



**Understanding Long-Run African Growth:
Colonial Institutions or Colonial Education?**

Journal:	<i>Journal of Development Studies</i>
Manuscript ID:	FJDS-2008-Mar-0007.R1
Manuscript Type:	Original Manuscripts
Keywords:	Economic development < Economics, Education < Education, Sub-Saharan Africa < Geographical Area



Understanding Long-Run African Growth: Colonial Institutions or Colonial Education?

ABSTRACT

Long-term growth in developing countries has been explained in four frameworks: 'extractive colonial institutions' (Acemoglu et al., 2001), 'colonial legal origin' (La Porta et al., 2004) 'geography' (Gallup et al., 1998) and 'colonial human capital' (Glaeser et al., 2004). In this paper we test the 'colonial human capital' explanation for sub-Saharan Africa, controlling for legal origins and geography. Utilizing data on colonial-era education, we find that instrumented human capital explains long-term growth better, and shows greater stability over time, than instrumented measures for extractive institutions. We suggest that the impact of the disease environment on African long-term growth runs through a human capital channel rather than an extractive-institutions channel. The effect of education is robust to including variables capturing legal origin and geography, which have additional explanatory power.

JEL codes: O11, P16, P51

1. Introduction

This paper is an empirical examination of the colonial origins of Africa's economic growth. Developments in growth theory suggest that explanations should be located in the broad areas of geography, institutions and human capital. Whereas the geography school examines factors where one-way causality with growth is beyond reasonable doubt, - including location, precipitation, sunshine and natural endowments - empirical studies on institutions need to address an endogeneity problem. Recent studies have done so by employing variables that precede modern economic growth in the developing world, including the legal systems used by colonising powers (La Porta et al., 2004) and settler mortality (Acemoglu et al., 2001).

This paper extends this approach to the study of human capital's impact on long-run growth in sub-Saharan Africa (hereafter 'Africa'). We focus on Africa because of the availability of colonial data relating to our research topic. Also, Africa's experience occupies a sufficiently distinct place in the development literature to merit separate study of the continent (as testified to by the notorious 'Africa dummy' appearing in much cross-country econometric work). We utilise freshly collected data on African colonial human capital and instrument it with settler mortality. Our main positive finding is that instrumented colonial-era education is a causal factor for long-term growth. This finding is robust to inclusion of additional effects of legal origin and geography. Our education measure explains growth better and shows greater stability over time than do measures for extractive institutions used by Acemoglu et al. (2001). We also find some evidence that institutions are endogenous to education, as suggested by Glaeser et al. (2004).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

The next section reviews the four main schools of thought in the current debate on the roots of long-term growth, followed by a historical background on colonial education in section 3. Section 4 introduces our data and presents the analysis and results. Section 5 concludes with a summary and discussion of our findings.

For Peer Review Only

2. Explanations of Long-Term Growth

2.1. *Extractive Institutions*

Institutions are broadly defined as the written and informal rules, beliefs, norms and habits that 'constrain and liberate human action' (North, 1990). Any empirical study on institutions and growth must come to terms with the pervasive and often elusive nature of institutions – particularly, their manifold manifestations, and the endogeneity of institutions to growth. A milestone study is by Acemoglu et al. (2001) who address both problems by studying a large number of former European colonies and defining their colonial-era institutions generically as 'extractive' or 'constructive'. The authors suggest that where the disease environment was favourable to European settlers, they settled in larger numbers and built societies with economic institutions akin to those in Europe. These would typically include many checks and balances on state power, fostering private entrepreneurship, trade and innovation. In contrast, where the disease environment was not favourable - as indicated by high settler mortality - Europeans created 'extractive institutions': legal constructs endowing the state with large powers and few constraints, designed to effectively transfer natural resources to the colonisers while stifling private initiative and commercial development (Acemoglu et al., 2001: 1375). The authors presume these institutional frameworks (if not concrete institutions) to be persistent, so that settler mortality would be a robust proxy for the quality of both early and current institutions.

