No controls

			% of roads paved in 1990-2000		% of infants immunized for DPT in 2001		Infant mortality in 1960-2001		Adult illiteracy rate in 1970-2002		School attainment in 1960-1990	
			(1)		(2)		(3)		(4)		(5)	
	Strat	Egalit										
Centr	β_1	β_3	**22.23*****	**17.36****	**37.73*****	**40.06****	**-33.54****	**19**	**-16.41***	**5.08**	**1.01***	**-0.59**
			(7.99)	(8.02)	(7.48)	(19.4)	(13.63)	(27.91)	(8.87)	(13.73)	(0.54)	(1.08)
Fragm	β_2	0	**5.1**	0	**11.17**	0	**75.89****	0	**45.67****	0	**-2.21****	0
			(10.07)		(23.44)		(37.22)		(21.45)		(0.95)	
$\beta_1-\beta_2$			17.13	(13.75)	26.56	(21.23)	-109.43***	(35.06)	-62.09***	(20.31)	3.22***	(0.83)
$\beta_1-\beta_3$			4.88	(11.07)	-2.33	(18.68)	-52.54*	(28.63)	-21.5*	(12.68)	1.59	(0.96)
$\beta_1-\beta_2-\beta_3$			**-0.22**	**(15.88)**	**-13.5**	**(31.86)**	**-128.43*****	**(46.33)**	**-67.17****	**(25.44)**	**3.8****	**(1.5)**
Obs			40		42		42		37		26	
Rsq			0.24		0.34		0.32		0.27		0.28	

Table 3: Indigenous centralization, class stratification and public goods provision

Panel B: Controlling for Log of initial GDP/cap

			% of roads paved in 1990-2000		% of infants immunized for DPT in 2001		Infant mortality in 1960-2001		Adult illiteracy rate in 1970-2002		School attainment in 1960-1990	
			(1)		(2)		(3)		(4)		(5)	
	Strat	Egalit										
Centr	β_1	β_3	**22.89*** **	**22** **	**37.18*** **	**42.11***	**-37.2** **	**10.4**	**-21.27** **	**-2.89**	**1.01***	**-0.54**
			(7.72)	(8.4)	(8.56)	(21.86)	(14.31)	(28.55)	(8.58)	(16.95)	(0.55)	(1.16)
Fragm	β_2	0	**10.03**	0	**12.7**	0	**74** **	0	**36.39***	0	**-2.17** **	0
			(10.88)		(26.25)		(34.27)		(20.31)		(0.9)	
	$\beta_1-\beta_2$		12.86	(14.61)	24.48	(22.83)	-111.2***	(31.57)	-57.65***	(18.74)	3.18***	(0.78)
	$\beta_1-\beta_3$		0.88	(11.7)	-4.94	(19.93)	-47.6*	(27.58)	-18.38	(15.94)	1.55	(1.06)
	$\beta_1-\beta_2-\beta_3$		**-9.15**	**(18.15)**	**-17.63**	**(36.69)**	**-121.6*** **	**(44.66)**	**-54.76** **	**(26.85)**	**3.72** **	**(1.48)**
	Obs		40		41		40		36		26	
	Rsq		0.28		0.32		0.39		0.37		0.29	

Notes:

(1) β_1, β_2 and β_3 refer to the OLS estimations of $Y_i = \beta_0 + \beta_1$*Centr-&-Strat$_i$ + β_2*Fragm-&-Strat$_i$ + β_3*Centr-&-Egalit$_i$ + $X'_i\gamma + \varepsilon_i$.

(2) "Initial GDP/cap" refers to GDP/cap in 1960 for columns 3 and 5, in 1970 for column 4, in 1986 for column 1 and in 2001 for column 2.

(3) Robust standard errors are shown in parentheses.

(4) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 4: Robustness to geographic controls

Panel A: Basic centralization results	*Dependent variables*				
	% of roads paved in 1990-2000	% of infants immunized for DPT in 2001	Infant mortality in 1960-2001	Adult illiteracy rate in 1970-2002	School attainment in 1960-1990
Specifications	(1)	(2)	(3)	(4)	(5)
Centralization	**21.53*** (7.04)**	**36.08*** (7.13)**	**-42.5*** (15.12)**	**-23.77*** (8.29)**	**1.24** (0.49)**
No geographic controls					
Centralization	**18.37** (7.82)**	**34.49*** (7.95)**	**-50.87*** (14.36)**	**-24.5*** (7.05)**	**1.49** (0.59)**
Latitude	33.07 (28.29)	15.4 (33.07)	80.9 (58.72)	7.99 (40.57)	-2.02 (3.39)
Centralization	**24.54*** (8.15)**	**36.26*** (7.8)**	**-44.23*** (15.79)**	**-22.93*** (8.37)**	**1.3** (0.56)**
Landlocked dummy	-6.26 (5.1)	-0.39 (5.85)	4.15 (9.38)	-2.11 (5.68)	-0.09 (0.42)
Centralization	**23.94*** (7.36)**	**38.1*** (8.14)**	**-43.72*** (15.6)**	**-23.93*** (8.48)**	**1.23** (0.52)**
Inland waterways	338.63* (176.08)	548.8 (575.73)	216.24 (350.4)	369.91** (159.41)	7.71 (25.74)
Centralization	**21.43*** (6.98)**	**36.65*** (7.03)**	**-41.52** (15.71)**	**-23.66*** (8.45)**	**1.15** (0.5)**
Water area	-15.48 (22.68)	94.32** (42.15)	39.27 (60.34)	4.32 (30.93)	-2.55 (1.92)
Centralization	**29.48*** (9.63)**	**32.7*** (8.78)**	**-29.04 (17.93)**	**-11.23 (8.6)**	**0.48 (0.61)**
Average elevation	-8.3* (4.33)	3.51 (4.7)	-14.58* (7.74)	-13.44** (5.49)	0.77* (0.43)
Centralization	**23.1*** (6.35)**	**32.2*** (8.59)**	**-40.19** (19.38)**	**-21.69* (11.82)**	**0.97 (0.64)**
p-value for Land usage shares	[0.05]	[0.53]	[0.43]	[0.3]	[0.5]
Centralization	**18.25** (7.06)**	**33.51*** (10.29)**	**-31.67** (15.48)**	**-20.95** (9.48)**	**1.29 (0.78)**
p-value for Climate types	[0]	[0.1]	[0.07]	[0.51]	[0.08]

