

The Modern Impact of Precolonial Centralization in Africa

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Abstract

We assess, theoretically and empirically, the view that precolonial political institutions shaped the performance of colonial and postcolonial African governments. Using anthropological data, we find a strong positive association between the provision of public goods such as education, health and infrastructure in African countries and the centralization of their ethnic groups' precolonial institutions. To empirically identify the effect of precolonial centralization, we build and test a model where centralization boosts public goods by making local elites more accountable. Our results are consistent with the view that precolonial centralization shaped the success of modernization policies in Africa by reducing policy capture by local elites. The paper documents the importance of precolonial institutions and stresses the desirability of centralization when local capture undermines socioeconomic reforms.

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1. Introduction

The economic literature on institutions holds that colonizers' strategies of conquest and rule are main determinants of the observed variation in the quality of government among former European colonies (e.g. La Porta et al. 1999, Acemoglu et al. 2001). Yet, several scholars forcefully stressed the role played by the precolonial institutions found by colonizers upon their arrival. Bates (1983) and Boone (2003), among others, argue that precolonial institutions were especially important in Africa, where their impact was enhanced by the weakness of the colonial and postcolonial central state. For example, Mamdani (1996) suggests that African precolonial institutions played a key role at the local level, leading to "decentralized tyranny", a state where traditional chiefs usurped the functions of the modern state for personal gain. Historians (e.g. Schapera 1970, Apter 1961, Pratt 1965) confirm the existence of such phenomenon but stress that *centralized* precolonial institutions limited its scope by rendering local elites accountable, thus fostering the adoption of European policies and technologies.

In this paper we assess, theoretically and empirically, the role of precolonial centralization in Africa. Using anthropological data on precolonial institutions and data on public goods across African countries for the 1960-2000 period, we find a strong and positive association between the share of a country's population belonging to ethnic groups with *centralized* (rather than *fragmented*) precolonial political institutions and its provision of public goods such as health, education and infrastructure in the postcolonial period.

In line with African history, a direct interpretation of this finding would support the "local capture" view – first advanced by Riker (1964) – holding that *centralization* increases the accountability of local regressive elites, thus fostering public goods provision. But two other broad hypotheses can explain our empirical finding. According to the first, centralized ethnic groups were simply socioeconomically more "advanced", thus being more effective at adopting western technologies; in this view, precolonial institutions did not matter, but precolonial endowments did. The second hypothesis holds that precolonial centralization played an important but indirect role by improving colonial and postcolonial political outcomes at the national level.

We try to disentangle these three hypotheses by following two strategies. First, we build a model of the benefits of precolonial centralization under the "local capture" view. This view generates specific predictions on the relationship between public goods and precolonial centralization that are unlikely to hold under the alternative hypotheses. Hence, by empirically testing the model we can make progress toward identification. Second, we extensively control in our regressions for a large set of variables capturing both the advancement of a group and national level effects of precolonial centralization.

Our model builds on two key assumptions borrowed from African colonial history (e.g. Apter 1961, Tosh 1978, Bates 1983), which we review in Section 3. First, we assume that for providing local public goods, colonizers relied on the precolonial institutions they found upon their arrival. Second, we assume that precolonial centralization created a competition for higher office among local elites that was won by the elite with widest popular support. Under these assumptions, we find that precolonial centralization leads to the formation of local pressure groups that hold local elites accountable and induce them to provide more public goods, thus eliminating the two costs of decentralization stressed by Riker (1964): the conflict between local elites and the center or “lack of coordination” – responsible for the underprovision of public goods involving large interdistrict spillovers – and the conflict between local elites and local masses or “local tyranny” – responsible for the underprovision also of public goods without spillovers.

Crucially, our model predicts that precolonial centralization benefits local communities depending on their level of social stratification. In stratified communities, where the tyranny of local entrenched elites is acute, centralization boosts the provision of all public goods, i.e. those with and without spillovers. In egalitarian communities, where the problem of local tyranny is small, centralization only boosts the provision of goods with large spillovers.

We test these predictions by using another dimension of African ethnic groups coded in our anthropological dataset: the degree of social stratification at the local level. In line with our theory, we find that for goods with large spillovers, such as roads and immunization, the benefit of centralization is large in both stratified and egalitarian groups. Conversely, for education and infant mortality, centralization benefits stratified groups more than egalitarian ones. Indeed, spillovers should be relatively less important for the public goods behind these latter outcomes (local schools and clinics).

These results are hard to reconcile with the two alternative views that centralized groups were simply more “advanced” or that their institutions only improved national politics. A general version of these views predicts that – either for their advancement or better national politics – centralized groups *uniformly* enjoy more public goods, irrespective of local stratification. Although in more nuanced versions of these hypotheses local stratification may matter, they are still incapable of explaining the different patterns obtained for public goods with high and low spillovers.

We further evaluate the robustness of our findings by extensively controlling in our regressions for proxies capturing our alternative hypotheses. Ethnic-group and country-level proxies capture the factors anthropologists view as key attributes of socioeconomic advancement: urbanization and population density, easiness of transportation, use of writing, technological level, use of money, absence of slavery, fixity of residence, dependence on agriculture. As for national

politics, we control for national political outcomes in the colonial and postcolonial periods. Our results are remarkably robust to the inclusion of different controls, pointing to a direct effect of precolonial centralization on public goods in Africa. In particular, the robustness of our theoretical predictions is highly consistent with the “local capture” view and suggests that precolonial centralization did not only help to foster interdistrict coordination but also to soften local tyranny.

Our paper contributes to the literature on institutions with two main ideas. First, our results indicate that *precolonial* institutions shaped the quality of government in Africa, allowing centralized groups to better adopt and implement modern technologies of public goods provision. Our evidence that precolonial history matters echoes the finding that countries’ “experience” with the working of state-level institutions improves their economic performance (Bockstette et al. 2002). Our results further suggest that the key asset of centralized groups was their developed attitude for organizing politically and holding local leaders accountable. Since traditionally fragmented groups lacked such attitude, the unprecedented powers that modernization provided to their local leaders led to decentralized tyranny and disorder (Mamdani 1996).

Second, our analysis has important implications for the political economy literature on centralization (see Bardhan 2002 for a review). It suggests that centralization can be optimal when powerful local elites prevent the implementation of socioeconomic reforms.¹ Indeed, our findings disconfirm, at least in Africa, the “central capture” view – first advanced by Tiebout (1956) – holding that *decentralization* fosters the accountability of local elites. Supportive of the “local capture” view, our study of precolonial centralization parallels Riker’s (1964) assertion that, rather than encouraging freedom, federalism may lead to local tyranny. Moreover, our blessing of inter-elite competition for higher office is analogous to his idea that a strong party system can improve local government by providing career incentives to local politicians. We believe that these ideas can shed light on the policy debate on centralization, which we discuss in the Conclusions.

The paper is organized as follows. Section 2 presents our basic empirical findings. Section 3 reviews the role of precolonial institutions in African history. Section 4 models the benefits of precolonial centralization under local capture. Section 5 brings the model to the data. Section 6 controls for alternative hypotheses. Section 7 concludes.

2. Precolonial Centralization and Public Goods in Africa

We now build our cross-country measure of precolonial centralization and present the basic empirical finding of the paper, which motivates our subsequent analysis: the strong and positive

¹Our finding that the effects of centralization are systematically related to the nature of public goods and of local politics is new to the empirical literature on centralization (Fisman and Gatti 2002, Treisman 2000 and 2003), which has only looked at the overall effect of centralization, without studying the relative roles of coordination and local tyranny.

association between the provision of public goods across African countries and the precolonial centralization of their ethnic groups. The analysis would ideally be performed at the ethnic-group level, but the lack of comparable subnational data on public goods prevents us from doing so.

2.1. The Data

Between 1962 and 1967, the anthropological journal *Ethnology* published several installments of the *Ethnographic Atlas* (Murdock 1967, World Cultures 1986), 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. Murdock pinpointed every ethnic group to the earliest period for which satisfactory data existed to avoid the acculturative effects of contacts with Europeans. In Africa, Murdock's goal was to describe ethnic groups in the period immediately preceding the massive European colonization of the late 19th – early 20th century. We thus call African indigenous institutions as measured by his data “precolonial”. Clearly, in certain parts of Africa, earlier contacts with Europeans (e.g. the slave trade) took place before the 19th century. Yet, like the economic literature on institutions (La Porta et al. 1999, Acemoglu et al. 2001) which focuses on the impact of European *administrative rule* on the colonies, we focus on the period of European administrative rule because we believe this period to be crucial for understanding the role of precolonial institutions in modernization.

Murdock's *Jurisdictional Hierarchy* variable measures the degree of centralization of precolonial institutions, and gives for each ethnic group the number of jurisdictional levels transcending the local community. The variable attributes the value of 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 into categories 0 or 1 and “centralized” a group scoring 2, 3 or 4 in Murdock's variable. 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 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.²

Having classified more than 300 African ethnic groups, we matched them with the groups listed in the *Atlas Narodov Mira*, published in 1964 by the Miklukho-Maklai Ethnological Institute

²Anthropologists (Fortes and Evans-Pritchard 1940) often label the same categories as “state/stateless”. We avoid this terminology because the term “stateless” can misleadingly suggest that fragmented societies lack politics. The centralized/fragmented distinction better corresponds to the definition of the *Jurisdictional Hierarchy* variable we use.

in the Soviet Union, which provides the most comprehensive division of the world population into ethnic groups.³ We used the countries' ethnic composition from the Soviet Atlas to calculate the share of each country's non-European population belonging to centralized ethnic groups. This share represents our country-level index of precolonial centralization and we call it "Centralization".⁴ Our sample consists of 42 countries in Sub-Saharan Africa.⁵ Table A1 shows our Centralization index. The measure displays a wide cross-country variation, ranging from the value of 1 for Lesotho (both of its ethnic groups, the Sotho and the Zulu are highly centralized) to the value of 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 the percentage of infants immunized against DPT (diphtheria, pertussis and tetanus) represent our health outcomes. Adult illiteracy rate and average school attainment proxy for education. The percentage of roads paved (as a share of total roads) is our measure of infrastructure⁶. These variables are 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 specification is:

$$Y_i = \alpha_0 + \alpha_1 * Centralization_i + \varepsilon_i$$

Y_i is one of our outcome measures in country i and $Centralization_i$ is the value of our index for that country. Parameter α_1 captures the association between precolonial centralization and public goods.

2.2. Basic Empirical Findings

The odd-numbered columns in Table 1 show the bivariate relationship between Centralization and different public goods outcomes; in even-numbered columns, we include initial per capita GDP to control for initial income differences across countries. Figures 1-5 show the results graphically. Centralization is positively associated with the quality of infrastructure as measured by the percentage of roads paved (Columns 1 and 2), with the percentage of infants immunized against DPT (Columns 3 and 4) and with the average years of school attainment

³Easterly and Levine (1997) built their ethnolinguistic fractionalization index using the Atlas. Alesina et al. (2003) and Fearon (2003) criticize the Atlas, using alternative ethnic partitions. Their critique does not appear to be relevant for Sub-Saharan Africa, so we continue to use the Atlas for its better coverage of African ethnic groups.

⁴We exclude Europeans to focus on indigenous institutions, but their inclusion does not affect our empirical results.

⁵We dropped Mauritius, Seychelles, Cape Verde and Sao Tome and Principe from the sample created by Robert Bates. These islands, uninhabited before the slave trade and colonization, do not have truly precolonial institutions.

⁶We tried *life expectancy at birth* and, not surprisingly, all results were virtually identical to those for *infant mortality*. Using *percent of infants immunized against measles* (rather than DPT) also yields very similar results.

(Columns 9 and 10). Our centralization index has a negative impact on infant mortality (Columns 5 and 6) and adult illiteracy (Columns 7 and 8), confirming that precolonial centralization is positively associated with the quality of health and education. All these relationships are statistically significant and economically large. For example, a change from 0 to 1 in our index⁷ (i.e. a move from a country only populated by fragmented groups to a country only populated by centralized groups) is associated with 42 fewer infants (out of every 1000) dying in the first year of life. This effect, equivalent to a reduction of 1.5 standard deviations in our sample, is twice as large as that of doubling initial GDP per capita. The magnitude of the association is similar for the other public goods, ranging from 1 to 2 standard deviations in the dependent variable and being larger than the effect of doubling initial GDP per capita.⁸

The comparison between the educational outcomes of Lesotho and Mali is also instructive on the size of the correlation between Centralization and public goods. Lesotho 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. But while the Centralization index gives 1 for Lesotho, it only gives 0.115 for Mali, whose population is mostly from the politically fragmented Nuclear Mande and Voltaic ethnic groups. Thus, differences in precolonial centralization may capture more than a third of the observed differences in education between these two countries.

In sum, Table 1 shows that African countries inhabited by centralized groups enjoy a better provision of basic public goods. Yet, this evidence does not *per se* prove the direct impact of precolonial centralization on modernization. To begin with, it would be helpful to see if this correlation originated in the colonial or the postcolonial period. Indeed, if precolonial institutions shaped the ability of African countries to adopt western policies and technologies, such effects probably originated in the formative colonial period when the major European innovations were introduced and the seeds of modernization were laid. In this view, centralized African groups had already jumped ahead in terms of education, health and infrastructure by the 1960s and the gap persisted after independence. Unfortunately, we cannot perform a detailed analysis of the impact of precolonial institutions in these different periods as all our public goods data are from the postcolonial period. Yet, since our data series begin as early as in 1960 for schooling and infant mortality and in 1970 for adult illiteracy, we can check how the association between our Centralization index and these outcomes has evolved since immediate postcolonial years. Figures

⁷ When we discuss the size of the coefficient on *Centralization*, we always refer to a change in the index from 0 to 1.

⁸ We checked for the presence of influential observations by computing the *DFbetas* from each regression in Table 1 (see, e.g., Belsley, Kuh and Welsch (1980, p. 28)). The only case of $abs(DFbeta) > 1$ is Comoros in road regressions. If we drop it, the coefficient is reduced to about 16, but remains 1 percent significant. If we more conservatively drop all observations with $abs(DFbeta) > 2/\sqrt{\#obs}$, the results become even stronger than those in Table 1.