One gap in the Acemoglu et al. (2001) analysis is that the two steps in the argument (high European population mortality led to low European population densities, which led to extractive institutions) are not separately tested. Also, they do not examine

1
2
3 whether their result was driven mainly by the gap in economic performance between
4
5 *settler* economies such as the US, Australia and New Zealand and *colonies* in Africa and
6
7
8 Asia. This begs the question if extractive institutions explain performance also within a
9
10 solely African context We return to both these issues in the empirical section 3.
11

12 13 14 15 16 2.2. *Legal Origins*

17
18 Djankov et al. (2002), Glaeser and Shleifer (2002) and La Porta et al. (1998) address the
19
20 endogeneity problem besetting institutions by creating a measure of early, colonial-era
21
22 institutions, which preceded developing-country current growth performance. Their
23
24 measurement distinguishes between colonial institutions originating from different
25
26 national legal systems. Again, the presumption is that once introduced, these systems do
27
28 not change fundamentally and hence legal origin determines the qualities of also current
29
30 institutions (Glaeser and Shleifer 2002). in our context the differences between Africa's
31
32 most active colonisers would be relevant. Under French civil law, 'professional judges,
33
34 legal codes, and written records' are typical while British common law is characterised
35
36 by 'lay judges, broader legal principle and oral argument' (Glaeser and Shleifer
37
38 2002:1193). Joireman (2006) questions this assumption and argues that there is
39
40 significant heterogeneity within common-law countries. This also applies to colonies: she
41
42 shows how Kenya and India – which both had common law systems imposed by the
43
44 British coloniser - have very different colonial and post-colonial legal experiences. But in
45
46 Djankov et al. (2002), Glaeser and Shleifer (2002) and La Porta et al. (1998), legal-origin
47
48 differences are successfully linked to measures for present-day institutions including
49
50 market regulation, property rights, quality of government, political freedom and financial
51
52
53
54
55
56
57
58
59
60

1
2
3 development. These concrete institutions, in turn, are shown to systematically relate to
4
5 growth.
6
7

10 2.3. *Geography*

11
12 Yet another group of scholars links differences in economic development patterns to
13 geographical factors. An important analytical advantage is the absence of serious
14 endogeneity problems: geographical factors plausibly have some impact on economic
15 growth, while growth has no or very little direct effect on geography. The four broad
16 areas often cited relate to natural endowments, productivity, diseases, and transport costs
17 (Sachs and Warner, 1997; Gallup et al. 1998; Bloom and Sachs, 1998; Diamond, 1999;
18 Sachs, 2001).
19
20
21
22
23
24
25
26
27
28

29 Endowments of ‘point resources’ (principally oil, gas, diamonds, and precious
30 metals) provide a growth potential which may be successfully exploited to raise income
31 sustainably; but they are also notorious for leading to a ‘resource curse’ of political and
32 economic instability related to rents. In contrast, endowments with non-point, widespread
33 natural resources such as sunshine, rainfall and soil fertility have historically constituted
34 the most common geographical basis for broad-based and sustainable growth. This may
35 account partly for Africa’s growth problems, as its location in the tropics implies that
36 production conditions, particularly in agriculture, are less favourable and more variable
37 than in temperate zones, due to fragile soils and little or infrequent rainfall. A third
38 geographical factor is the incidence of plagues and pests which affect plants and animals
39 (and thereby agricultural productivity) as well as the productivity of human labour. Such
40 diseases (particularly, malaria) are unusually widespread in Africa and their impact is
41 therefore more harmful than in most other parts of the world. Fourth, lack of access to
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 seaports or navigable rivers increases local transport costs; a third of all African countries
4 are landlocked, comprising a quarter of its population (Sachs and Warner 1997, Gallup et
5 al. 1998). Also, large distances to world markets increase the transport costs of trade.
6
7

8
9
10 Over time, powerful feedback mechanisms may reinforce these barriers to
11 economic development. Low agricultural productivity inhibits an ‘agricultural
12 transformation’, which historically has been the basis for industrialisation, economic
13 diversification and rising income levels in all now-developed countries (Timmer, 2002).
14 Harsh living conditions lead to thinly settled countries and low incomes, which then
15 constitute an endogenous drag on further growth, for example through demand
16 limitations and larger costs (and lower returns) in infrastructure construction. Small
17 domestic markets also inhibit scale-sensitive technological innovation, widening the
18 ‘ecological divide’ with developed countries that hinders the adoption of innovations
19 through technology diffusion (Sachs, 2001:22).
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

36 2.4. *Human Capital*

37
38 The human capital angle on growth in former colonies has recently been argued by
39 Glaeser et al. (2004) and Djankov et al. (2003), based on early work by Schultz (1961),
40 Lipset (1959, 1960), Dewey (1916) and others. As it is the focus of this paper, we discuss
41 it in some detail.
42
43
44
45
46
47