Table 4: Robustness to geographic controls

Panel B: Centralization-Stratification matrix ($\beta_1-\beta_2-\beta_3$)	*Dependent variables*									
	% of roads paved in 1990-2000		% of infants immunized for DPT in 2001		Infant mortality in 1960-2001		Adult illiteracy rate in 1970-2002		School attainment in 1960-1990	
Geographic controls	(1)		(2)		(3)		(4)		(5)	
No controls	-9.15	(18.15)	-17.63	(36.69)	-121.6***	(44.66)	-54.76**	(26.85)	3.72**	(1.48)
Latitude	-1.79	(19.07)	-16.24	(41.8)	-115.88**	(45.6)	-61.01**	(29.58)	3.65**	(1.36)
Landlocked dummy	-8.11	(17.1)	-17.68	(37.01)	-121.64***	(44.16)	-54.57*	(27.69)	3.71**	(1.5)
Inland waterways	-1.85	(18.45)	-8.72	(35.46)	-128.33**	(48.82)	-50.8*	(29.63)	4.6**	(1.86)
Water area	-9.92	(18.29)	-13.09	(28.78)	-120.21**	(46.87)	-55.32**	(26.83)	3.64**	(1.6)
Average elevation	-5.26	(17.44)	-18.97	(36.55)	-115.17***	(42.28)	-47.06**	(19.71)	3*	(1.51)
Land usage shares	1.58	(16.16)	-26.74	(43.47)	-112.72**	(54.84)	-50.06	(32.68)	3.67*	(1.94)
Climate types	-6.33	(21.76)	-54.87	(38.1)	-102.05**	(44.1)	-43.05	(32)	3.8*	(2.12)

Notes:

(1) Panel A shows coefficients and robust standard errors for *Centralization* index and geographic controls introduced one at a time.

(2) Panel B shows coefficients and robust standard errors of $\beta_1-\beta_2-\beta_3$ from the OLS estimations of $Y_i = \beta_0 + \beta_1$*Centr-&-Strat$_i$ + β_2*Fragm-&-Strat$_i$ + β_3*Centr-&-Egalit$_i$ + $X'_i\gamma + \varepsilon_i$, where geographic controls are introduced one at a time.

(3) All regressions control for *Log of initial GDP/cap* from Tables 1 and 3.

(4) All regressions have 40, 41, 40, 36 and 26 observations in columns 1 to 5 respectively, except those including *Land usage* (39, 40, 40, 35, 26 observations) and those including *Inland waterways* (38, 39, 38, 34, 25).

(5) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

(6) In Panel A the p-values for *Land usage* shares and *Climate* types refer to the F tests of joint significance.

Table 5: Robustness to cultural and demographic controls

Panel A: Basic centralization results	*Dependent variables*									
	% of roads paved in 1990-2000		% of infants immunized for DPT in 2001		Infant mortality in 1960-2001		Adult illiteracy rate in 1970-2002		School attainment in 1960-1990	
Specifications	(1)		(2)		(3)		(4)		(5)	
Centralization	**21.53*** **	**(7.04)**	**36.08*** **	**(7.13)**	**-42.5*** **	**(15.12)**	**-23.77*** **	**(8.29)**	**1.24** **	**(0.49)**
No cultural or demographic controls										
Centralization	**21.21*** **	**(6.98)**	**35.91*** **	**(7.14)**	**-42.44*** **	**(15.39)**	**-23.38*** **	**(8.39)**	**1.24** **	**(0.5)**
Permanent settlements	2.52	(6.64)	12.06	(8.98)	-2.28	(16.71)	-5.31	(9.12)	0.6	(1.35)
Centralization	**21.5*** **	**(7.11)**	**36.79*** **	**(7.23)**	**-42.24*** **	**(14.94)**	**-23.59*** **	**(8.31)**	**1.48** **	**(0.61)**
Dependence on agriculture	0.32	(1.14)	1.57	(1.98)	0.61	(3.72)	0.99	(1.88)	0.28	(0.22)
Centralization	**20.5*** **	**(4.89)**	**31.13*** **	**(8.39)**	**-43.6** **	**(17.88)**	**-25.07** **	**(10.18)**	**1.41** **	**(0.51)**
Population density in 1960	0.031	(0.15)	0.15	(0.096)	0.037	(0.152)	0.035	(0.083)	-0.009	(0.006)
Centralization	**21.62*** **	**(7.34)**	**36.64*** **	**(7.52)**	**-41.95*** **	**(14.26)**	**-23.53** **	**(8.97)**	**1.45** **	**(0.58)**
Population density per arable land in 1960	-0.016	(0.014)	0.009	(0.034)	0.043	(0.048)	-0.02	(0.018)	0.004*	(0.002)
Centralization	**22.76*** **	**(7.84)**	**30.42*** **	**(8.25)**	**-47.58*** **	**(17.12)**	**-25.42** **	**(11.12)**	**1.74** **	**(0.65)**
% of urban population in 1960	0.096	(0.164)	-0.414	(0.316)	-0.65	(0.647)	-0.115	(0.357)	0.054	(0.037)