6-8 report the evolution of the magnitude and statistical significance of α_1 over time. The data provide some support for the thesis of early divergence: the coefficient for Centralization index becomes smaller (in absolute value) and less significant as we move further away from the colonial period. This suggests that African colonial history is key for understanding the role of precolonial centralization in modernization. Thus, looking to explain the association of Table 1, in the next section we review 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 precolonial centralization in modernization. Scoring 0.634 in our Centralization index, Uganda displays a considerable variety of precolonial institutions *within* its borders. The South and the West of the country cover the territory of the precolonial kingdoms of Buganda, Bunyoro, Toro and Ankole. In contrast, the North of Uganda is entirely populated by fragmented ethnic groups such as Lango, Acholi and Karamoja. 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 their precolonial centralization. Table 2 compares the quality of public goods across Ugandan regions using measures of infrastructure, health and education around the year 2000. The figures confirm *within* Uganda, our cross-country findings. The Central and Western Regions inhabited by centralized groups enjoy much more public goods than the North of the country inhabited by fragmented groups; the “mixed” Eastern Region has intermediate values.

Did precolonial institutions play a role in shaping such regional variation? Historical accounts of the colonial period suggest this to be the case. The British, who colonized the Ugandan territory between 1890 and 1910, immediately understood the importance of native authorities for implementing their policies and heavily relied on traditional chiefs for building roads, organizing schools, improving sanitation, and many other activities (Pratt 1965). As a result, British rule in Uganda was characterized by a strong continuity of precolonial institutions.

In the areas inhabited by centralized groups, such as the kingdoms of Buganda, Toro, or Ankole, the British upheld (in exchange for tribute) the precolonial system of government based upon hierarchy of chiefs (Apter 1961). In traditionally fragmented districts, such as Lango or Teso, the British yielded power to local chiefs selected from men of local standing (village headmen, clan heads). In the absence of precolonial political hierarchy, these local chiefs were directly subordinate to the Colonial Administration, but the paucity of European officers allowed them to

exercise a good deal of unsupervised power (Low 1965).⁹ Hence, in colonial Uganda, the administration of local affairs reflected its precolonial patterns, being more centralized in areas inhabited by centralized groups and more decentralized in areas inhabited by fragmented groups.

Historians of Uganda stress the beneficial role played by precolonial centralization in the colonial period. In particular, they attribute the meager performance of fragmented groups to the regressive role of their local chiefs. Burke (1964) depicts the Teso local chiefs as absolute tyrants. Tosh (1978, p.182) describes the abusive behavior of Lango chiefs, who “*exploited their office for personal or factional ends; and the ordinary population became alienated from the administrative structure*”. He emphasizes that such behavior was a direct result of the fragmented nature of local politics among the Lango and shows how it distorted the administration of justice as well as reforms aimed at expanding education and agricultural productivity. These accounts more generally reflect 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, p. 37) concludes 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 greater accountability of local chiefs in traditionally centralized systems also emerges from accounts on the Buganda, Bunyoro, Toro and other centralized Ugandan groups (Apter 1961, Richards 1960, Burke 1964). Thus, it is perhaps not surprising that centralized institutions fostered the introduction of new agricultural technologies (Richards 1960, Ehrlich 1965), religion and education (Low, 1965), and health improvements (Pratt, 1965). Thus, as suggested by Mamdani (1996), during the colonial period modernization gave a great deal of power to local traditional authorities. Yet, while in fragmented groups such power was virtually unrestrained, in centralized groups the presence of a central apparatus softened the impact of “decentralized tyranny”.

Importantly, the accountability of local chiefs in centralized groups derived from the process followed by the central apparatus for their appointment. For instance, the kingdom of Buganda maintained a dynamic political system with significant chances of promotion from office to office. Local chiefs were appointed by the Kabaka (the king) or lower-level administrators and could be abruptly dismissed if the performance of their district was poor (Apter 1961, Low 1971).

Did such accountability simply reflect the preference of precolonial central rulers for modernization or was it due to something else? An important insight into this question is offered by the history of the Buganda, which shows how the local chiefs with larger political support would win the competition for higher office. A chief with more followers could better influence the king’s

⁹The 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 rather small (Low, 1965).

appointment process through bribes, protest or by satisfying the king's need for soldiers (Apter 1961).¹⁰ Since the size of his constituency determined a man's prestige and his chance of being appointed, competition for office held local chiefs accountable to their populations, ultimately behooving them to rule in the interest of their communities (Apter 1961). Low (1971, p. 141) vividly describes this effect: *"The ordinary peasant attached himself as a client-follower to a chief... 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."*

Further evidence confirms this picture for other African countries. The colonial history of the Tswana of Botswana does not only testify that precolonial centralization fostered modernization but also that its main virtue was the accountability of local chiefs, disciplined by competition for higher office (Schapera 1970, Wylie 1990). This view is also confirmed by the accounts of the Sotho of Lesotho (Ashton 1967, Breytenbach 1975) 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).¹¹ 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.

In line with Figures 6-8, the historical evidence presented so far focuses on the link between precolonial centralization and modernization in the colonial period. However, it is unlikely that the effects of precolonial centralization on modernization were limited to this period. Some African countries, such as Botswana or Swaziland, reveal a clear continuity between postcolonial political leaders and precolonial rulers, as traditional patterns of politics influenced the nature of the postcolonial state (Potholm 1977, Picard 1987). But also elsewhere did precolonial institutions continue to shape political and economic outcomes at the local level, where postindependent African regimes (like their colonial predecessors) could not achieve their objectives without the cooperation of traditional power holders (van Rouveroy van Nieuwaal 1987, Boone 2003).

¹⁰ The central apparatus often directly tested the popularity of a chief by consulting the local people (Richards, 1960).

¹¹ Competition among the Tswana chiefs was pervasive. Success depended on followers' support and the chief was judged by how generously he spread the benefits of modernization throughout his realm (Wylie 1990). In the Sotho kingdom, the commoners could influence the king's appointment policy by gathering together. By allowing the locals to voice their interests and make demands to the central authorities, such gatherings served as a check on political abuses (Breytenbach 1975). Among the Southern Bantu, the power of elites also depended on the number of their followers. By ruling unjustly, a local chief risked alienating his own followers and being deposed (Schapera 1956).

To sum up, African history shows a clear continuity of precolonial institutions, and stresses their crucial role in modernization. Moreover, in line with the political economy literature on centralization, historians support the notion that precolonial centralization reduced “local capture” (Riker 1964) by providing local chiefs with career incentives. Thus, the historical evidence echoes Bates (1983, p. 41-42), who viewed competition for office among the elites as a general feature of centralized African precolonial societies and hinted at the economic benefits it could 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 evidence instead seems to disconfirm – at least in Africa – what we call the “central capture” view (Tiebout 1956), holding that decentralization *increases* the accountability of local rulers by fostering people’s mobility, improving voters’ information (Besley and Case 1995), or enhancing their ability to replace misbehaving politicians (Seabright 1996). These latter factors were of minor importance or absent in African reality, where entrenched local elites captured power for personal gain.¹²

While the “local capture” view offers a plausible explanation for the empirical association of Table 1, our empirical findings are also consistent with two different hypotheses. The first holds that centralized groups were just socioeconomically more “advanced”. In this view, their greater ability to adopt western technologies for public goods provision was not due to their institutions but to their being, for instance, richer or more literate. A different hypothesis instead stresses that precolonial institutions did, in fact, play a role, but not by improving local politics as emphasized by the “local capture” view. In this second view, precolonial centralization improved national political outcomes in the colonial and postcolonial period, for instance by providing a check on the power of colonial and postcolonial national leaders. Reverse causality, on the other hand, is unlikely to drive the results of Table 1. African ethnic institutions certainly evolved over history, but they were predetermined at the end of the 19th century when the massive European colonization began. Historians agree that the technologies for providing modern public goods were first introduced by European administrators, who built the first road and railway networks and, together with missionaries, developed the system of formal education and built public-health facilities (Bauer 1975, Duignan and Gann 1975). These developments laid the foundation for further improvements in the postcolonial period, which is the source of our outcome measures. It is then difficult to see how the latter could have affected the Centralization index.

To empirically distinguish the “local capture” view from the views that centralized groups were more advanced or induced better national politics, we follow two strategies. First, equipped

¹² As for migration, mobility costs are typically large in underdeveloped countries (Bardhan 2002). But our evidence also suggests that: a) Hostile inter-village relations discouraged migration; b) Politicians skillfully manipulated people’s incentive to move to their own advantage by banning or facilitating migration (Tosh 1978, Southold 1964).

with the historical background of this section, we build a model of “local capture” which yields specific implications of such a view which differ from those of our alternative hypotheses. Thus, by estimating the model, we can make some progress toward identification. Second, we check the robustness of our results by extensively controlling for proxies for our alternative hypotheses.

4. A Model of Precolonial Centralization and Social Stratification

In line with historical evidence, we model the benefits of precolonial centralization by making two assumptions. First, centralization creates a competition for higher office among local elites that is won by the elite with widest local support. Second, the colonial government uses precolonial institutions for providing local public goods. We consider two versions of such delegation: an extreme case, where colonizers make modernization policies available but leave their implementation and financing to traditional authorities, and a more realistic scenario where the colonial government invests, but traditional authorities must cooperate in providing public goods.¹³

The model uncovers distinctive predictions of the “local capture” view by separating the two benefits that Riker (1964) attributes to centralization: greater coordination among local rulers (Oates 1972)¹⁴ and their lesser tyranny against local populations (Bardhan and Mookherjee 2000, Blanchard and Shleifer 2001). It does so by modeling the degree of social stratification at the local level and by considering the provision of goods with different amounts of inter-district spillovers.

The economy is divided into two geographically distinct districts.¹⁵ A measure one of citizens lives in district $i \in \{1,2\}$, where an amount $g_i \in \{0,1\}$ of a local public good is provided at unit cost C . The preferences over public goods and private consumption of citizen j in district i are

$$(1 - k)g_i + kg_{-i} + m_j.$$

m_j is j 's income. $k \in \{0,1/2\}$ measures the inter-district spillovers of the public good: if $k = 0$, there are no spillovers, if $k = 1/2$, spillovers are large. We assume:

A.1: $1/2 < C < 1$.

Thus, the good is costly but it is socially efficient to provide it in both districts. Let us now study how g_1, g_2 are determined under different political arrangements.

4.1. Decentralization

In each district, public goods are set and financed by a local *Elite* wielding political power.

¹³ We do not model any cost of centralization. This is not because we believe that such costs are unimportant. Yet, in Africa our empirical findings point to a net benefit of centralization, so we disregard possible costs to empirically focus our model. We discuss some of the costs of centralization in the Conclusions.

¹⁴ In similar spirit, Shleifer and Vishny (1993), argue that centralization eliminates double marginalization.

¹⁵ In the context of this paper, the “economy” represents an ethnic group, *not* a country.

The *Elite* represents a share $s \in \{0,1\}$ of the local population and owns the total district wealth $W > 0$. If $s = 1$, the society is egalitarian (i.e. everyone owns the same share of W), if $s = 0$ the society is highly stratified (i.e. only one person owns W)¹⁶. In district i the *Elite* solves:

$$\max_{g_i \in \{0,1\}} s[(1-k)g_i + kg_{-i}] - Cg_i + W.$$

Since the *Elite* owns all local wealth, it must bear the full cost C of public goods, even though it only enjoys a share s of its value. Then, **A.1** implies:

Proposition 1: *Under decentralization, in stratified groups ($s = 0$) no public good is provided. In egalitarian groups ($s = 1$), the good without spillovers ($k = 0$) is provided, but the good with spillovers ($k = 1/2$) is not.*

Proofs are in Appendix 3. Decentralization has two costs in our model: local tyranny and lack of coordination. The first cost causes zero provision in stratified societies, where the entrenched local tyrant has no interest in spending resources for the *Masses*. The second cost causes zero provision of goods with large spillovers in egalitarian societies: even if rulers are fully benevolent with respect to the locals, they cannot coordinate across districts.

4.2. Centralization

Under centralization, a central ruler decides on public goods in both districts and exerts his power through an administrative hierarchy. In line with the evidence of Section 3, we model competition for office among elites as follows. In each district i , the local *Elite* buys the support of locals by promising (in case of victory) to persuade the central ruler to execute (g_i^i, g_{-i}^i) .¹⁷ The *Elite* with larger local support wins the office, getting the rent of $\pi > 0$ associated with it. The central ruler implements the public goods policy proposed by the winner and finances it by taxing both *Elites* equally. If the *Elites* enjoy the same level of support, they share the rents; each *Elite* gets $\pi/2$ and the spending level it proposes in its own district is implemented. To gain support, district i *Elite* must promise a policy (g_i^i, g_{-i}^i) making the locals better off with respect to the promise made in district $-i$. For instance, in an equilibrium where both *Elites* win support, district 1 plan (g_1^1, g_2^1) in response to district 2 plan (g_1^2, g_2^2) must satisfy:

$$(1-k)g_1^1 + kg_2^2 \geq (1-k)g_1^2 + kg_2^1 \quad (PC)$$

The left-hand side of this participation constraint shows the value of public goods' provision

¹⁶ This assumption is made for algebraic simplicity: our results also hold for $s \in (0,1)$. In an earlier version of the paper we obtained very similar results by assuming g_i to be continuous and subject to a quadratic cost of provision.

¹⁷ For simplicity, we do not allow monetary transfers from the *Elite* to the local masses. Such transfers would never be used in equilibrium, since public goods are cost effective and represent a more efficient way of providing benefits.

enjoyed by the locals of district 1 if they support their own *Elite* (here both *Elites* win, so in each district i the promise g_i^i of the local *Elite* is executed). If instead they do not support their *Elite*, they enjoy the public goods plan agreed upon in district 2. To win, district 1 *Elite* sets (g_1^1, g_2^1) to maximize its payoff, subject to PC . If PC is fulfilled, district 1 *Elite* obtains support and enjoys rents from office plus its value of public goods minus half their total cost. If instead PC is not fulfilled, district 1 *Elite* only gets its value of public goods minus half their total cost. The general tradeoff faced by district i *Elite* is between boosting public goods, thus increasing the chances of winning (either by gaining more local support or by reducing the support of the competing *Elite*), and paying more for their provision. Let us now assume:

A.2: $\pi > 2C$.