48 The term human capital was defined by its originator Theodore Schultz (1961:1)
49 as ‘skills and knowledge’ which are ‘a form of capital’ and are ‘in substantial part a
50 product of deliberate investment’. He also posited the link with economic growth,
51 observing that ‘increases in economic output have been large in comparison with
52 increases in land, man-hours and physical reproducible capital. Investment in human
53
54
55
56
57
58
59
60

1
2
3 capital is probably the major explanation for this difference' (1961:1). Education can be
4
5 viewed as one such investment in human capital, another one being, for example, health
6
7 care (Schultz, 1999:67). Our focus is on the education component of human capital.
8
9

10
11 The key observation in the human capital angle on the colonial roots of Africa's
12
13 growth, then, is not that settlers took 'institutional fundamentals' with them. They took
14
15 themselves, their human capital, and the means to proliferate the education component of
16
17 that human capital through their educational systems. As in the Acemoglu et al (2001)
18
19 account, there is a link with the density of settlement by colonisers, but it does not run via
20
21 extractive institutions. Instead, the relevant reasoning here is that where fewer settlers
22
23 went to stay, less of their human capital was brought and developed via educational
24
25 systems (Lloyd et al. 1999: 17). Thus the idea is that the colonisers' initial human capital
26
27 endowment and its proliferation affected long-term economic development. This links in
28
29 with Krueger and Lindahl (2001:1105) who, reviewing the literature on education and
30
31 growth, conclude that 'the initial level of education [is] positively correlated with
32
33 economic growth'. For Africa, the corollary would be that '[l]ow levels of health and
34
35 education are two salient factors contributing to [Africa's] slow growth', as Schultz
36
37 (1999:67-68) notes.
38
39
40
41
42

43
44 Some observers question the relevance of education to growth, since the returns to
45
46 education are typically low in agrarian societies (as most colonies were) relative to its
47
48 return in more diversified economies (Galor et al. 2006, Pritchett 2000, Bennel 1996).
49
50 For Africa at least, this is contradicted by the Appleton and Balihuta (1996) overview of
51
52 studies on the link between education and agricultural productivity in Africa. They
53
54 conclude that the estimated effects are positive and often very large economically (though
55
56 not always statistically significant) (Appleton and Balihuta 1996: 420). But apart from
57
58
59
60

1
2
3 this, the human capital school has emphasised that the key benefits of human capital are
4
5 'not technological but political' (Glaeser et al. 2004:282). Early writers argued that
6
7 education 'broadens man's outlook, enables him to understand the need for norms of
8
9 tolerance, restrains him from adhering to extremist doctrines, and increases his capacity
10
11 to make rational electoral choices' (Lipset 1960:39). Educated people are purportedly
12
13 more aware of government actions, more actively participating in society, and better able
14
15 to organise themselves politically and to resolve their conflicts 'through negotiation and
16
17 voting rather than through violent disputes' (Glaeser et al. 2004:272; also, Lipset 1960,
18
19 Bourguignon and Verdier 2000, Tilly 1998). Education, in this view, is also a
20
21 precondition for a well-functioning judicial and administrative system.
22
23
24
25
26

27
28 Yet other critics question this benign role of education in fostering economic
29
30 growth and development, as it may also give rise to political instability, ethnic tensions
31
32 and chronic violence. Huntington (1968:41) already observed that 'modernity breeds
33
34 stability, but modernization breeds instability': he found that at low levels of literacy
35
36 (roughly below 50 %), education breeds political instability while for countries with
37
38 higher literacy rates it fosters stability. He went on to outline a mechanism where better
39
40 educated people in developing countries with weak political systems are better able to
41
42 organise protests, stage coups or foster other forms of political instability, which may
43
44 impede economic growth. Bayly (2004:222) likewise writes of Britain's preference for
45
46 indirect rule in Africa in an attempt to 'stifle the growth of English-educated elites like
47
48 those who were causing such troubles in India and Egypt'.
49
50
51
52

53
54 In another type of criticism, Bush and Santorelli (2000) document how education
55
56 has been used by states for the purposes of cultural repression and segregation of ethnic
57
58 minority groups. This includes colonial governments, who have used education for
59
60

1
2
3 cultural assimilation aims and for divide-and-rule politics. For instance, in Belgian
4 Africa, the schooling system from the late 19th century 'openly favoured the Tutsi
5 minority and actively discriminated against the Hutu' and during the 1920s 'set up
6 special schools to educate Tutsis as the future leaders of the country and ... as support
7 staff for the colonial government' (Bush and Santorelli, 2000:10). They link this to the
8 enduring ethnic tensions in the successor states Rwanda and Burundi, which erupted into
9 violence and genocide in the early 1990s. Bush and Santorelli provide similar examples
10 from Sudan, South Africa, Uganda, Zaire and for many other, non-African countries.
11 Likewise, Davidson (1992) describes how the fact that African elites were typically
12 Western-style educated alienated them from their compatriots - one reason for the
13 legitimacy crisis of African governments, which in turn has hampered sustainable growth
14 processes. Also quantitative other research confirms that the relation of education with
15 growth is not simple and typically nonlinear, often mediated by other variables such as
16 inequality, as in Rehme's (2007) study.