Table 5: Robustness to cultural and demographic controls

Panel B: Centralization-Stratification matrix ($\beta_1-\beta_2-\beta_3$)	*Dependent variables*				
	% of roads paved in 1990-2000	% of infants immunized for DPT in 2001	Infant mortality in 1960-2001	Adult illiteracy rate in 1970-2002	School attainment in 1960-1990
Cultural and demographic controls	(1)	(2)	(3)	(4)	(5)
No controls	-9.15 (18.15)	-17.63 (36.69)	-121.6*** (44.66)	-54.76** (26.85)	3.72** (1.48)
Permanent settlements	-9.32 (18.37)	-23.59 (36.25)	-123.59*** (43.37)	-54.34* (27.87)	3.85** (1.72)
Dependence on agriculture	-9.03 (18.71)	-20.21 (37.02)	-121.86*** (44.87)	-56.61** (27.08)	3.55** (1.59)
Population density in 1960	-11.03 (15.17)	-29.32 (36.4)	-125.99*** (46.13)	-60.11** (28.76)	3.79** (1.62)
Population density per arable land in 1960	-9.46 (18.53)	-19.88 (36.79)	-124.46*** (44.08)	-52.44* (27.5)	3.27*** (1.14)
% of urban population in 1960	-10.3 (18.11)	-11.94 (37.4)	-118.33** (45.73)	-54.72* (27.89)	3.22** (1.41)

Notes:

(1) Panel A shows coefficients and robust standard errors for *Centralization* index and cultural or demographic controls introduced one at a time.

(2) Panel B shows coefficients and robust standard errors of $\beta_1-\beta_2-\beta_3$ from the OLS estimations of

$Y_i = \beta_0 + \beta_1$*Centr-&-Strat$_i + \beta_2$*Fragm-&-Strat$_i + \beta_3$*Centr-&-Egalit$_i + X'_i\gamma + \varepsilon_i$, where cultural and demographic controls are introduced one at a time.

(3) All regressions control for *Log of initial GDP/cap* from Tables 1 and 3.

(4) All regressions have 40, 41, 40, 36 and 26 observations in columns 1 to 5 respectively, except those including *Population density per arable land* (39, 40, 40, 35, 26 observations).

(5) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 6: Robustness to colonial and national controls

Panel A: Basic centralization results	*Dependent variables*				
	% of roads paved in 1990-2000	% of infants immunized for DPT in 2001	Infant mortality in 1960-2001	Adult illiteracy rate in 1970-2002	School attainment in 1960-1990
Specifications	(1)	(2)	(3)	(4)	(5)
Centralization	**21.53*** (7.04)**	**36.08*** (7.13)**	**-42.5*** (15.12)**	**-23.77*** (8.29)**	**1.24** (0.49)**
No colonial or national controls					
Centralization	**15.86*** (4.8)**	**36.57*** (7.55)**	**-40.42** (16.27)**	**-24.26** (8.96)**	**0.55 (0.71)**
% of European descent in1960	-46.74 (51.07)	-20.13 (48.64)	-45.65 (147.98)	-109** (52.24)	76.42 (46.52)
Centralization	**20.96*** (7.38)**	**31.97*** (6.49)**	**-40.93** (16)**	**-18.55** (6.86)**	**1.1*** (0.39)**
English legal origin	3.86 (3.84)	16.79*** (5.49)	-16.85* (9.18)	-18.32*** (4.77)	0.65 (0.41)
Centralization	**26.7*** (7.31)**	**36.71*** (6.69)**	**-35.74** (15.59)**	**-18.33** (8.87)**	**0.7 (0.68)**
Catholics	-0.15 (0.16)	-0.07 (0.18)	0.34 (0.39)	0.4 (0.24)	-0.02 (0.03)
Muslims	0.14 (0.13)	0 (0.16)	0.5* (0.25)	0.52** (0.19)	-0.04* (0.02)
Other religions	0.11 (0.15)	0.29 (0.19)	0.27 (0.32)	0.42 (0.25)	-0.04 (0.03)
Centralization	**25.47*** (8.83)**	**35.19*** (8.13)**	**-43.08** (15.99)**	**-23.21** (9.27)**	**1.08 (0.72)**
Ethnolinguistic fractionalization	12.03 (11.64)	-2.21 (7.35)	-1.64 (11.84)	1.27 (8.95)	-0.33 (1.03)
Centralization	**21.58*** (7.28)**	**37.84*** (7.38)**	**-44.71*** (14.65)**	**-24.77*** (8.15)**	**1.6*** (0.45)**
Civil wars in 1970-92	-1.13 (8.46)	-17.6 (12.03)	31.92 (26.55)	13.33 (16.24)	-3.12*** (0.91)
Centralization	**19.95** (7.73)**	**32.03*** (8.13)**	**-37.65** (15.07)**	**-24.05** (8.99)**	**1.29** (0.52)**
Democracy in 1970-94	1.09 (0.95)	2.39* (1.29)	-2.73* (1.61)	-0.6 (1.03)	-0.03 (0.05)
Centralization	**20.25** (7.57)**	**33.23*** (8.04)**	**-38.41** (15.33)**	**-23.82** (8.86)**	**1.24** (0.5)**
Constraints on the executive in 1970-94	1.64 (1.6)	3.17 (2.06)	-4.08 (2.44)	-1.76 (1.65)	-0.01 (0.07)