This assumption guarantees that the rents from office are sufficiently large, so that *Elites* are eager to provide public goods to win it. We then find:

Proposition 2: *Under centralization, public goods provision is always $g_1 = g_2 = 1$, irrespective of stratification and spillovers.*

By inducing competition for higher administrative office among entrenched local *Elites*, centralization boosts public goods provision. *Elites* try to gain local support both by promising more goods in their own district and by promising more goods in other districts, which makes it more costly for competing *Elites* to gain support. The first effect eliminates the underprovision of goods without spillovers; the second effect also solves the coordination problem typical of goods with lots of spillovers. Notice that in equilibrium, centralization leads to the formation of local coalitions between the citizens and the *Elites*.

Crucially, the model separates the coordination benefit of centralization from its ability to remove local tyranny. The latter varies systematically with local stratification (which proxies for the severity of local tyranny), the former with the interdistrict spillovers of the provided good (which proxy for the costs of lack of coordination). In egalitarian societies local tyranny is less of a problem, so centralization only boosts the provision of goods with large spillovers. In stratified societies centralization solves both coordination and local tyranny problems, thus boosting the provision of goods with *and* without spillovers.

The “political competition” effect of our model has not received much analytical attention. Bardhan and Mookherjee (2000) build a model where centralization reduces local capture *if* it increases political competition. Their analysis looks at electoral competition, without focusing on the career incentives of local politicians. In Rikerian spirit, Blanchard and Shleifer (2001) stress career incentives, but assume central rulers to be benevolent and punish regressive elites. In our

model instead, the center is self-interested, but the competition among local elites to influence it induces the formation of local pressure groups reducing capture. Moreover, in contrast to these two stories, by using stratification and spillovers, our model separates the traditional coordination effect of centralization from the softening of local tyranny.

Our analysis of centralized and fragmented African groups explicitly focuses on the territorial integration dimension of centralization. It may be argued that our model does not capture another dimension of centralization, more often associated with federalism, i.e. the division of tasks between local and central authorities. We disagree. In a simple theoretical world with only one policy decision to be made by either a local or a central authority, the distinction between these two notions of centralization collapses. In general, as long as there is no interaction among policy tasks, the two dimensions of centralization seem to remain equivalent, as policy issues could be separated and different levels of integration could be defined with respect to each of these. But our political competition effect is likely to be present even in a broader set of contexts as long as centralization a) creates a hierarchy of offices for the elites to compete for, *and* b) the winner in such competition is at least partially determined by the level of support he enjoys from the local population.¹⁸

4.3. Precolonial Centralization and Colonization

Suppose now that colonialists themselves finance public goods and wish to provide more goods than local *Elites*, for simplicity $g_1 = g_2 = 1$. However, they cannot provide these goods without the cooperation of traditional authorities. In particular, suppose that local provision is fully executed by precolonial authorities, who interact with colonialists in the following way: $t=0$: colonialists advance C to local *Elites*; $t=1$: local *Elites* set the level of public goods.

Under these assumptions, public goods provision depends on precolonial centralization in the exact same way it did in Propositions 1 and 2. After colonialists have advanced C , the cost and benefit of providing public goods are borne by traditional authorities. The only difference now is that colonialists only invest if they anticipate that traditional authorities will provide public goods.

4.4. Centralization, Stratification and the Empirical Identification of “Local Capture”

The centralization-stratification matrix below reports the provision of g_1 and g_2 under all possible configurations, summarizing the predictions of the model:

¹⁸ In this respect, Myerson (2005) shows that federal systems may hold politicians more accountable than unitary ones, because local politicians have an incentive to earn a good reputation at the local level. At first sight, Myerson’s analysis might seem to contradict the notion that centralization increases the incentives of local politicians. However, the federal structure considered by Myerson is already centralized with respect to fragmented African systems. In addition, by only considering electoral incentives, Myerson precludes competition among local interest groups in unitary systems, a possibility that our model considers by looking at the career incentives of bureaucrats.

	Stratified	Egalitarian
Centralized	1	1
Fragmented	0	1-2k

From the left to the right, we measure whether the local community is stratified or egalitarian and from top to bottom whether it is administered through centralized or fragmented institutions. In line with our basic empirical findings, the model predicts that precolonial centralization increases public goods. This is due both to greater coordination and reduced local tyranny. In egalitarian societies there is no problem of local tyranny, so centralization is only beneficial for goods with large spillovers ($k=1/2$). In stratified societies, not only does centralization foster greater coordination, but it also softens local tyranny, boosting the provision of *any* public good, irrespective of k .

At this point, it is useful to see the predictions of our theory with respect to the public goods considered in our empirical analysis. For this purpose, we must classify our public goods outcomes with respect to spillovers. An objective measure of spillovers is not available, but for the variables considered, it is possible to characterize with a certain confidence whether the underlying public good is closer to the ideal of “no spillovers” ($k \approx 0$) or to that of “large spillovers” ($k \approx 1/2$).

For instance, paved roads are clearly close to the ideal of “large spillovers” goods, as they facilitate mobility across districts. Conversely, educational outcomes such as illiteracy and schooling can be interpreted as being closer to the “no spillovers” ideal, as confirmed by the empirical estimates of low external returns to education (Acemoglu and Angrist 2000). The classification of our health measures is less straightforward, but the following distinction seems reasonable. The infectious nature of diphtheria, pertussis and tetanus can create widespread epidemics, so that immunization against them is closer to the “large spillovers” ideal. But infectious diseases are only one cause of mortality.¹⁹ Other diseases are less transmittable and the factors reducing their impact (e.g. availability of medical supplies, access to clean water, modern sanitation facilities) are more locality-specific. Thus, unlike immunization, infant mortality is presumably closer to the “no spillovers” ideal. The same distinction between the control of epidemics and general health facilities in terms of spillovers is also stressed by Bardhan (2002).

We thus classify paved roads and infant immunization as “large spillovers” goods ($k \approx 1/2$) and expect the centralization-stratification matrix for these outcomes to look like matrix M1 below:

¹⁹ 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.

M1	Stratified	Egalitarian
Centralized	1	1
Fragmented	0	0

In contrast, we classify adult illiteracy, schooling and infant mortality as “no spillovers” goods and expect for these outcomes a provision pattern similar to matrix M2 below:

M2	Stratified	Egalitarian
Centralized	1	1
Fragmented	0	1

M1 and M2 summarize the main predictions of our model of “local capture”. First, the benefit of precolonial centralization is larger for stratified groups, where centralization – in addition to internalizing spillovers – helps remove local tyranny. Second, the benefit of centralization varies across public goods: for “no spillovers” goods, centralization only benefits stratified groups, for “large spillovers” goods, it benefits *both* stratified and egalitarian ones.

Importantly, these two predictions of “local capture” are not easily fulfilled under the alternative hypotheses that might otherwise explain the positive association between precolonial centralization and public goods. Consider, for instance, the hypothesis that centralized groups were just more “advanced”, so that they could naturally produce more public goods. In terms of our model, one could state this view by assuming that advanced groups have a smaller cost of providing public goods $C' < C$. Then, such groups would be expected to fare better irrespective of stratification, thus yielding the provision pattern M1. A similar uniform effect holds under the view that precolonial centralization rendered national governments more effective, irrespective of the conditions prevailing at the local level (which also induces a lower cost of provision). Both views would thus be inconsistent with a larger benefit of centralization for stratified groups.

More nuanced versions of these hypotheses may claim that a group’s advancement or its ability to support national politics is related to both its centralization and its stratification. For instance, it may be argued that only centralized *and* stratified groups are really advanced or can effectively improve national politics. Yet, these alternative versions would still be inconsistent with our matrices: they would predict a positive provision only for the centralized-stratified cell of the matrix (or the centralized-egalitarian groups if they are viewed as the better ones). In general, any story that, disregarding the governance effects of centralization, views centralization *and* stratification as proxies for a third (omitted) factor, would predict a greater benefit of centralization for either stratified or egalitarian groups. As such, it would be hard to reconcile with the evidence

of different patterns of provision (those in M1 and M2) across different types of goods.

In the next section, we propose a strategy for estimating our centralization-stratification matrix. In line with our discussion, if the data confirm the predictions of the model for our public goods outcomes, the evidence lends support to the “local capture” view, as the alternative hypotheses are inconsistent with the joint predictions of our model. Interestingly, if the empirical patterns shift from M1 to M2 across public goods, our analysis would also help us empirically separate the coordination and the local tyranny effects of precolonial centralization, which is something the empirical literature on centralization did not attempt.

5. Estimating the Centralization-Stratification Matrix

5.1. Empirical Strategy

To estimate the centralization-stratification matrix, we need a measure of stratification at the local level. We use the *Class Stratification* variable from Murdock’s *Ethnographic Atlas*, which, for each ethnic group, codes the degree of class differentiation at the local level in five mutually exclusive categories. Three of them concern the type of stratification. “Elite”, “dual” and “complex” stratification indicate patterns 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 class distinctions (i.e. with entrenched Elites in terms of our model), so we call the ethnic groups belonging to any one of them “stratified”. Other ethnic groups either do not have class distinctions or have only wealth distinctions, which are “not crystallized into distinct and hereditary social classes”. Since social classes are absent under both definitions, we call the groups belonging to either of the two categories “egalitarian”.²⁰

Combining the class stratification of African ethnic groups with our previous centralized-fragmented distinction, we allocate each group to one of the four possible types of precolonial political systems, each corresponding to a cell of our centralization-stratification matrix.²¹ For every country in our sample, we find the share of its non-European population falling into each of the four cells. Table A5 shows the cross-country distribution of these shares. Then, we estimate our centralization-stratification matrix for public good outcome Y , using the following OLS regression:

$$Y_i = \beta_0 + \beta_1 * Centr\&Strat_i + \beta_2 * Fragm\&Strat_i + \beta_3 Centr\&Egal_i + \varepsilon_i$$

²⁰ See Appendix 1 for the precise definitions of different categories of the *Class Stratification* variable.

²¹ Incidentally, in line with the ideas of Fried (1967), in our sample there is a positive (but far from perfect) correlation between centralization and stratification of about 0.7. This suggests that, if anything, the alternative hypothesis holding that centralized *and* stratified groups are the better ones should have more bite.

Y_i is the value of the 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 . The share of fragmented and egalitarian ethnic groups is omitted from our regressions, so that β_1 , β_2 and β_3 represent the quality of public goods in other precolonial political systems, *relative to that benchmark*. Thus, we estimate the following empirical equivalent to our centralization-stratification matrix:

ME	Stratified	Egalitarian
Centralized	$\beta_1 = 2k$	$\beta_3 = 2k$
Fragmented	$\beta_2 = -(1 - 2k)$	0

According to the “local capture” view, the pattern of this matrix across different public goods is essentially captured by the sign and significance of the “difference-in-difference” coefficient ($\beta_1 - \beta_2 - \beta_3$). This coefficient indicates whether precolonial centralization is more beneficial for stratified or egalitarian ethnic groups, as it subtracts the benefit of precolonial centralization in the latter (β_3) from that in the former groups ($\beta_1 - \beta_2$). For “large spillovers” ($k \approx 1/2$) goods such as paved roads and immunization, our theory predicts – in line with matrix M1 – a uniform effect of Centralization across stratified and egalitarian communities. Thus, we expect ($\beta_1 - \beta_2 - \beta_3$) to be zero, driven by β_1 and β_3 , which are both positive and of similar magnitude. Conversely, for “no spillovers” goods ($k \approx 0$), such as schooling, illiteracy and infant mortality, we expect – in line with matrix M2 – political fragmentation to be costly only when it leads to local tyranny, i.e. in stratified groups. Thus, we expect ($\beta_1 - \beta_2 - \beta_3$) to reflect a greater benefit of Centralization in stratified groups, and β_2 to testify the adverse “local tyranny” effect of stratification in fragmented groups. Let us now move to the empirical estimates of our matrix.

5.2. Empirical Findings

Table 3 presents the estimated centralization-stratification matrices ME for our public goods measures. To check whether actual provision patterns are consistent with our theoretical predictions, we report (in bold) the estimate and standard error of ($\beta_1 - \beta_2 - \beta_3$). For completeness, we also report estimates and standard errors of ($\beta_1 - \beta_2$) and ($\beta_1 - \beta_3$). Panel A reports these 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 only

focus our discussion on those reported in Panel B.

Columns 1 and 2 describe our findings for paved roads and DPT immunization. The results, highly consistent with the “large spillovers” nature of these goods, mimic the pattern of matrix M1. $(\beta_1 - \beta_2 - \beta_3)$ is very insignificant, so that the benefit of centralization is uniform across stratified and egalitarian societies. Moreover, β_1 and β_3 are large, statistically significant and of similar magnitude. 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.²² As predicted by the model, the results confirm a uniform benefit of precolonial centralization across stratified and egalitarian societies for “large spillovers” goods.

The matrices in columns 3, 4 and 5 show our findings for the “no spillovers” public goods considered: infant mortality, illiteracy rate and schooling. The results drastically differ from those of columns 1 and 2 and are now highly consistent with the pattern of matrix M2. Consistent with the predictions of our model, the highly significant $(\beta_1 - \beta_2 - \beta_3)$ suggests that for “no spillovers” goods, centralization mainly benefits stratified ethnic groups. Indeed, for all these public goods, β_2 is statistically significant. Its sign suggests that introducing stratification into fragmented societies deteriorates public policies aimed at expanding education and health services. In fragmented groups, stratification increases infant mortality by 74 and the 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).²³

The estimates of $(\beta_1 - \beta_2)$, large and highly significant (at the 1% level) for all three variables, confirm the benefit of precolonial centralization for communities with an unequal distribution of power. Centralization reduces the number of infants who die by 100 (out of 1000), cuts illiteracy by 57.65 percentage points and increases schooling by 3.18 years. All these effects are larger than 3 standard deviations. In contrast, β_3 is very small and not statistically distinguishable from 0 for all three variables, indicating that for this category of public goods, centralization does not play any role in egalitarian societies.

To summarize, the evidence presented in Table 3 is consistent with “local capture” as it suggests that for “no spillovers” goods such as education and infant mortality, precolonial centralization was mainly beneficial in stratified societies, and for “large spillovers” goods such as paved roads and DPT immunization, it uniformly benefited both stratified and egalitarian groups.

²² In columns 1 and 2 estimates of $\beta_1 - \beta_2$ are noisy, with low significance. Yet, β_1 and β_3 are similar in size and β_2 is not statistically different from 0, so we do not conclude that there is no coordination benefit in stratified groups.

²³ The large adverse effect of stratification on education in fragmented societies suggests that local tyranny may be especially severe for this outcome. *Elites* are likely to be very reluctant to invest in mass education, as it can undermine their political power. For instance, missionary education often attempted to supplant African values with Western ones.