17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
This literature illustrates that education can indeed have long-term influence, for
good as well as for harm. On balance however, these effects appear not sufficiently
strong to make education's effect on economic growth negative on average. A large body
of empirical research on that relation in the last half century finds that more and better
education is robustly associated with higher levels of economic growth (Gemmel, 1996;
Topel, 1999, Krueger and Lindahl, 2001), often conditional on other factors such as
capital investment and the trade regime (Judson, 1998; Vinod and Kaushik, 2007¹.
Schultz (1999) presents an overview of findings relevant to Africa. Beyond this specialist
literature, the role of education in creating the 'wealth of nations' is also a mainstay in

1
2
3 the general study of factors fostering economic growth, from Adam Smith to David
4
5 Landes' (1997) celebrated *Wealth and Poverty of Nations*.
6
7

8 We build on these results by looking back to colonial times. Taking our cues from
9
10 the human capital literature, we hypothesise that colonial education may have fostered
11
12 long-term growth through two channels: both by affecting present education levels, and
13
14 through its effect on political institutions, fostering stability, 'voice', and good
15
16 governance (especially, secure property rights and law and order). In support of this link,
17
18 Lipset (1960) found that the least educated societies are never stable democracies,
19
20 whereas highly educated societies generally are. This was updated and confirmed by
21
22 Glaeser et al. (2004), who also find a strong effect of initial education on institutional
23
24 changes.
25
26
27

28
29 It is important to note that we restrict our analysis to colonial education, and this
30
31 is a limitation of the present research. Obviously, also pre-colonial, indigenous education
32
33 systems – such as education by village elders, the extended family or in an indigenous
34
35 religious setting (Adeyemi and Adeyinka, 2003) – invest people with social and cognitive
36
37 skills and knowledge, and thus may build their human capital and so contribute to, among
38
39 other things, economic growth. Or alternatively, they may have interacted with (hindered
40
41 or fostered) the development of colonial education systems. Such indigenous education
42
43 systems predated and often co-existed with colonial education efforts, and may have been
44
45 important because the reach of colonial administration and education systems was often
46
47 limited. As Bayly (2004:254) notes of colonial administration in general, '[w]hole areas
48
49 of the European colonial world ... remained in the grip of resistance to central authority,
50
51 and the power of local chieftains until the very beginnings of decolonization itself in the
52
53 1940s.' In this environment, state-colonial education systems must have been only one of
54
55
56
57
58
59
60

1
2
3 many influences on human capital, and indigenous education systems may have been
4
5 equally (or more?) determining to human capital formation as was colonial education..
6
7

8 But as indigenous education systems varied greatly over communities and were
9
10 often not formalised, it is difficult to systematically take them into account in a
11
12 quantitative cross-country analysis - even if there were reliable cross-country data. And
13
14 even apart from data issues, also conceptually the impact of pre-colonial education on
15
16 colonial education is a vast topic in itself, mediated and shaped as that relation is by
17
18 environmental factors such as population density, the spread of Islam with its rival
19
20 schooling system, and the different policies of colonisers (see also Lange et al. 2006). For
21
22 reasons of scope and delineation we therefore consider it beyond this paper to treat it in
23
24 any detail; but we return to this issue in our concluding section 5 as an avenue for future
25
26 research.
27
28
29
30

31 We limit this study to a test of the effect of colonial human capital on subsequent
32
33 growth in former African colonies. We do however include control variables (relating to
34
35 legal origins, extractive institutions and geography). We will explicitly test in section 4
36
37 the two 'human capital' channels suggested in the literature. But first we turn to a
38
39 consideration of the context.
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

3. Colonial and Post-Colonial Education and Development in Africa: Historical Background

We organise our discussion of colonial education systems around the main distinction in our sample, which is the difference between educational policies by the British and the French colonising powers. The spread of European-style education in the territories they colonised was part of the late 19th and early 20th century process of empire building, in which the British and French vied for control over large parts of the African continent: formal education rates increased rapidly once the ‘scramble for Africa’ truly began in the 1880s, and indeed spread most quickly in contested areas. For instance Tanzania, handed to the British empire by the League of Nations after the First World War, and not threatened by the ambitions of rival colonisers, continued to have the lowest primary enrolment rates in all British Africa.