Table 6: Robustness to colonial and national controls

Panel B: Centralization-Stratification matrix ($\beta_1-\beta_2-\beta_3$)	*Dependent variables*				
	% of roads paved in 1990-2000	% of infants immunized for DPT in 2001	Infant mortality in 1960-2001	Adult illiteracy rate in 1970-2002	School attainment in 1960-1990
Colonial and national controls	(1)	(2)	(3)	(4)	(5)
No controls	-9.15 (18.15)	-17.63 (36.69)	-121.6*** (44.66)	-54.76** (26.85)	3.72** (1.48)
% of European descent in 1960	-19.06 (14.48)	-16.66 (37.54)	-121.47** (45.21)	-52.42* (27.22)	3.41** (1.45)
English legal origin	-8.28 (17.03)	-10.6 (30.31)	-120.33*** (43.63)	-51.93** (24.56)	3.64** (1.43)
Religion variables	12.83 (20.62)	-25.56 (36.83)	-106.07** (44.05)	-32.66 (21.92)	0.67 (2.08)
Ethnolinguistic fractionalization	-7.28 (17.9)	-17.57 (37.32)	-122.06** (46.79)	-54.76** (26.86)	3.76** (1.54)
Civil wars in 1970-92	-9.37 (19.32)	-16.86 (37.47)	-122.33** (46.81)	-52.82* (27.51)	3.2** (1.33)
Democracy in 1970-94	-5.58 (17.24)	-4.19 (34.11)	-127.5*** (46.3)	-56.48* (28.9)	3.66** (1.48)
Constraints on the executive in 1970-94	-4.89 (17.57)	-5.57 (35.57)	-133.52*** (44.34)	-60.3** (28.77)	3.78** (1.51)

Notes:

(1) Panel A shows coefficients and robust standard errors for *Centralization* index and colonial or national controls introduced one at a time.

(2) Panel B shows coefficients and robust standard errors of $\beta_1-\beta_2-\beta_3$ from the OLS estimations of $Y_i = \beta_0 + \beta_1$*Centr-&-Strat$_i + \beta_2$*Fragm-&-Strat$_i + \beta_3$*Centr-&-Egalit$_i + X'_i\gamma + \varepsilon_i$, where colonial and national controls are introduced one at a time.

(3) All regressions control for *Log of initial GDP/cap* from Tables 1 and 3.

(4) All regressions have 40, 41, 40, 36 and 26 observations in columns 1 to 5 respectively, except those including *% of Europeans* (39, 40, 39, 35, 26 observations) and those including *Democracy* or *Constraints on the executive* (39, 39, 40, 35, 26).

(5) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Appendix 1

Data and Sources

Dependent variables	
% of roads paved in 1990-2000	Average of roads paved (as percent of total roads) for the years 1990-2000. Paved roads are roads that have been sealed with asphalt or similar road-building materials. Scale 0-100. Source: Based on World Bank World Development Indicators (2003).
% of infants immunized for DPT in 2001	Infant immunization measures the rate of vaccination coverage of children under one year of age. A child is considered adequately immunized against DPT (diphtheria, pertussis or whooping cough, and tetanus) after receiving two or three doses of vaccine, depending on the immunization scheme. Scale 0-100. Source: World Bank World Development Indicators (2003).
Infant mortality in 1960-2001	Average of infant mortality rate for the years 1960-2001. Infant mortality rate is the number of infants who die before reaching one year of age, per 1,000 live births in a given year. Source: Based on World Bank World Development Indicators (2003).
Adult illiteracy rate in 1970-2002	Average of adult illiteracy rate for the years 1970-2002. Adult illiteracy rate is the proportion of adults aged 15 and above who cannot, with understanding, read and write a short, simple statement of their everyday life. Scale 0-100. Source: Based on World Bank World Development Indicators (2003).
School attainment in 1960-1990	Average of school attainment for the years 1960-1990. Each value is an average of schooling years in the total population over the age of 15. Source: Based on Barro and Lee (1994).
Main independent variables	
Centralization	For each country measures the share of the non-European population that belongs to indigenously "centralized" ethnic groups. Scale is 0 to 1. An ethnic group is defined as "centralized" if it has 2, 3 or 4 jurisdictional levels above the local community according to Murdock's (1967) *Jurisdictional Hierarchy* variable. (It is defined as "fragmented" if it has 0 or 1 levels) Source: Constructed by the authors using Murdock (1967) and Atlas Narodov Mira (1964).

Continued

Data and Sources (continued)

Centralization-Stratification shares	For each country measure the shares of the non-European population that belongs to indigenously centralized and stratified, fragmented and stratified, centralized and egalitarian or fragmented and egalitarian ethnic groups. Scale is 0 to 1. An ethnic group is defined as "centralized" if it has 2, 3 or 4 jurisdictional levels above the local community according to Murdock's (1967) *Jurisdictional Hierarchy* variable. It is defined as "fragmented" if it has 0 or 1 levels. An ethnic group is defined as "stratified" if Murdock's (1967) *Class Stratification* variable indicates that the group is characterized by one of the following: a) "elite stratification, in which an elite class derives its superior status from, and perpetuates it through, control over scarce resources, particularly land, and is thereby differentiated from a propertyless proletariat or serf class"; b) "dual stratification into a hereditary aristocracy and a lower class of ordinary commoners or freemen, where traditionally ascribed noble status is at least as decisive as control over scarce resources" or c) "complex stratification into social classes correlated in large measure with extensive differentiation of occupational statuses". A group is defined as "egalitarian" if according to the same variable it is characterized by a) "absence of significant class distinctions among freemen, ignoring variations in individual repute achieved through skill, valor, piety, or wisdom" or b) "wealth distinctions based on the possession or distribution of property present and socially important but not crystallized into distinct and hereditary social classes". Source: Constructed by the authors using Murdock (1967) and Atlas Narodov Mira (1964).
Log of GDP per capita in 1960, 1970 and 1986	Logarithm of GDP per capita in constant 1985 dollars (international prices). Source: Global Development Network Growth Database, based on Penn World Table 5.6.
Log of GDP per capita in 2001	Logarithm of GDP per capita in constant 1995 dollars (international prices). Source: World Bank World Development Indicators (2003).
Geographic controls	
Latitude	The absolute value of the latitude of the country, scaled to take values between 0 and 1. Source: La Porta et al (1999), originally based on CIA World Factbook (1996).
Landlocked	Dummy variable taking value 1 if a country is landlocked, 0 otherwise. Source: Parker (1997).
Inland waterways	Length of inland waterways (km) divided by land area (km sq). Land area is a country's total area, excluding area under inland water bodies. In most cases the definition of inland water bodies includes major rivers and lakes. Source: Based on Parker (1997) and World Bank World Development Indicators (2003).
Water area	Water area (km sq) divided by land area (km sq). Land area is a country's total area, excluding area under inland water bodies. In most cases the definition of inland water bodies includes major rivers and lakes. Source: Based on Parker (1997) and World Bank World Development Indicators (2003).