These results allow us to draw two main conclusions. First, the positive association between precolonial centralization and public goods provision in Africa we uncovered is likely to be due, at least in part, to the “local capture” view. Omitted variables or indirect effects of precolonial centralization are unlikely to be the whole story: as discussed in Section 4, their predictions are inconsistent with the findings of this section. Second, internalization of spillovers is not the only benefit of centralization as it cannot account for the observed differences in the provision of public goods with few spillovers. Thus, we provide some econometric support for the benefit of centralization to reduce local tyranny. As emphasized by both African history and our model, by expanding the political arena and enhancing inter-elite competition, centralized precolonial institutions might have reduced the policy distortions associated with local tyranny.

6. Evaluation of Alternative Hypotheses

Although the findings of the last section already support the “local capture” view, we further evaluate its robustness by controlling for several proxies for our alternative hypotheses. We include these proxies one at a time in our baseline regressions where we also control for initial income, so as to capture general cross-country differences in economic status and minimize possible omitted variable bias in the coefficient on Centralization. Tables 4 to 6 report the results of this exercise. For the basic regressions, we report the value and standard error of the coefficient on Centralization, as well as those for the relevant proxy. For the test of the centralization-stratification matrix, we report the value and the standard error of the “difference-in-difference” coefficient $\beta_1 - \beta_2 - \beta_3$. The robustness of $\beta_1 - \beta_2 - \beta_3$ is especially important: the evidence supports “local capture” insofar as the patterns in the matrix remain unaffected. Let us examine the view that centralized groups were more advanced.

6.1. First Alternative Hypothesis: Socioeconomic Advancement

At this point, it is important to be precise on what we mean by socioeconomic advancement. Centralization itself can be viewed as an index of advancement. Yet, anthropologists (e.g. Murdock and Provost 1973) noticed that other factors are also indicative of a group’s status. They identify eight other dimensions of advancement: urbanization and density of population, easiness of transportation, use of writing, technological level, use of money, absence of slavery, fixity of residence, dependence on agriculture. In this section, we separate the effect of precolonial centralization by controlling for the effects of these dimensions. Our proxies comprise both ethnic-

group level variables taken from the anthropological data and country-level controls.²⁴ Below we review the eight dimensions of “advancement” one by one.

– *Urbanization and population density.* Population density and urbanization do not only capture a group’s economic advancement (and thus its ability to provide public goods), but they may also affect the likelihood of centralization. For instance, high population density may increase the pressure on resources, leading the rich to use centralization to keep their power. In addition, densely populated or urbanized areas may better afford the fixed cost of a centralized administrative apparatus.²⁵ We measure these factors using the country-level population density (both relative to total area and arable land) and the urbanization rate in 1960.²⁶

– *Easiness of transportation.* Transport costs affect “advancement” by shaping socioeconomic exchange, but they may also shape political organization (Polanyi 1957, Gluckman 1965, Lenski 1966). For instance, environments favorable to trade (e.g. harbors, rivers) may induce the establishment of centralized enforcement agencies to make trade prosper. Based on these theories, we picked these two controls: the landlocked dummy and the length of inland waterways.

– *Use of writing.* Groups using writing and written records are likely to better absorb and communicate the information involved in adopting new technologies. But writing may also help these groups to support centralization. We control for Murdock’s *Writing and Records* variable, indicating whether a group had a precolonial system of writing and possessed written records.

– *Technological level.* Technologically more advanced groups are likely to better adopt modern technologies, as they may be richer or more skilled. The same factors may also affect a group’s ability to centralize, so we control for this possibility using Murdock’s *Metal* variable, indicating whether metalworking was present or absent in the precolonial economy of an ethnic group.

– *Use of money.* Money is also a technology, whose goal it is to facilitate economic exchange. Thus, for the same reasons as those mentioned before, we control for this technology by including Murdock’s *Money* variable in our regressions, indicating whether an ethnic group used money as a medium of exchange in its precolonial economy.

– *Slavery.* History of slavery and slave trade could impede the formation of centralized political systems, but it could also lead to a lower quality of government and a lower level of public goods provision (Nunn 2005). We control for this possibility by using Murdock’s *Slavery* variable indicating the prevalence of slavery in precolonial times for each ethnic group.

Table 4 shows the results for urbanization and population density, easiness of transportation,

²⁴See Appendix 1 for the exact definitions of these variables.

²⁵Acemoglu 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.

²⁶Controlling for the population density in 1900 produces similar results.

use of writing, technological level, use of money and slavery. Panel A shows the results for the level regressions. The effect of Centralization remains large and significant, while the proxies we introduce do not generally have a strong predictive power.²⁷ Panel B shows the results for our centralization-stratification matrix to be robust to the inclusion of new controls, remaining consistent with our “local capture” theory. In roads and immunization regressions ($\beta_1 - \beta_2 - \beta_3$) is statistically indistinguishable from 0, indicating that for “large spillovers” goods, the benefit of precolonial centralization is uniform across stratified and egalitarian societies. The predictions of our model are also fulfilled for “no spillovers” goods. Education and infant mortality regressions estimate ($\beta_1 - \beta_2 - \beta_3$) which is generally significant and has the right sign, thereby suggesting a larger benefit of precolonial centralization for stratified groups. Hence, the data are consistent with the view that precolonial centralization fostered the provision of “no spillovers” goods by reducing local tyranny. We now consider other proxies for socioeconomic “advancement”.

– *Fixity of residence.* It can be harder for nomadic groups to invest in socioeconomic advancement (or in schools, hospitals or infrastructure that lead to it), but it may also be harder for them to build a centralized apparatus. To control for this effect, we use Murdock’s *Settlement Pattern* variable, indicating, for each ethnic group, whether it is nomadic or has permanent settlements.

– *Dependence on agriculture.* In addition to being an indicator of advancement, agricultural productivity is also likely to favor centralization (Braudel 1972). Thus, we control for Murdock’s *Share of Agriculture in Subsistence Economy* variable indicating, for each group, the importance of agriculture relative to animal husbandry, fishing, hunting-gathering. We also control for country-level geographic variables like the area of water reservoirs (measuring water abundance), the average height of mountains (measuring the availability of agricultural lands and climate), patterns of land usage²⁸, and measures of climate such as climate types and the absolute value of latitude. The latter variables also control for other geographic theories of centralization such as Wittfogel’s (1957) “irrigation hypothesis” or Carneiro’s (1970) “geographical circumscription theory”.

Table 5 shows the results for fixity of residence and dependence on agriculture. Panel A shows the results for level regressions. Once again, in the vast majority of specifications, the effect of Centralization remains large and significant, while the proxies we introduce do not generally have a strong predictive power (except for climate). Only controlling for a country’s average elevation weakens our illiteracy and infant mortality results and drastically reduces the effect of Centralization on schooling. This is due both to the significant direct impact of elevation on these

²⁷ Surprisingly, the regressions show a negative association between precolonial writing and health and educational outcomes. This is largely due to the fact that the use of writing was much more prevalent in Muslim areas (cross-country correlation of 0.72), which tend to have lower levels of these public goods.

²⁸By including forests, the land usage proxy also controls for transport costs.

public goods and its high correlation (0.51) with centralization. Importantly, however, the inclusion of elevation does not affect the pattern of our centralization-stratification matrix for education and infant mortality, still consistent with that of “no spillovers” public goods.

More generally, Panel B shows the results for our centralization-stratification matrix to be robust to the inclusion of new controls. Centralization continues to disproportionately benefit stratified groups for “no spillovers” goods (i.e. $(\beta_1 - \beta_2 - \beta_3)$ is generally significant and has the right sign), while generating a uniform benefit for “large spillovers” good (i.e. $(\beta_1 - \beta_2 - \beta_3)$ is statistically indistinguishable from 0).²⁹ These results are consistent with the “local capture” view.

6.2. Second Alternative Hypothesis: National Politics

The hypothesis that precolonial centralization only had an indirect effect, affecting political outcomes at the national level, can be formulated in two broad versions. The first deals with the possibility that precolonial centralization influenced the strategies of the colonizers. The second focuses on their impact on the political space of postindependence African countries. In this subsection, we evaluate the importance of such indirect stories.³⁰

– *Colonial factors.* Acemoglu et al. (2001) suggest that Europeans set up better institutions (probably leading to more public goods) in colonies where they could settle more easily. Centralized precolonial systems may just have facilitated European settlement, perhaps by allowing them to deal more effectively with indigenous populations. 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 French ones. Either by coincidence or by choice, the English might have been more likely to rule over centralized groups (better suited to their strategy of Indirect Rule). Our basic regressions 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, precolonial institutions may have facilitated or impeded the arrival of missionaries, who brought with them not only their credo but also efforts aimed at improving literacy and health conditions. Therefore, we control for 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

²⁹Land usage and climate types slightly weaken $(\beta_1 - \beta_2 - \beta_3)$ for adult illiteracy. Yet, even in these specifications centralization benefits stratified groups ($(\beta_1 - \beta_2)$ is significant at the 5% level) but not egalitarian ones. In general, the features of our matrix are preserved in all our specifications (results are available from the authors).

³⁰Notice that urbanization and population density can also be affected by centralization. For instance, the presence of decision-making centers may attract people from peripheries and boost urbanization. Thus, our previous robustness results can also be viewed as rejecting other indirect channels through which centralization might have worked.

impact of Centralization on the latter. Controlling for religion might bias the coefficient of Centralization downward, but we still want to see how it affects the results.

Panel A of Table 6 shows our basic results to be generally robust to the colonization stories. Only in schooling regressions is the coefficient of Centralization weakened when we control for the percentage of Europeans or religion shares, as countries with larger European settlements and/or with a larger share of Protestants attain better educational outcomes. Yet, we are reassured about the impact of Centralization on education by the results for adult illiteracy (for which we have a much larger sample), which are unaffected by the inclusion of those controls.³¹ Panel B shows that controlling for colonial factors does not affect our centralization-stratification matrix. For roads and DPT immunization, the data confirm a uniform impact of precolonial centralization due to spillovers. For “no spillover” goods, it is still the case that precolonial centralization is particularly beneficial for stratified societies. Only for educational outcomes does $(\beta_1 - \beta_2 - \beta_3)$ lose its significance when we control for religion. However, 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 zero).³² In addition, as noticed above, the results for education may be downward biased when we control for religion.

– *Post-colonial factors.* The high frequency of civil wars in Africa makes them an important feature of a country’s national politics. The risk of having a civil war may depend on the precolonial institutions. For instance, the degree of inter-ethnic military conflict can be a function of the organization of the groups involved (Fearon and Laitin 1996). We control for this channel by including the frequency of a country’s civil wars in our regressions. A country’s precolonial institutions may also have exerted a far-reaching impact on the political regime at the national level. In postindependence Africa, centralized groups could provide mechanisms of political participation and representation, putting constraints on the behavior of national political elites (Boone 2003).³³ To account for this indirect effect of centralization, we include two standard measures of checks and balances in our regressions: the indexes of Democracy and Constraints on the Executive.

Finally, being centered on ethnic groups’ characteristics, our analysis is related to the literature on the effects of ethnic fractionalization (see Alesina and La Ferrara (2003) for a review). The standard approach defines ethnicity as based on language and views the costs of fractionalization as being due to cultural barriers in inter-ethnic relations. Instead, we focus on

³¹ Notice also that, consistent with the findings of La Porta et al. (1999), African countries of English legal origin fare better in health and education.

³² Full results are not shown, but available from the authors.

³³ Instead, Acemoglu et al. (2002) make an opposite argument. In their view, the centralized indigenous structure provided the basis for the establishment of extractive institutions by colonial and postcolonial elites.

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.³⁴

Table 6 tends to reject the channels working through postcolonial 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 our centralization-stratification matrix is not affected by the inclusion of postcolonial controls either.

Overall, the evidence of this section corroborates our results from Section 5 and tends to reject the hypotheses that centralized groups fared better just because they were more advanced or because precolonial institutions only had an indirect effect through national politics. Instead, the data are broadly consistent with the presence of a direct impact of precolonial centralization on public goods. Importantly, the estimation of our centralization-stratification matrix supports the local capture view and suggests that precolonial centralization boosted public goods provision by helping to both internalize spillovers and soften local tyranny.

7. Conclusions

This paper assesses, empirically and theoretically, the view that precolonial centralization affected the quality of government in colonial and postcolonial Africa. We document a positive association between the provision of modern public goods such as education, health and infrastructure in African countries and the centralization of their precolonial political institutions. We present historical evidence suggesting that in Africa, in line with the “local capture” view, the main virtue of precolonial centralization was greater accountability of local elites, disciplined by competition for higher office. In light of this evidence, we build a model to show how, by fostering competition among entrenched local elites, precolonial centralization boosts public goods by both internalizing spillovers and softening local tyranny. By estimating our model and extensively controlling for alternative hypotheses, we find that the “local capture” view is important to fully explain the impact of precolonial centralization on public goods in Africa.

Thus, our findings lend support to Riker's (1964) concern that decentralization may lead to local capture and ineffective government. This consideration brings us to the policy implications of

³⁴Scholars 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.

our analysis. In policy circles, decentralization is widely believed to make governments more responsive and efficient. However, the arguments in favor of political decentralization ultimately rely on the 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 America³⁵ – casts some doubt on this premise and shows how in decentralized systems local power holders may subvert politics to their own advantage. Our findings suggest that under such circumstances, political *centralization* may be desirable due to its ability to increase the accountability of local politicians by creating career incentives for them.

Naturally, we do not mean to suggest that a move toward centralization is always good. First, the decision to move towards greater centralization should take into account the large implementation costs that must be incurred for it to be effective. As noted in the Introduction, a key attribute of centralized groups was their *developed* attitude for organizing politically and holding local leaders accountable. Formerly decentralized entities may be less apt at readily reaping the benefits of centralization. Given their lack of “experience capital”, a move toward centralization may turn out to be ineffective or even damaging for them, at least in the short run.

In addition, as we documented, centralization may be especially beneficial during periods of drastic reforms, when a society needs to speedily adopt available policies and technologies and local capture may severely threaten their implementation. Yet, as discussed by Huntington (1968) and Acemoglu et al. (2002), centralization may become costly when societies need to innovate because the inequality in political power resulting from it may trigger the establishment of central oligarchies refusing entry to newcomers. But innovation and change are often precipitated by outsiders. Hence, centralization may eventually create hostility toward change and innovation. As a result, it should be borne in mind that costs and benefits of centralization are likely to vary along a country’s development path.