Continued

Average elevation	Average elevation (th m). Source: Parker (1997).
Land usage shares	Identify the percentage of the land of each country that belongs to the four types of land usage: (1) Arable, (2) Permanent crops, (3) Meadows and pastures and (4) Forest and woodland. The residual is called "Other land usage". The numbers are in percent (scale from 0 to 100). Source: Parker (1997).
Climate types	Climate types are tropical wet, tropical monsoon, tropical wet and dry, steppe (low latitude), desert (low latitude), subtropical humid, dry steppe wasteland and highland. Source: Parker (1997).
Cultural and demographic controls	
Permanent settlements	For each country measures the share of the non-European population that belongs to ethnic groups that indigenously have "permanent settlements". Scale is 0 to 1. An ethnic group is defined as having "permanent settlements" if according to Murdock's (1967) *Settlement Pattern* variable it is characterized by one of the following: a) "complex settlements consisting of a nucleated village or town with outlying homesteads or satellite hamlets"; b) "compact and relatively permanent settlements, i.e. nucleated villages or towns"; c) "separated hamlets where several such form more or less permanent single community" or d) "neighborhoods of dispersed family homesteads". In contrast, "nomadic" groups are described by the same variable as either: a) "fully migratory or nomadic bands"; b) "seminomadic communities whose members wander in bands for at least half of the year but occupy a fixed settlement at some season or seasons"; c) "semisedentary communities whose members shift from one to another fixed settlement at different seasons or who occupy more or less permanently a single settlement from which a substantial proportion of the population departs seasonally to occupy shifting camps" or d) having "compact but impermanent settlements, i.e. villages whose location is shifted every few years". Source: Constructed by the authors using Murdock (1967) and Atlas Narodov Mira (1964).
Dependence on agriculture	For each country measures a weighted average of "dependence on agriculture" of its ethnic groups. "Dependence on agriculture" for each group is from Murdock's (1967) *Subsistence Economy* variable and is relative to its dependence on hunting-gathering, fishing and animal husbandry. Scale is from 1 to 10. Source: Constructed by the authors using Murdock (1967) and Atlas Narodov Mira (1964).
Population density in 1960	Total population in 1960 divided by land area in square kilometers. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. Refugees not permanently settled in the country of asylum are generally considered to be part of the population of their country of origin. Land area is a country's total area, excluding area under inland water bodies. In most cases the definition of inland water bodies includes major rivers and lakes. Source: Based on World Bank World Development Indicators (2003).

Continued

Data and Sources (continued)

Population density per arable land in 1960	Total population in 1960 divided by arable land in square kilometers. Arable land includes land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Source: Based on World Bank World Development Indicators (2003).
% of urban population in 1960	Urban population is the midyear population of areas defined as urban in each country and reported to the United Nations. It is measured here as the percentage of the total population. Scale 0-100. Source: World Bank World Development Indicators (2003).
Colonial and national controls	
% of European descent in 1960	% of population of European descent in 1960. "European" includes all whites. Scale from 0 to 1. Source: Morrison et al. (1989).
English legal origin	Dummy variable taking value 1 for countries with English legal origin, 0 otherwise. Source: La Porta et al. (1999), originally based on "Foreign Laws: Current Sources of Basic Legislation in Jurisdictions of the World" (1989) and CIA World Factbook (1996).
Religion shares	Identify the percentage of the population of each country that belonged to the three most widely spread religions in the world in 1980. The numbers are in percent (scale from 0 to 100). The three religions identified are Roman Catholic, Protestant and Muslim. The residual is called "other religions". Source: La Porta et al. (1999), originally based on Barrett (1982), Worldmark Encyclopedia of Nations (1995), Statistical Abstract of the World (1995), United Nations (1995), CIA (1996).
Ethnolinguistic fractionalization	Average value of five different indices of ethnolinguistic fractionalization. Its value ranges from 0 to 1. Source: La Porta et al. (1999), originally from Easterly and Levine (1997).
Civil wars in 1970-1992	Percent of years for the period 1970-1992 in which a country experienced civil war. Scale from 0 to 1. Source: Bates (2003), originally from Singer (1994).
Democracy in 1970-1994	Average of democracy for the years 1970-1994. Democracy is measured on an eleven-category scale, from 0 to 10, with a higher score indicating more democracy. Points are awarded on three dimensions: competitiveness of political participation (from 1 to 3); competitiveness of executive recruitment (from 1 to 2, with a bonus of 1 point if there is an election); and constraints on chief executive (from 1 to 4). Source: Polity III dataset.
Constraints on the executive in 1970-1994	Average of constraints on the executive for the years 1970-1994. Constraints on the executive are measured on a seven-category scale, from 1 to 7, with a higher score indicating more constraints. Score of 1 indicates unlimited authority; score of 3 indicates slight to moderate limitations; score of 5 indicates substantial limitations; score of 7 indicates executive parity or subordination. Scores of 2, 4 and 6 indicate intermediate values. Source: Polity III dataset.