³⁵ See Shleifer and Treisman (1999) on Russia; Lieten (1996) and Mathew and Nayak (1996) on India; Fox (1990) on Latin America.

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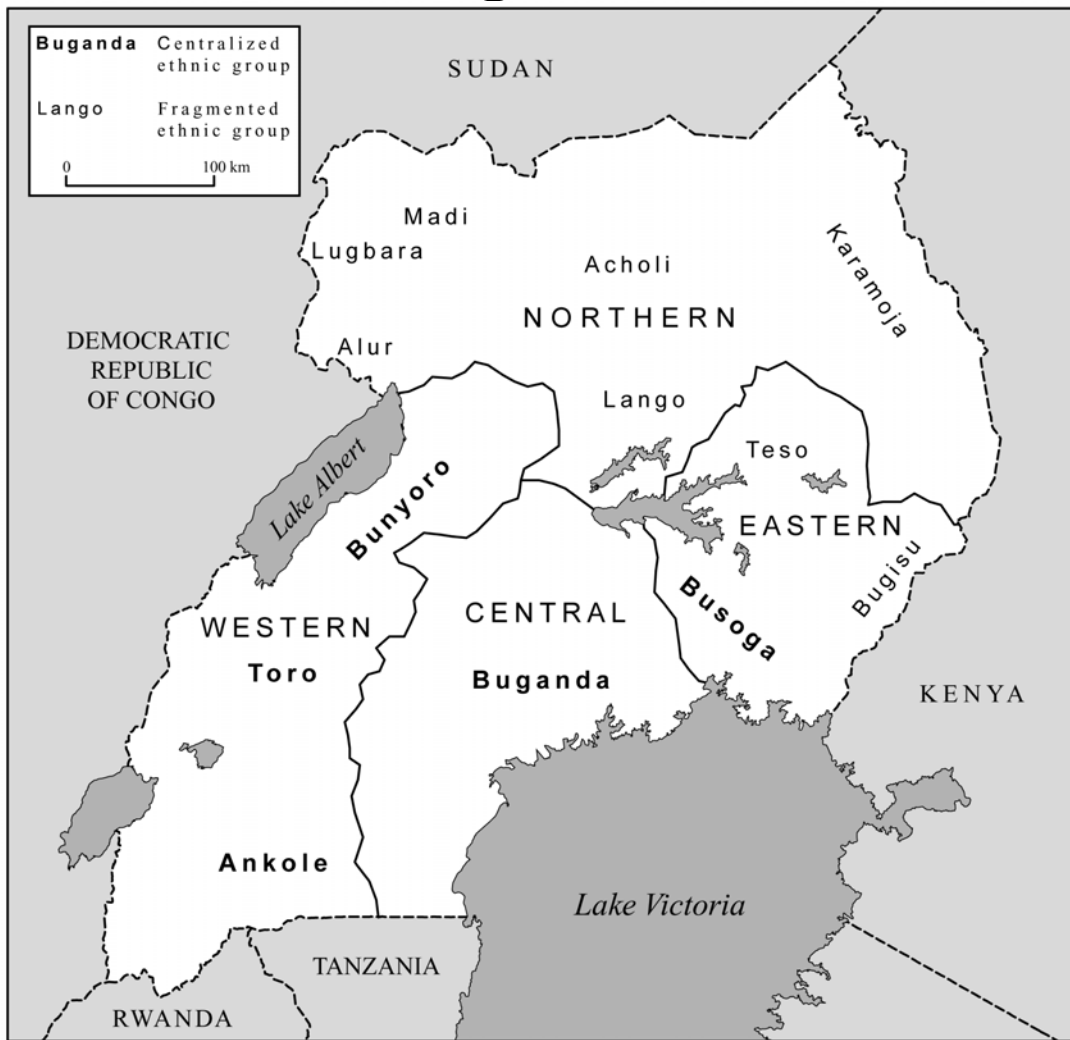
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Uganda



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

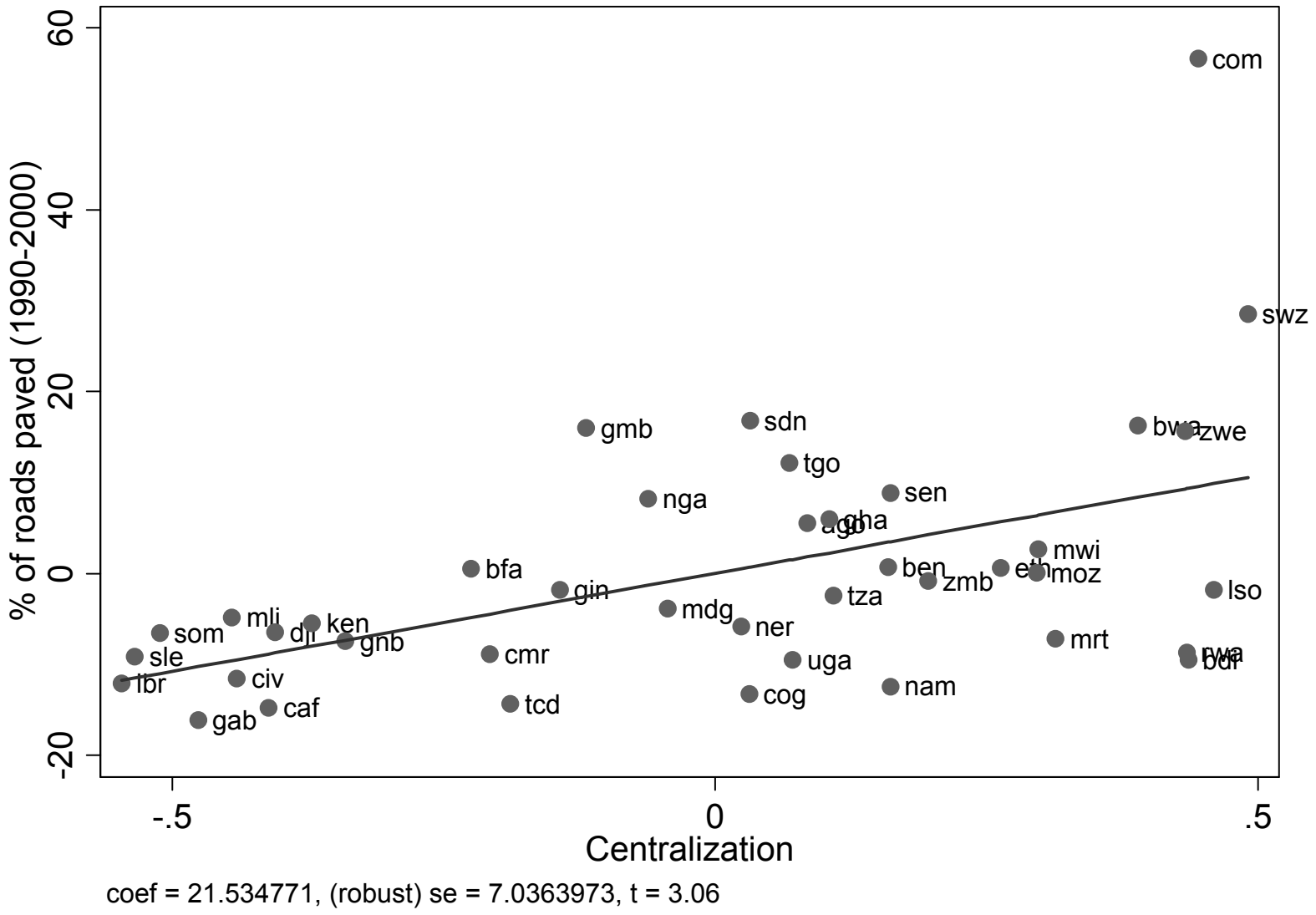
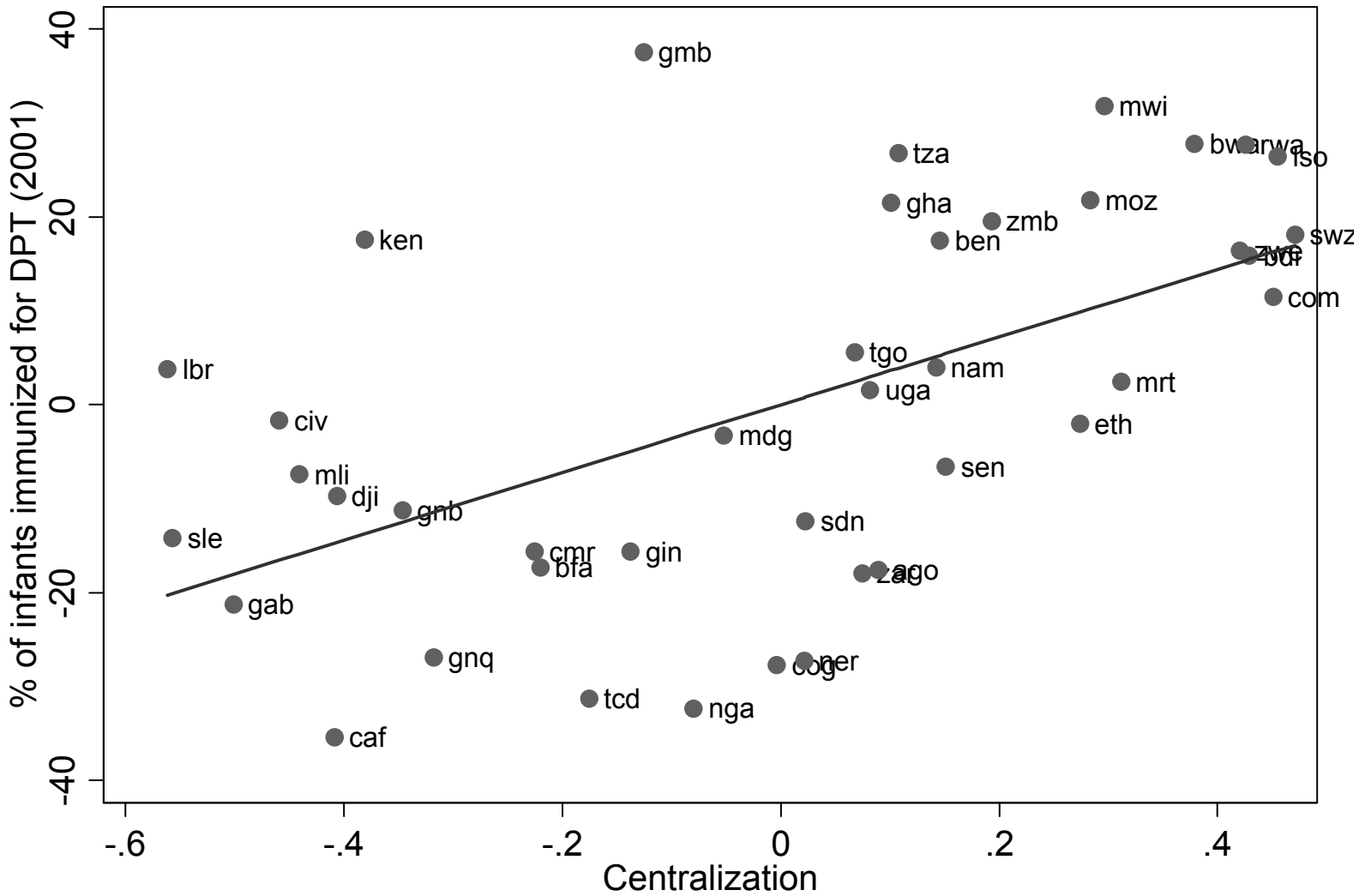


Figure 1: Precolonial centralization and paved roads
 (partial relation controlling for log of GDP/cap in 1986)



coef = 36.07716, (robust) se = 7.1253938, t = 5.06

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

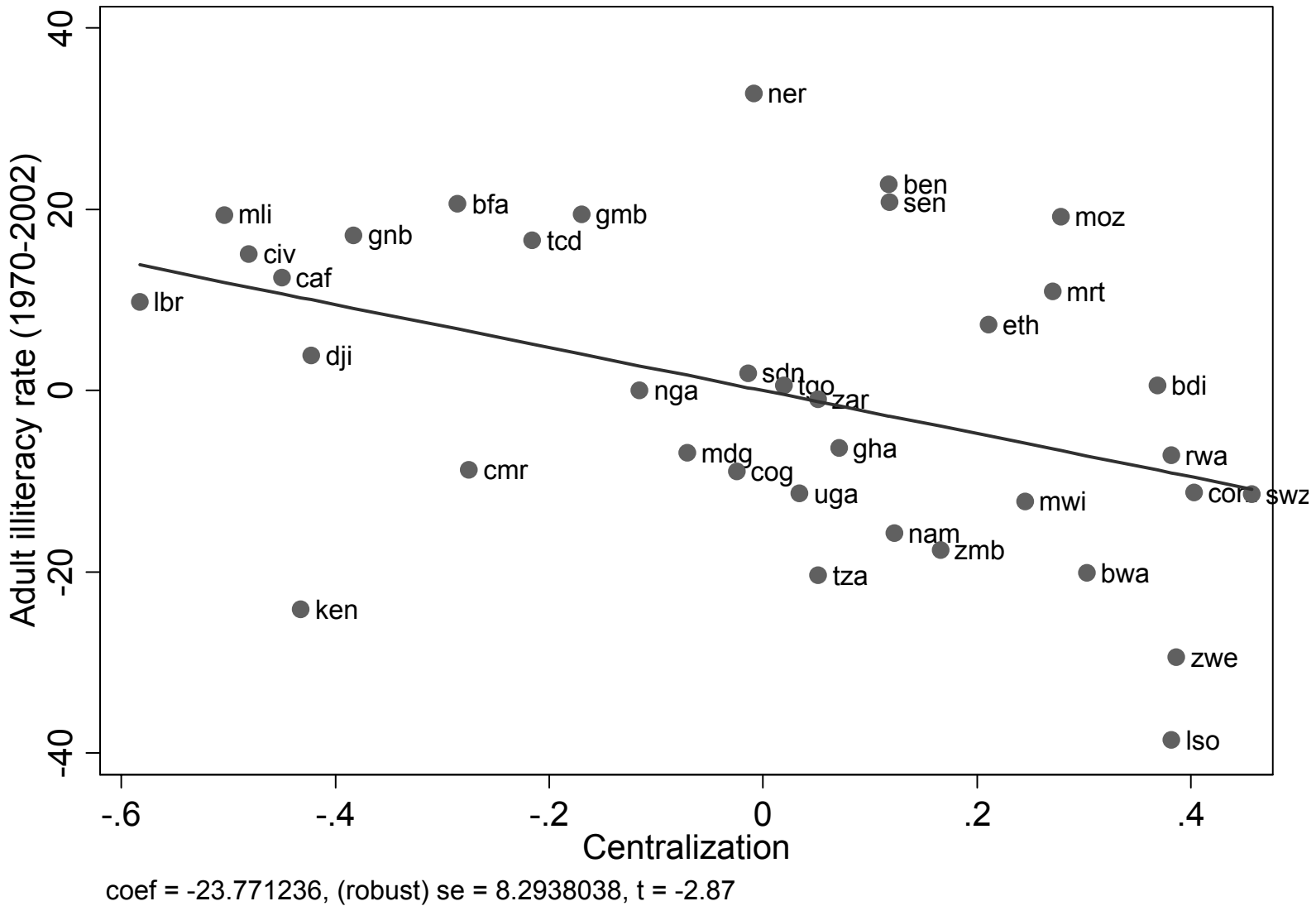
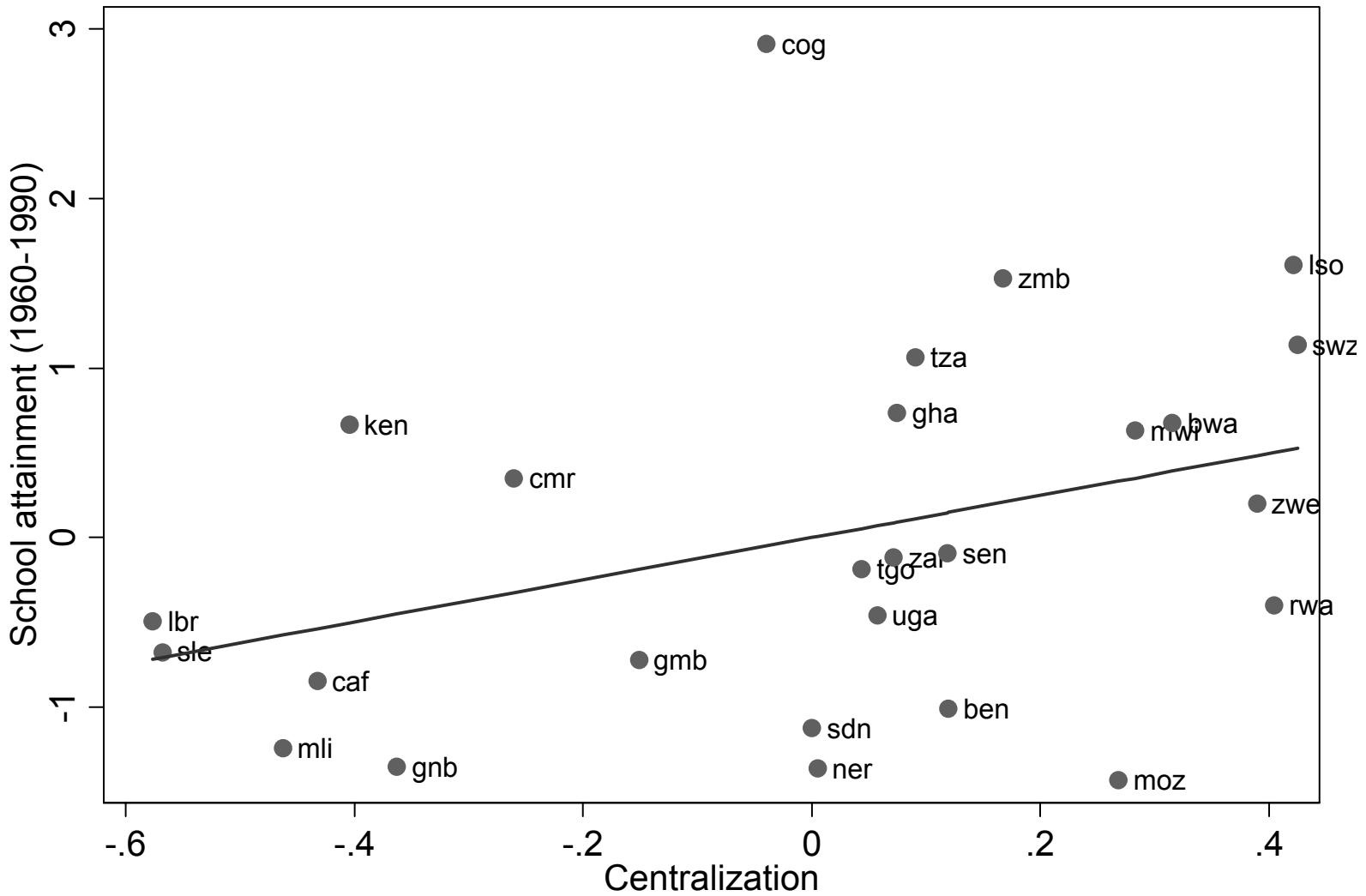
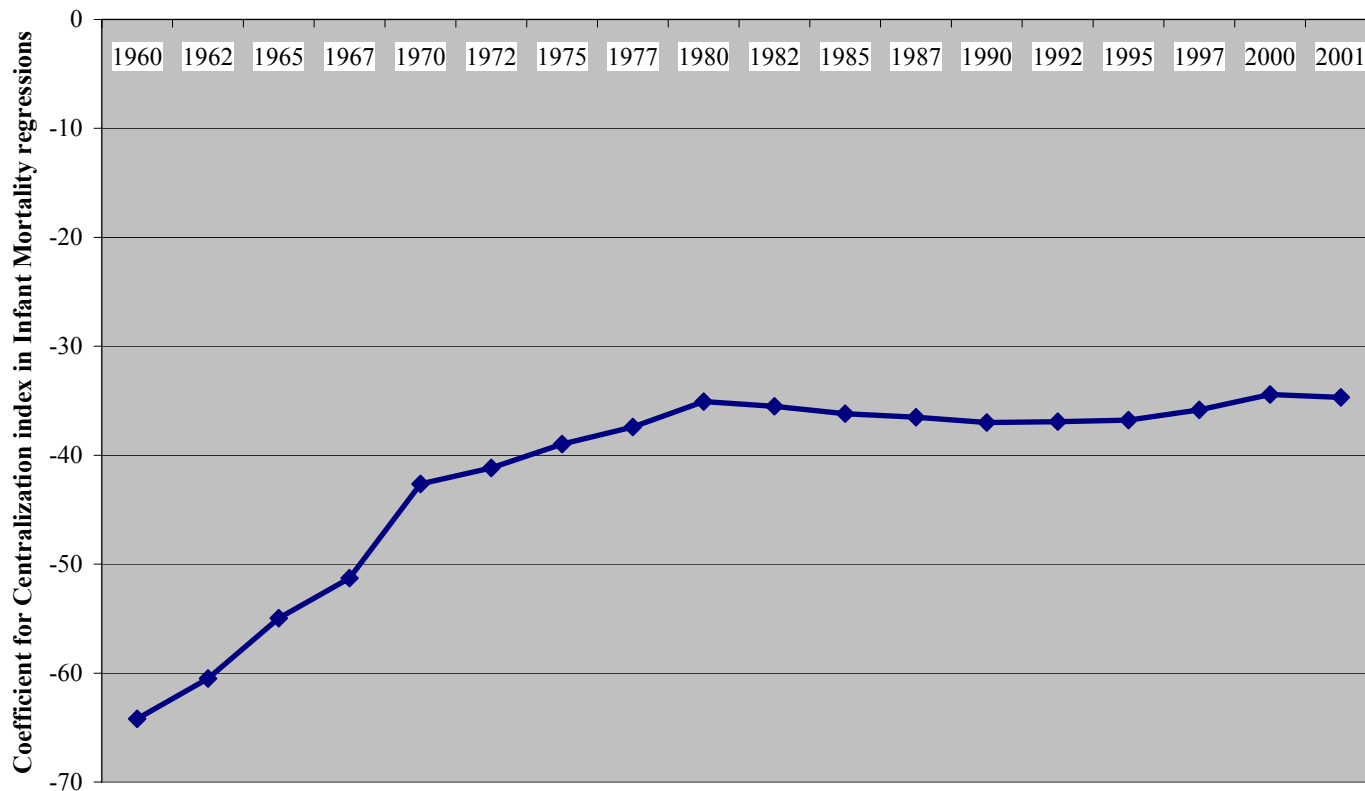


Figure 4: Precolonial centralization and adult illiteracy
 (partial relation controlling for log of GDP/cap in 1970)



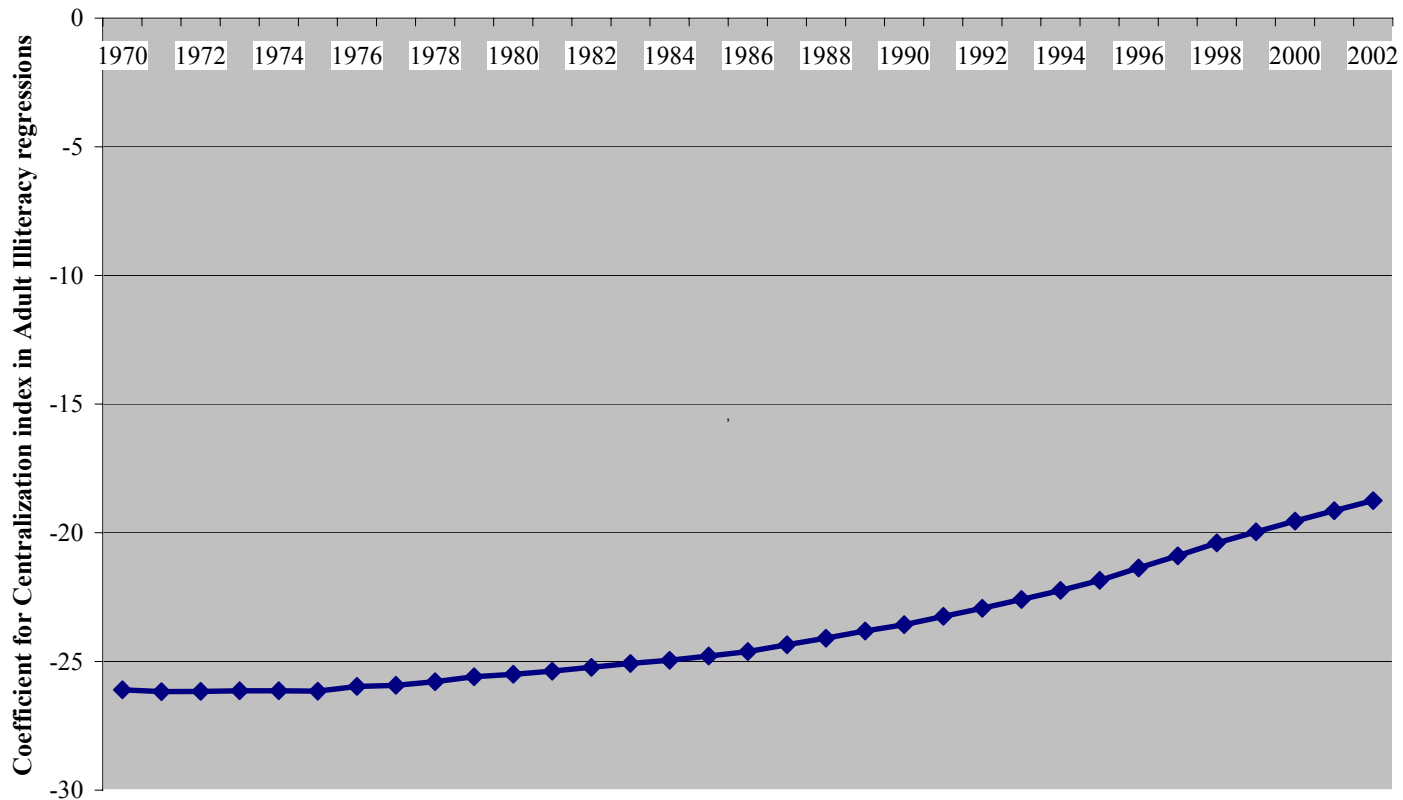
coef = 1.2428953, (robust) se = .48549674, t = 2.56