Appendix 2

Table A1: Indigenous political centralization in Sub-Saharan Africa
(Share of the Non-European population that had centralized political institutions before colonization)

Country	Centralization	Country	Centralization
Comoros	1	Niger	0.582
Lesotho	1	Sudan	0.576
Swaziland	1	Congo Rep	0.536
Burundi	0.995	Madagascar	0.505
Rwanda	0.982	Nigeria	0.478
Zimbabwe	0.965	Gambia	0.426
Botswana	0.893	Guinea	0.406
Malawi	0.861	Chad	0.384
Mauritania	0.858	Burkina Faso	0.338
Mozambique	0.844	Cameroon	0.316
Ethiopia	0.843	Guinea-Bissau	0.214
Zambia	0.743	Equatorial Guinea	0.211
Benin	0.695	Kenya	0.172
Senegal	0.694	Central African Republic	0.144
Tanzania	0.669	Djibouti	0.133
Namibia	0.664	Mali	0.115
Ghana	0.651	Cote d'Ivoire	0.082
Congo Dem Rep	0.649	Somalia	0.034
Angola	0.635	Gabon	0.011
Uganda	0.634	Sierra Leone	0.008
Togo	0.622	Liberia	0

Table A2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
% of roads paved in 1990-2000	40	18.528	14.018	0.8	73.763
% of infants immunized for DPT in 2001	42	57.881	20.403	23	96
Infant mortality in 1960-2001	42	127.658	31.405	73.856	195.389
Adult illiteracy rate in 1970-2002	37	56.062	17.893	24.377	89.561
School attainment in 1960-1990	26	1.918	1.1	0.467	5.015
Main independent variables					
Centralization	42	0.537	0.321	0	1
Centralized & Stratified	42	0.468	0.325	0	1
Centralized & Egalitarian	42	0.069	0.168	0	0.756
Fragmented & Stratified	42	0.085	0.144	0	0.509
Fragmented & Egalitarian	42	0.378	0.318	0	1
Log of GDP/cap in 1960	40	6.559	0.456	5.549	7.49
Log of GDP/cap in 1970	41	6.751	0.567	5.69	8.217
Log of GDP/cap in 1986	42	6.758	0.544	5.743	8.302
Log of GDP/cap in 2001	41	6.027	0.873	4.459	8.384
Geographic controls					
Latitude	42	0.125	0.08	0	0.326
Landlocked dummy	42	0.333	0.477	0	1
Inland waterways	40	0.003	0.007	0	0.04
Water area	42	0.043	0.068	0	0.289
Average elevation	42	0.486	0.605	0.002	2.14
Cultural and demographic controls					
Permanent settlements	42	0.852	0.261	0.036	1
Dependence on agriculture	42	5.399	1.242	1.195	7.38
Population density in 1960	42	20.163	26.175	0.753	114.525
Population density per arable land in 1960	41	197.614	112.153	59.783	617.5
% of urban population in 1960	42	12.843	9.643	1.8	49.6
Colonial and national controls					
% of European descent in 1960	41	0.014	0.03	0.001	0.141
English legal origin	42	0.405	0.497	0	1
Catholics	42	23.457	22.22	0	78.3
Muslims	42	31.536	34.802	0	99.8
Protestants	42	13.812	14.886	0	64.2
Other religions	42	31.195	19.736	0.1	64.1
Ethnolinguistic fractionalization	42	0.639	0.271	0	1
Civil wars in 1970-92	42	0.095	0.196	0	0.783
Democracy in 1970-94	40	1.233	2.48	0	10
Constraints on the executive in 1970-94	40	2.458	1.548	1	7

Table A3: Pairwise correlations of dependent variables

	% of roads paved in 1990-2000	% of infants immunized for DPT in 2001	Infant mortality in 1960-2001	Adult illiteracy rate in 1970-2002	School attainment in 1960-1990
% of roads paved in 1990-2000	1				
	(40)				
% of infants immunized for DPT in 2001	0.357**	1			
	(40)	(42)			
Infant mortality in 1960-2001	-0.332**	-0.309**	1		
	(40)	(42)	(42)		
Adult illiteracy rate in 1970-2002	-0.268	-0.335**	0.726***	1	
	(35)	(37)	(37)	(37)	
School attainment in 1960-1990	0.181	0.213	-0.576***	-0.78***	1
	(25)	(26)	(26)	(25)	(26)

Notes:
(1) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.
(2) Number of observations is shown in parentheses.

Table A4: Pairwise correlations between indigenous political institutions and controls

	Indigenous political institutions				
	Centra-lization	Centr & Strat	Centr & Egalit	Fragm & Strat	Fragm & Egalit
Income					
Log of GDP/cap in 1960	-0.21	-0.128	-0.15	-0.021	0.226
Log of GDP/cap in 1970	-0.203	-0.14	-0.11	-0.114	0.259
Log of GDP/cap in 1986	-0.068	0.049	-0.23	-0.183	0.152
Log of GDP/cap in 2001	-0.044	0.117	-0.301*	-0.212	0.144
Geographic controls					
Latitude	0.386**	0.306**	0.147	0.203	-0.482***
Landlocked dummy	0.336**	0.263*	0.135	-0.085	-0.301*
Inland waterways	-0.144	-0.118	-0.05	0.444***	-0.058
Water area	0.003	-0.152	0.299*	-0.011	0.002
Average elevation	0.508***	0.48***	0.044	-0.152	-0.444***
Cultural and demographic controls					
Permanent settlements	0.141	0.195	-0.11	0.001	-0.143
Dependence on agriculture	0.033	0.035	-0	0.087	-0.073
Population density in 1960	0.414***	0.444***	-0.07	-0.097	-0.375**
Population density per arable land in 1960	-0.028	0.07	-0.19	0.099	-0.017
% of urban population in 1960	-0.453***	-0.326**	-0.24	-0.043	0.477***
Colonial and national controls					
% of European descent in 1960	-0.048	0.009	-0.11	-0.176	0.129
English legal origin	0.098	0.036	0.116	-0.087	-0.059
Catholics	0.134	0.171	-0.08	-0.39**	0.041
Muslims	-0.193	-0.221	0.059	0.426***	0.002
Protestants	0.171	0.168	0.001	-0.309**	-0.032
Other religions	0.061	0.071	-0.02	-0.079	-0.026
Ethnolinguistic fractionalization	-0.363**	-0.403***	0.084	0.046	0.346**
Civil wars in 1970-92	0.083	-0.036	0.227	-0.224	0.018
Democracy in 1970-94	0.187	0.244	-0.12	0.135	-0.257
Constraints on the executive in 1970-94	0.164	0.208	-0.09	0.193	-0.26