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



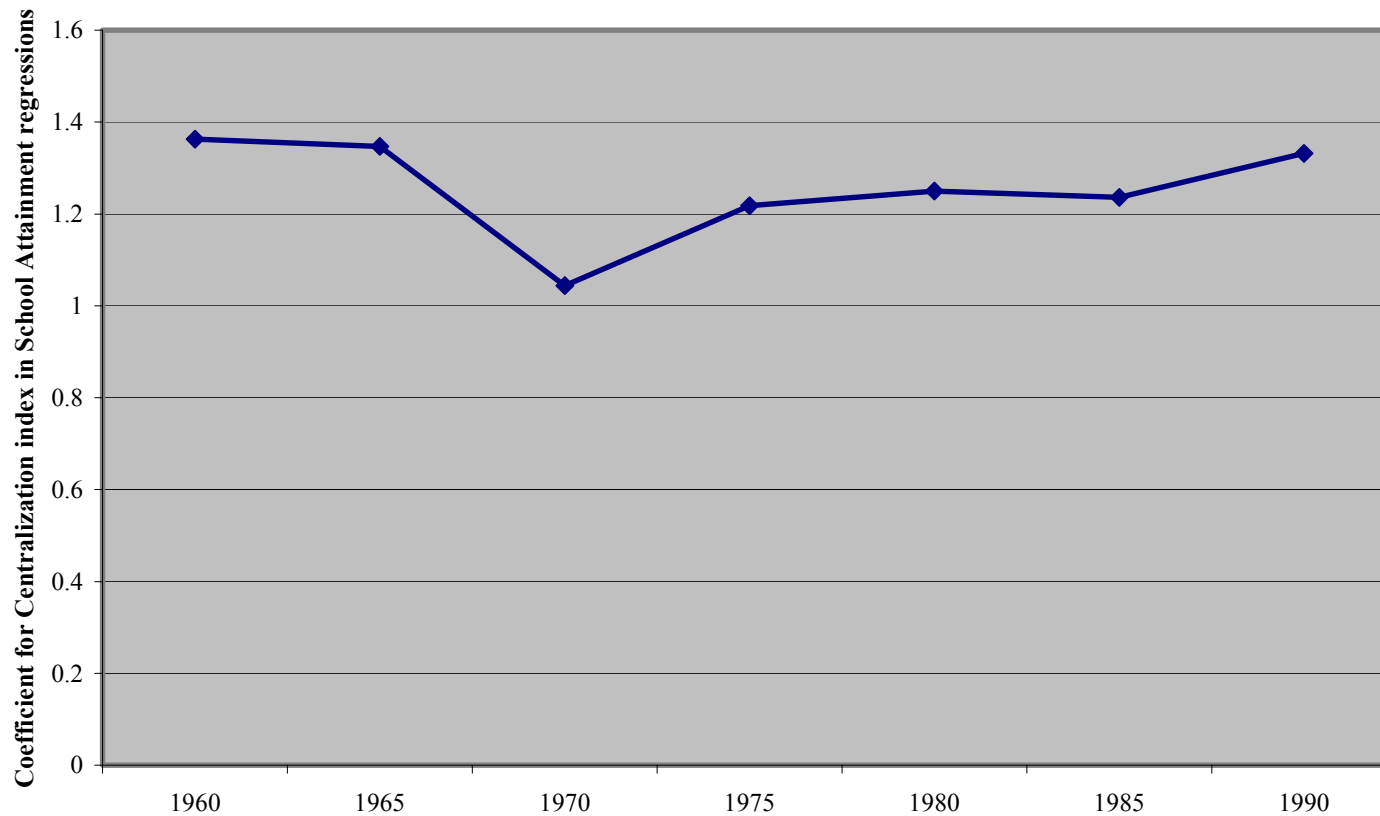
- (1) The chart shows the values of the coefficient for *Centralization* index from the OLS regressions of $InfantMortality_i = \alpha_0 + \alpha_1 * Centralization_i + \alpha_2 * \log(GDP/cap_1960)_i + \varepsilon_i$, where infant mortality is measured in different years.
- (2) The coefficient is significant at the 1% level between 1960 and 1967, and at the 5% level between 1970 and 2001.
- (3) The regressions have 39 observations between 1960 and 1967, and 40 observations between 1970 and 2001.

Figure 6: Precolonial centralization and infant mortality: relationship over time



- (1) The chart shows the values of the coefficient for *Centralization* index from the OLS regressions of $AdultIlliteracy_i = \alpha_0 + \alpha_1 * Centralization_i + \alpha_2 * \log(GDP/cap_1970)_i + \varepsilon_i$, where adult illiteracy is measured in different years.
- (2) The coefficient is significant at the 1% level between 1970 and 1988, and at the 5% level between 1989 and 2002.
- (3) All regressions have 36 observations.

Figure 7: Precolonial centralization and adult illiteracy: relationship over time



- (1) The chart shows the values of the coefficient for *Centralization* index from the OLS regressions of $SchoolAttainment_i = \alpha_0 + \alpha_1 * Centralization_i + \alpha_2 * \ln(GDP/cap_1960)_i + \varepsilon_i$, where school attainment is measured in different years.
- (2) The coefficient is significant at the 1% level in 1960 and 1965, at the 5% level in 1970, 1975 and 1990, and at the 10% level in 1980 and 1985.
- (3) The regressions have 21 observations in 1960 and 1965, 23 in 1970, 24 in 1975, 25 in 1980, and 26 observations in 1985 and 1990.

Figure 8: Precolonial centralization and school attainment: relationship over time

Table 1: Precolonial 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*** (7.21)	21.53*** (7.04)	36.79*** (6.53)	36.08*** (7.13)	-35.24** (14.79)	-42.5*** (15.12)	-18.74** (9.04)	-23.77*** (8.29)	1.24** (0.47)	1.24** (0.49)
Log of initial GDP/cap		4.95 (3.38)		0.9 (2.5)		-23.8** (9.26)		-11.17** (4.56)		0.36 (0.61)
Constant	7.12** (2.65)	-26.72 (22.73)	38.11*** (4.85)	33.22* (17.37)	146.6*** (10.01)	306.72*** (63.48)	66.94*** (5.95)	145.63*** (32.36)	1.2*** (0.33)	-1.12 (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: Precolonial centralization and public goods in Uganda

<i>Region</i>	Central	Western	Eastern	Northern
<i>Precolonial institutions of ethnic groups</i>	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: Testing the "local capture" hypothesis: precolonial 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)			
Centr	Strat	β_1	β_3	22.23***	17.36**	37.73***	40.06**	-33.54**	19	-16.41*	5.08	1.01*	-0.59
	Egalit			(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: Testing the "local capture" hypothesis: precolonial 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)
Centr	Strat	22.89*** (7.72)	37.18*** (8.56)	-37.2** (14.31)	-21.27** (8.58)	1.01* (0.55)
	Egalit	22** (8.4)	42.11* (21.86)	10.4 (28.55)	-2.89 (16.95)	-0.54 (1.16)
Fragm	β ₂	10.03 (10.88)	12.7 (26.25)	74** (34.27)	36.39* (20.31)	-2.17** (0.9)
	0	0	0	0	0	0
β ₁ -β ₂		12.86 (14.61)	24.48 (22.83)	-111.2*** (31.57)	-57.65*** (18.74)	3.18*** (0.78)
β ₁ -β ₃		0.88 (11.7)	-4.94 (19.93)	-47.6* (27.58)	-18.38 (15.94)	1.55 (1.06)
β ₁ -β ₂ -β 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
Rsqr		0.28	0.32	0.39	0.37	0.29

Notes:

- (1) β₁, β₂ and β₃ refer to the OLS estimations of $Y_i = \beta_0 + \beta_1 * \text{Centr-}\&\text{-Strat}_i + \beta_2 * \text{Fragm-}\&\text{-Strat}_i + \beta_3 * \text{Centr-}\&\text{-Egalit}_i + X_i' \gamma + \varepsilon_i$
- (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: Testing the "advancement" hypothesis: demography, trade, technology and slavery

<i>Panel A: Basic centralization results</i>	<i>Dependent variables</i>									
	% 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	
<i>Specifications</i>	(1)	(2)	(3)	(4)	(5)					
Centralization No "advancement" controls	21.53*** (7.04)	36.08*** (7.13)	-42.5*** (15.12)	-23.77*** (8.29)	1.24** (0.49)					
Centralization Population density in 1960	20.5*** (4.89) 0.031 (0.15)	31.13*** (8.39) 0.15 (0.096)	-43.6** (17.88) 0.037 (0.152)	-25.07** (10.18) 0.035 (0.083)	1.41** (0.51) -0.009 (0.006)					
Centralization Population density per arable land in 1960	21.62*** (7.34) -0.016 (0.014)	36.64*** (7.52) 0.009 (0.034)	-41.95*** (14.26) 0.043 (0.048)	-23.53** (8.97) -0.02 (0.018)	1.45** (0.58) 0.004* (0.002)					
Centralization % of urban population in 1960	22.76*** (7.84) 0.096 (0.164)	30.42*** (8.25) -0.414 (0.316)	-47.58*** (17.12) -0.65 (0.647)	-25.42** (11.12) -0.115 (0.357)	1.74** (0.65) 0.054 (0.037)					
Centralization Landlocked dummy	24.54*** (8.15) -6.26 (5.1)	36.26*** (7.8) -0.39 (5.85)	-44.23*** (15.79) 4.15 (9.38)	-22.93*** (8.37) -2.11 (5.68)	1.3** (0.56) -0.09 (0.42)					
Centralization Inland waterways	23.94*** (7.36) 338.63* (176.08)	38.1*** (8.14) 548.8 (575.73)	-43.72*** (15.6) 216.24 (350.4)	-23.93*** (8.48) 369.91** (159.41)	1.23** (0.52) 7.71 (25.74)					
Centralization Writing	21.66*** (6.89) 0.67 (4.87)	34.83*** (6.87) -16.78** (8.16)	-39.7** (15.86) 22.99 (13.77)	-19.78** (8.2) 23.47*** (8.5)	1.04** (0.48) -1.8*** (0.5)					
Centralization Metal	21.78** (8.1) 1.49 (10.64)	33.87*** (7.4) -13.76 (8.79)	-40.19** (15.31) 20.69 (20.36)	-20.8** (7.84) 19.07* (10.9)	1.08** (0.51) -0.75 (0.56)					
Centralization Money	23.61** (8.92) 7.18 (8.11)	33.26*** (7.24) -9.86 (6.92)	-42.8*** (15.03) -1.19 (15.76)	-21.27** (7.92) 9.83 (7.95)	1.16** (0.5) -0.22 (0.81)					
Centralization Slavery	20.42** (8) -4.59 (10.47)	33.04*** (7.59) -17.49 (10.42)	-33.52** (14.76) 39.83** (18.92)	-15.97** (7.38) 28.42*** (8.66)	0.81* (0.46) -1.08** (0.44)					

Table 4: Testing the "advancement" hypothesis: demography, trade, technology and slavery

<i>Panel B: Centralization-Stratification matrix</i> ($\beta_1-\beta_2-\beta_3$)	<i>Dependent variables</i>									
	% 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	
<i>"Advancement" controls</i>	(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)
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)
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)
Writing	-9	(17.83)	-28.98	(32.47)	-113.19**	(44.1)	-40.49*	(23.74)	2.38	(1.67)
Metal	-9.64	(17.85)	-14.16	(37.3)	-120.28**	(45.64)	-53.18*	(28.23)	3.68**	(1.53)
Money	-25.7	(17.69)	-2.4	(46.13)	-160.44***	(47.37)	-90.71***	(22.13)	4.63***	(1.42)
Slavery	-10.18	(19.26)	-20.72	(36.44)	-104.39**	(45.56)	-41.71	(26.21)	3.22*	(1.74)

Notes:

(1) Panel A shows coefficients and robust standard errors for *Centralization* index and "advancement" 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 $Y_i = \beta_0 + \beta_1 * \text{Centr-}\&\text{-Strat}_i + \beta_2 * \text{Fragm-}\&\text{-Strat}_i + \beta_3 * \text{Centr-}\&\text{-Egalit}_i + X_i' \gamma + \varepsilon_i$, where "advancement" 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) 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.

Table 5: Testing the "advancement" hypothesis: fixity of residence and dependence on agriculture

<i>Panel A: Basic centralization results</i>	<i>Dependent variables</i>									
	% 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	
<i>Specifications</i>	(1)	(2)	(3)	(4)	(5)					
Centralization No "advancement" controls	21.53*** (7.04)	36.08*** (7.13)	-42.5*** (15.12)	-23.77*** (8.29)	1.24** (0.49)					
Centralization Permanent settlements	21.21*** (6.98) 2.52 (6.64)	35.91*** (7.14) 12.06 (8.98)	-42.44*** (15.39) -2.28 (16.71)	-23.38*** (8.39) -5.31 (9.12)	1.24** (0.5) 0.6 (1.35)					
Centralization Dependence on agriculture	21.5*** (7.11) 0.32 (1.14)	36.79*** (7.23) 1.57 (1.98)	-42.24*** (14.94) 0.61 (3.72)	-23.59*** (8.31) 0.99 (1.88)	1.48** (0.61) 0.28 (0.22)					
Centralization Water area	21.43*** (6.98) -15.48 (22.68)	36.65*** (7.03) 94.32** (42.15)	-41.52** (15.71) 39.27 (60.34)	-23.66*** (8.45) 4.32 (30.93)	1.15** (0.5) -2.55 (1.92)					
Centralization p-value for Land usage shares	23.1*** (6.35) [0.05]	32.2*** (8.59) [0.53]	-40.19** (19.38) [0.43]	-21.69* (11.82) [0.3]	0.97 (0.64) [0.5]					
Centralization p-value for Climate types	18.25** (7.06) [0]	33.51*** (10.29) [0.1]	-31.67** (15.48) [0.07]	-20.95** (9.48) [0.51]	1.29 (0.78) [0.08]					
Centralization Latitude	18.37** (7.82) 33.07 (28.29)	34.49*** (7.95) 15.4 (33.07)	-50.87*** (14.36) 80.9 (58.72)	-24.5*** (7.05) 7.99 (40.57)	1.49** (0.59) -2.02 (3.39)					
Centralization Average elevation	29.48*** (9.63) -8.3* (4.33)	32.7*** (8.78) 3.51 (4.7)	-29.04 (17.93) -14.58* (7.74)	-11.23 (8.6) -13.44** (5.49)	0.48 (0.61) 0.77* (0.43)					

Table 5: Testing the "advancement" hypothesis: fixity of residence and dependence on agriculture

<i>Panel B: Centralization-Stratification matrix</i> ($\beta_1-\beta_2-\beta_3$)	<i>Dependent variables</i>									
	% 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	
<i>"Advancement" controls</i>	(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)
Water area	-9.92	(18.29)	-13.09	(28.78)	-120.21**	(46.87)	-55.32**	(26.83)	3.64**	(1.6)
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)
Latitude	-1.79	(19.07)	-16.24	(41.8)	-115.88**	(45.6)	-61.01**	(29.58)	3.65**	(1.36)
Average elevation	-5.26	(17.44)	-18.97	(36.55)	-115.17***	(42.28)	-47.06**	(19.71)	3*	(1.51)

Notes:

(1) Panel A shows coefficients and robust standard errors for *Centralization* index and "advancement" 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

$Y_i = \beta_0 + \beta_1 * \text{Centr-}\&\text{-Strat}_i + \beta_2 * \text{Fragm-}\&\text{-Strat}_i + \beta_3 * \text{Centr-}\&\text{-Egalit}_i + X_i' \gamma + \varepsilon_i$, where "advancement" 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).

(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 6: Testing the "national politics" hypothesis: colonial and postcolonial factors*Panel A: Basic centralization results*

<i>Specifications</i>	<i>Dependent variables</i>									
	% 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)					
Centralization No colonial or postcolonial controls	21.53*** (7.04)	36.08*** (7.13)	-42.5*** (15.12)	-23.77*** (8.29)	1.24** (0.49)					
Centralization % of European descent in 1960	15.86*** (4.8)	36.57*** (7.55)	-40.42** (16.27)	-24.26** (8.96)	0.55 (0.71)					
	-46.74 (51.07)	-20.13 (48.64)	-45.65 (147.98)	-109** (52.24)	76.42 (46.52)					
Centralization English legal origin	20.96*** (7.38)	31.97*** (6.49)	-40.93** (16)	-18.55** (6.86)	1.1*** (0.39)					
	3.86 (3.84)	16.79*** (5.49)	-16.85* (9.18)	-18.32*** (4.77)	0.65 (0.41)					
Centralization Catholics	26.7*** (7.31)	36.71*** (6.69)	-35.74** (15.59)	-18.33** (8.87)	0.7 (0.68)					
	-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 Civil wars in 1970-92	21.58*** (7.28)	37.84*** (7.38)	-44.71*** (14.65)	-24.77*** (8.15)	1.6*** (0.45)					
	-1.13 (8.46)	-17.6 (12.03)	31.92 (26.55)	13.33 (16.24)	-3.12*** (0.91)					
Centralization Democracy in 1970-94	19.95** (7.73)	32.03*** (8.13)	-37.65** (15.07)	-24.05** (8.99)	1.29** (0.52)					
	1.09 (0.95)	2.39* (1.29)	-2.73* (1.61)	-0.6 (1.03)	-0.03 (0.05)					
Centralization Constraints on the executive in 1970-94	20.25** (7.57)	33.23*** (8.04)	-38.41** (15.33)	-23.82** (8.86)	1.24** (0.5)					
	1.64 (1.6)	3.17 (2.06)	-4.08 (2.44)	-1.76 (1.65)	-0.01 (0.07)					
Centralization Ethnolinguistic fractionalization	25.47*** (8.83)	35.19*** (8.13)	-43.08** (15.99)	-23.21** (9.27)	1.08 (0.72)					
	12.03 (11.64)	-2.21 (7.35)	-1.64 (11.84)	1.27 (8.95)	-0.33 (1.03)					

Table 6: Testing the "national politics" hypothesis: colonial and postcolonial factors

<i>Panel B: Centralization-Stratification matrix</i> ($\beta_1-\beta_2-\beta_3$)	<i>Dependent variables</i>									
	% 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	
<i>Colonial and postcolonial controls</i>	(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)
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)
Ethnolinguistic fractionalization	-7.28	(17.9)	-17.57	(37.32)	-122.06**	(46.79)	-54.76**	(26.86)	3.76**	(1.54)

Notes:

(1) Panel A shows coefficients and robust standard errors for *Centralization* index and colonial or postcolonial 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

$Y_i = \beta_0 + \beta_1 * \text{Centr-}\& \text{-Strat}_i + \beta_2 * \text{Fragm-}\& \text{-Strat}_i + \beta_3 * \text{Centr-}\& \text{-Egalit}_i + X_i' \gamma + \varepsilon_i$, where colonial and postcolonial 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) <i>Jurisdictional Hierarchy</i> 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).
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Continued

Data and Sources (continued)

Centralization-Stratification shares	<p>For each country measure the shares of the non-European population that belongs to precolonially 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) <i>Jurisdictional Hierarchy</i> variable. It is defined as "fragmented" if it has 0 or 1 levels. An ethnic group is defined as "stratified" if Murdock's (1967) <i>Class Stratification</i> variable indicates that the group is characterized by one of the following:</p> <ul style="list-style-type: none">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" orc) "complex stratification into social classes correlated in large measure with extensive differentiation of occupational statuses". <p>A group is defined as "egalitarian" if according to the same variable it is characterized by</p> <ul style="list-style-type: none">a) "absence of significant class distinctions among freemen, ignoring variations in individual repute achieved through skill, valor, piety, or wisdom" orb) "wealth distinctions based on the possession or distribution of property present and socially important but not crystallized into distinct and hereditary social classes". <p>Source: Constructed by the authors using Murdock (1967) and Atlas Narodov Mira (1964).</p>
Log of GDP per capita in 1960, 1970 and 1986	<p>Logarithm of GDP per capita in constant 1985 dollars (international prices). Source: Global Development Network Growth Database, based on Penn World Table 5.6.</p>
Log of GDP per capita in 2001	<p>Logarithm of GDP per capita in constant 1995 dollars (international prices). Source: World Bank World Development Indicators (2003).</p>
<i>"Advancement" controls</i>	
Population density in 1960	<p>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).</p>
Population density per arable land in 1960	<p>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).</p>
% of urban population in 1960	<p>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).</p>

Continued

Data and Sources (continued)

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).
Writing	For each country measures the share of the non-European population that belongs to ethnic groups that had precolonial system of writing. Scale is 0 to 1. An ethnic group is defined as having a precolonial system of writing if according to <i>Writing and Records</i> variable of Murdock and Provost (1973): a) it "has an indigenous system of true writing and possesses written records of at least modest significance" or b) it "has an indigenous system of writing but lacks any significant accumulation of written records, or alternatively has long used the script of alien people". In contrast, a group is defined as lacking a pre-colonial system of writing if: a) it "lacks true writing but possesses significant nonwritten records in the form of picture writing, quipus, pictorial inscriptions, or the like"; b) "writing and significant records are lacking but the people employ mnemonic devices, e.g., simple tallies" or c) "writing, records, and mnemonic devices in any form are lacking or unreported". Source: Constructed by the authors using Murdock and Provost (1973) and Atlas Narodov Mira (1964).
Metal	For each country measures the share of the non-European population that belongs to ethnic groups that had metalworking (e.g., forging or casting of metal artifacts) activity present in their precolonial economy. Scale is 0 to 1. Source: Constructed by the authors using Murdock and Provost (1973) and Atlas Narodov Mira (1964).
Money	For each country measures the share of the non-European population that belongs to ethnic groups that used money as medium of exchange in their precolonial economy. Scale is 0 to 1. An ethnic group is defined as using money as medium of exchange if according to <i>Money</i> variable of Murdock and Provost (1973): a) it "uses an indigenous currency in the form of metal coins of standard weight and fineness and/or their equivalent in paper currency"; b) it "uses indigenous articles of token or conventional value, such as cowrie shells, wampum, or imitation tools, as an elementary form of money"; c) it "lacks any forms of indigenous money but has long used the currency of an alien people" or d) "true money is lacking but the society employs domestically usable articles, such as salt, grain, livestock, or ornaments, as a medium of exchange". In contrast, a group is defined as lacking medium of exchange if it "lacks any recognized medium of exchange, conducting mercantile transactions through the direct or indirect exchange of goods, e.g., barter." Source: Constructed by the authors using Murdock and Provost (1973) and Atlas Narodov Mira (1964).

Note: For *Writing*, *Metal* and *Money* variables the data are only available for 44 African ethnic groups, each representing a broader ethno-cultural province (Murdock 1968, Murdock and White 1969). We use this data to impute the values for all groups in the corresponding cluster.

Continued

Data and Sources (continued)

Slavery	<p>For each country measures the share of the non-European population that belongs to ethnic groups that had slavery in precolonial times. An ethnic group is defined as having slavery if according to Murdock's (1967) <i>Slavery</i> variable it had:</p> <ul style="list-style-type: none">a) "hereditary slavery present and of at least modest social significance";b) "slavery reported but not identified as hereditary or nonhereditary" orc) "incipient or nonhereditary slavery, i.e, where slave status is temporary and not transmitted to the children of slaves". <p>In contrast, a group is defined as not having slavery if it is characterized by "absence or near absence of slavery".</p>
Permanent settlements	<p>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) <i>Settlement Pattern</i> variable it is characterized by one of the following:</p> <ul style="list-style-type: none">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" ord) "neighborhoods of dispersed family homesteads". <p>In contrast, "nomadic" groups are described by the same variable as either:</p> <ul style="list-style-type: none">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" ord) having "compact but impermanent settlements, i.e. villages whose location is shifted every few years". <p>Source: Constructed by the authors using Murdock (1967) and Atlas Narodov Mira (1964).</p>
Dependence on agriculture	<p>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) <i>Subsistence Economy</i> 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).</p>
Water area	<p>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).</p>
Land usage shares	<p>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).</p>

Continued

Data and Sources (continued)

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).
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).
Average elevation	Average elevation (th m). Source: Parker (1997).
<i>Colonial and postcolonial controls</i>	
% 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).
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.
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).

Appendix 2

Table A1: Precolonial 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
<i>Dependent variables</i>					
% 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
<i>Main independent variables</i>					
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
<i>"Advancement" controls</i>					
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
Landlocked dummy	42	0.333	0.477	0	1
Inland waterways	40	0.003	0.007	0	0.04
Writing	42	0.181	0.312	0	1
Metal	42	0.902	0.194	0.109	1
Money	42	0.774	0.286	0.011	1
Slavery	42	0.85	0.277	0	1
Permanent settlements	42	0.852	0.261	0.036	1
Dependence on agriculture	42	5.399	1.242	1.195	7.38
Water area	42	0.043	0.068	0	0.289
Latitude	42	0.125	0.08	0	0.326
Average elevation	42	0.486	0.605	0.002	2.14
<i>Colonial and postcolonial controls</i>					
% 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
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
Ethnolinguistic fractionalization	42	0.639	0.271	0	1

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** (40)	1 (42)			
Infant mortality in 1960-2001	-0.332** (40)	-0.309** (42)	1 (42)		
Adult illiteracy rate in 1970-2002	-0.268 (35)	-0.335** (37)	0.726*** (37)	1 (37)	
School attainment in 1960-1990	0.181 (25)	0.213 (26)	-0.576*** (26)	-0.78*** (25)	1 (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 precolonial political institutions and controls

	<i>Precolonial political institutions</i>				
	Centra- lization	Centr & Strat	Centr & Egalit	Fragm & Strat	Fragm & Egalit
<i>Income</i>					
Log of GDP/cap in 1960	-0.21	-0.128	-0.145	-0.021	0.226
Log of GDP/cap in 1970	-0.203	-0.14	-0.114	-0.114	0.259
Log of GDP/cap in 1986	-0.068	0.049	-0.225	-0.183	0.152
Log of GDP/cap in 2001	-0.044	0.117	-0.301*	-0.212	0.144
<i>"Advancement" controls</i>					
Population density in 1960	0.414***	0.444***	-0.067	-0.097	-0.375**
Population density per arable land in 1960	-0.028	0.07	-0.186	0.099	-0.017
% of urban population in 1960	-0.453***	-0.326**	-0.236	-0.043	0.477***
Landlocked dummy	0.336**	0.263*	0.135	-0.085	-0.301*
Inland waterways	-0.144	-0.118	-0.049	0.444***	-0.058
Writing	-0.168	-0.216	0.097	0.142	0.105
Metal	-0.254	-0.304*	0.102	-0.083	0.295*
Money	-0.332**	-0.082	-0.476***	-0.199	0.426***
Slavery	-0.185	-0.232	0.094	0.263*	0.068
Permanent settlements	0.141	0.195	-0.107	0.001	-0.143
Dependence on agriculture	0.033	0.035	-0.004	0.087	-0.073
Water area	0.003	-0.152	0.299*	-0.011	0.002
Latitude	0.386**	0.306**	0.147	0.203	-0.482***
Average elevation	0.508***	0.48***	0.044	-0.152	-0.444***
<i>Colonial and postcolonial controls</i>					
% of European descent in 1960	-0.048	0.009	-0.106	-0.176	0.129
English legal origin	0.098	0.036	0.116	-0.087	-0.059
Catholics	0.134	0.171	-0.075	-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	-0.021	-0.079	-0.026
Civil wars in 1970-92	0.083	-0.036	0.227	-0.224	0.018
Democracy in 1970-94	0.187	0.244	-0.116	0.135	-0.257
Constraints on the executive in 1970-94	0.164	0.208	-0.091	0.193	-0.26
Ethnolinguistic fractionalization	-0.363**	-0.403***	0.084	0.046	0.346**

Notes:

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

Table A5: Precolonial 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. In stratified societies, $s=0$ and provision is $(g_1 = 0, g_2 = 0)$ irrespective of k . In egalitarian districts, $s = 1$ and there are two cases. If $k=1/2$, Assumption 1 implies that in equilibrium $(g_1 = 0, g_2 = 0)$. If $k=0$, then $C < 1$ implies that in equilibrium $(g_1 = 1, g_2 = 1)$.

Proof of Proposition 2. General remark: we solve for the equilibrium of the model by iteratively deleting weakly dominated strategies. In district i , *Elite* i proposes a (g_i^i, g_{-i}^i) maximizing its payoff given the plan proposed by *Elite* $-i$. Let us first consider stratified societies.

Stratified societies (s=0). There are two cases to study. 1. *No Spillovers (k=0)*. Since $\pi > C$, it is easily found that $(g_i^i = 1, g_{-i}^i = 1)$ is an equilibrium. Is it unique? It can be seen that *Elite* i weakly prefers $(g_i^i = 0, g_{-i}^i = 1)$ to $(g_i^i = 0, g_{-i}^i = 0)$ and $(g_i^i = 1, g_{-i}^i = 1)$ to $(g_i^i = 1, g_{-i}^i = 0)$. Thus, the game between Elites 1 and 2 reduces to:

<i>Elite</i> 1 \ <i>Elite</i> 2	(0,1)	(1,1)
(0,1)	$\pi/2, \pi/2$	$-C, \pi - C$
(1,1)	$\pi - C, -C$	$\pi/2 - C, \pi/2 - C$

It can be seen that, under **A.2.**, $(g_i^i = 1, g_{-i}^i = 1)$ is the unique equilibrium of the game. Thus, the equilibrium provision of “no spillovers” good in stratified societies is $(g_1 = 1, g_2 = 1)$.

2. *Spillovers (k=1/2)*. Again, $(g_i^i = 1, g_{-i}^i = 1)$ is an equilibrium. Is such equilibrium unique? It is easily seen that also in this case, we can eliminate (1,0) and (0,0) through iterated deletion of weakly dominated strategies. Hence, the game is the same as that depicted above and the same conclusion follows: under **A.2.**, for $k=1/2$ in stratified societies $(g_1 = 1, g_2 = 1)$ in equilibrium.

Egalitarian societies (s=1). Now political competition only requires the *Elite* (i.e. the whole local population) to participate. Once again, consider two cases. 1. *No spillovers (k=0)*. As in Proposition 1, in equilibrium it must be that $g_1 = g_2 = 1$. 2. *Spillovers (k=1/2)*. It is immediate to see that assumption A.1. implies that $(g_i^i = 1, g_{-i}^i = 1)$ is a dominant strategy. Thus, in equilibrium it must also be that $g_1 = g_2 = 1$.