Notes:
(1) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table A5: Indigenous centralization and class stratification in Sub-Saharan Africa

Country	Centr & Strat	Centr & Egalit	Fragm & Strat	Fragm & Egalit	Country	Centr & Strat	Centr & Egalit	Fragm & Strat	Fragm & Egalit
Angola	0.635	0	0	0.365	Lesotho	1	0	0	0
Benin	0.695	0	0.007	0.297	Liberia	0	0	0	1
Botswana	0.884	0.009	0	0.107	Madagascar	0.505	0	0.495	0
Burkina Faso	0.338	0	0.023	0.64	Malawi	0.105	0.756	0	0.139
Burundi	0.995	0	0	0.005	Mali	0.115	0	0.509	0.377
Cameroon	0.238	0.078	0.099	0.584	Mauritania	0.858	0	0.142	0
Central African Republic	0.144	0	0	0.856	Mozambique	0.318	0.526	0	0.156
Chad	0.384	0	0.098	0.518	Namibia	0.664	0	0	0.336
Comoros	0.983	0.017	0	0	Niger	0.135	0.447	0.286	0.132
Congo Dem Rep	0.559	0.09	0.012	0.34	Nigeria	0.466	0.012	0.052	0.47
Congo Rep	0.536	0	0	0.464	Rwanda	0.982	0	0	0.018
Cote d'Ivoire	0.082	0	0.026	0.893	Senegal	0.694	0	0.238	0.068
Djibouti	0.133	0	0	0.867	Sierra Leone	0.008	0	0.37	0.622
Equatorial Guinea	0.211	0	0	0.789	Somalia	0.034	0	0	0.966
Ethiopia	0.727	0.116	0.052	0.104	Sudan	0.083	0.494	0.047	0.376
Gabon	0.011	0	0	0.989	Swaziland	1	0	0	0
Gambia	0.426	0	0.462	0.112	Tanzania	0.591	0.078	0.091	0.24
Ghana	0.651	0	0.133	0.216	Togo	0.564	0.058	0	0.378
Guinea	0.406	0	0.259	0.335	Uganda	0.633	0.001	0.033	0.333
Guinea-Bissau	0.214	0	0.132	0.654	Zambia	0.56	0.184	0	0.257
Kenya	0.146	0.027	0	0.828	Zimbabwe	0.95	0.015	0	0.035

Appendix 3

Proof of Proposition 1

A political equilibrium consists of agreements $\left(g_1^{\,1}, g_2^{\,1}\right)$, $\left(g_1^{\,2}, g_2^{\,2}\right)$ such that the coalition *Elite-Masses* in district *i* finds policy $\left(g_1^{\,i}, g_2^{\,i}\right)$ optimal given the competitor's policy $\left(g_1^{\,-i}, g_2^{\,-i}\right)$. Taking as given the platform of the other district, in each locality *i* an encompassing coalition forms and chooses its own platform so as to:

$$\max_{g_i^{\,i}, g_{-i}^{\,i}} \left[\beta\lambda_M + (1-\beta)\lambda_E\right]\left[(1-k)\ln g_i^{\,i} + k\ln g_{-i}^{\,i}\right] - (g_i^{\,i} + g_{-i}^{\,i})/2$$

s.t.

$$\lambda_M\left[(1-k)\ln g_i^{\,i} + k\ln g_{-i}^{\,i}\right] - (g_i^{\,i} + g_{-i}^{\,i})/2 \geq \lambda_M\left[(1-k)\ln g_i^{\,-i} + k\ln g_{-i}^{\,-i}\right] - (g_i^{\,-i} + g_{-i}^{\,-i})/2$$

$$\lambda_E\left[(1-k)\ln g_i^{\,i} + k\ln g_{-i}^{\,i}\right] - (g_i^{\,i} + g_{-i}^{\,i})/2 \geq \lambda_E\left[(1-k)\ln g_i^{\,-i} + k\ln g_{-i}^{\,-i}\right] - (g_i^{\,-i} + g_{-i}^{\,-i})/2$$

Elite and *Masses* maximize a weighted average of their utilities subject to their participation constraints, i.e. to their willingness of being part of the encompassing coalition. The weight $\beta \in [0,1]$ indicates *Masses*' bargaining power in the coalition. Call $\lambda(\beta) \equiv \beta\lambda_M + (1-\beta)\lambda_E$. An optimum is characterized by first order conditions:

$$\lambda(\beta)\frac{(1-k)}{g_i^{\,i}} - (1/2) + z^{\,i}{}_M\left[\lambda_M\frac{(1-k)}{g_i^{\,i}} - (1/2)\right] + z^{\,i}{}_E\left[\lambda_E\frac{(1-k)}{g_i^{\,i}} - (1/2)\right] = 0$$

$$\lambda(\beta)\frac{k}{g_{-i}^{\,i}} - (1/2) + z^{\,i}{}_M\left[\lambda_M\frac{k}{g_{-i}^{\,i}} - (1/2)\right] + z^{\,i}{}_E\left[\lambda_E\frac{k}{g_{-i}^{\,i}} - (1/2)\right] = 0$$

$$\lambda_M\left[(1-k)\ln g_i^{\,i} + k\ln g_{-i}^{\,i}\right] - (g_i^{\,i} + g_{-i}^{\,i})/2 \geq \lambda_M\left[(1-k)\ln g_i^{\,-i} + k\ln g_{-i}^{\,-i}\right] - (g_i^{\,-i} + g_{-i}^{\,-i})/2$$

$$\lambda_E\left[(1-k)\ln g_i^{\,i} + k\ln g_{-i}^{\,i}\right] - (g_i^{\,i} + g_{-i}^{\,i})/2 \geq \lambda_E\left[(1-k)\ln g_i^{\,-i} + k\ln g_{-i}^{\,-i}\right] - (g_i^{\,-i} + g_{-i}^{\,-i})/2$$

In equilibrium, these conditions must hold for every *i*. Since the distribution of power within coalitions is the same across districts, the problems solved in districts 1 and 2 are symmetric and solutions are symmetric as well. Consider solutions of the form $g_i^{\,i} = g_{-i}^{\,-i} = x$, $g_{-i}^{\,i} = g_i^{\,-i} = y$. We can then have one of two cases:

a) Participation constraints do not bind.

In this equilibrium $z_l^i = 0, \forall i \in \{1,2\}, \forall l \in \{E, M\}$. Then $g_i^{\ i} = g_{-i}^{\ -i} = 2(1-k)\lambda(\beta)$ and $g_{-i}^{\ i} = g_i^{\ -i} = 2k\lambda(\beta)$. Participation constraints are satisfied because $k \leq 1/2$. Regardless of the value of β, every group prefers the local platform to that chosen in the other district. Both platforms have the same *inter-class* bias but differ in terms of their *inter-district* bias, as the platform chosen by district *i* tilts expenditures in its favor. Local groups then prefer to support the local politician rather than to risk losing to the other district. In this equilibrium the average level of public goods is $g_1 = g_2 = \lambda(\beta)$, which exceeds that under decentralization for two reasons. First, spillovers are internalized. Second, as long as $\beta > 0$, the higher taste of the *Masses* for public goods is taken into account in the bargaining process.

b) All participation constraints are binding.

In this case, *x* and *y* have to be such that $(1-2k)\ln(x/y) = 0$. The condition is only satisfied for *x=y*. However, such an allocation is not an equilibrium. If the platform of district *–i* consists of a quantity *x>0* of both public goods, the coalition in district *i* can increase its members' utilities by tilting public goods supply in favor of g_i while keeping total expenditure equal to *x*. Hence, this cannot be an equilibrium.

In a symmetric equilibrium either all the constraints are binding or none of them is binding. Hence, $g_1 = g_2 = \lambda(\beta)$ is a unique symmetric equilibrium.

Notice that there cannot be an asymmetric equilibrium. In such equilibrium, both districts must propose the same spending levels. Otherwise, in the high spending district the *Elite*'s participation constraint should be binding, whereas in the low spending district the *Masses*' participation constraint should be binding, which is impossible. However, if spending is the same across districts, then all participation constraints should be binding. As we have already seen, this is also impossible. Therefore, all the equilibria are symmetric.

Proof of Proposition 2

The colonizers' utility from (g_1, g_2) is $\lambda_C[\ln g_1 + \ln g_2]$. Their investment costs are $(1+\tau_1)g_1$ and $(1+\tau_2)g_2$. Therefore, they choose to provide $g_1 = \lambda_C/(1+\tau_1)$ and $g_2 = \lambda_C/(1+\tau_2)$. The degree of centralization and local stratification of indigenous political systems determines how τ_1 and τ_2 are set.

a) Decentralization

In stratified localities, the *Elite* sets the tax on local investment by the colonizers. We assume that the tax revenue is equally shared among local residents. Tax rate τ_i is set by the *Elite* of village *i* to maximize its utility from public goods and bribes:

$$\max_{\tau_i} \lambda_E[(1-k)\ln g_i + k \ln g_{-i}] + \tau_i g_i$$
$$s.t.$$
$$g_i = \lambda_C/(1+\tau_i)$$

At the optimum $1+\tau_i = \lambda_C/\lambda_E(1-k)$ and $g_i = \lambda_E(1-k)$. The level of public goods is thus identical to one obtained under local control of spending. Local *Elites* ask enough bribes to induce their preferred level of public goods. In addition, decentralized bribe taking reintroduces the disregard for spillovers. By the same token, in egalitarian districts $1+\tau_i = \lambda_C/\overline{\lambda}(1-k)$ and $g_i = \overline{\lambda}(1-k)$.

b) Centralization

Now political competition across districts takes place with respect to bribes τ_1 and τ_2. The revenues from bribes are equally shared among citizens. The analysis of coalition formation and platform choice reveals, as before, that the unique equilibrium is symmetric and has interior tax rates.

In stratified societies, when the *Masses*' bargaining power inside the coalition is β, we obtain $1+\tau_i^i = \lambda_C/2\lambda(\beta)(1-k)$ and $1+\tau_{-i}^i = \lambda_C/2\lambda(\beta)k$. On average, this induces the investment of $g_1 = g_2 = \lambda(\beta)$. Accordingly, in egalitarian societies, we have $g_1 = g_2 = \overline{\lambda}$. Therefore, when the colonizers invest and local authorities tax them, the levels of public goods

are exactly the same (under all the configurations) as in the case without the colonizers, when traditional authorities autonomously set public spending.