The two major European powers operated with distinct styles and educational outcomes. Benavot and Riddle (1988) calculate enrolment rates per school age population for different years before 1940, and find on average considerably higher figures in British Africa compared to French West Africa and Equatorial French Africa (see also Bowman and Anderson 1963). This difference in outcomes can be plausibly linked to the complex interaction, in both the French and British colonies, of their two most powerful institutions: the state, represented by the colonial administration system; and the church, represented by missionary educators.

3.1 *Colonial Administration*

The British exercised 'indirect rule' in Africa (Lugard 1929), where traditional structures and institutions were left intact and colonial rulers attempted to work with traditional chiefs. Within the colonial superstructure, chiefs maintained direct power over their peoples and lands (Lugard 1919). Indirect rule was motivated by pragmatism and by the aim of reducing the costs of colonial administration (Bayly 2004:222), and was characterised by a relative tolerance towards local customs compared to other colonial powers (Lugard 1929 and Wesseling 1991, Lloyd et al. 1999). The British did not introduce one centralised educational policy in their colonies but instead largely left it to missionaries to provide the population with education and to decide whether to educate also in the vernacular (Crowder 1964).

Missionaries had already laid the foundation of the schooling system before colonisation properly started, and the British government realised that they were the only party who had the organisation (and the motivation) to 'bear the brunt of the work in the early period' (Cowan et al 1965: 3). This attitude changed only after the First World War, when the colonial administration faced increasing needs for an educated administrative workforce. In a policy memorandum published shortly after the First World War, the British government announced that it 'reserved to itself the general direction and supervision of educational policy' and that 'voluntary agencies should be used in education' to which grants in aid were to be made if they 'conformed to the established standards' (Cowan et al. 1965:6). The colonial government increasingly involved itself in the content of educational programmes as it used inspection and supervision to monitor the spending of its funds. This larger involvement was partly also a response to growing concerns in the international community – expressed particularly

1
2
3 in the League of Nations – about the quality and accessibility of colonial education
4
5 (Cameron 1970, Cowan et al. 1965).
6
7

8 The major aim of British colonial schooling, then, was to provide Africans with
9
10 some minimal level of education and additionally build administrative capabilities of
11
12 traditional chiefs (Lloyd et al. 1999, Sutton 1965). But education was not a ticket to
13
14 upward mobility. Non ruling-class Africans who achieved higher education could not
15
16 participate in the ruling of the colony (Collins 1970). Since the British wished to avoid an
17
18 indigenous educated elite, colonial officials discouraged general education beyond the
19
20 primary level. Cost considerations also played a role in the British administration
21
22 preferring vocational training over general literacy and general education (Bayly
23
24 2004:222, Wesseling 1991).
25
26
27
28

29 In contrast, the French implemented an assimilation policy with the ultimate goal
30
31 of providing non-Western peoples with ‘cultural characteristics that would make them
32
33 acceptable as citizens on the same basis as their European fellow at home’ (Sutton 1965:
34
35 63), while ‘degrading or ignoring [traditional] institutions in favour of French customs,
36
37 culture and civilization’ (Collins, 1970: 162). Assimilation policies implied the
38
39 imposition of direct, centralized French control, including a centralised educational
40
41 policy. By the beginning of the 20th century all schools were obliged to teach in French
42
43 and to adopt the French school curriculum (Lloyd et al. 1999, Cowan et al. 1965).
44
45
46
47

48 Also in contrast to the British, the French colonial government divested
49
50 indigenous chiefs of their power by creating new administrative units (*cantons*) which
51
52 typically cut through traditional boundaries. Chiefs did keep their nominal positions but
53
54 were assigned to cantons on the basis of their education or demonstration of loyalty to the
55
56 French (Crowder 1964). The reward to obtaining education was thus admittance to the
57
58
59
60

1
2
3 lower echelons of the administration system (Collins 1970). Since most positions in the
4 colonial administration were to be filled by French nationals, trained in France, the
5 colonial government selected those who received advanced schooling with care, fearful
6 of unemployed higher educated Africans. A small elite excepted, pupils in the French
7 colonial schools received training in basic skills only (Lloyd et al. 1999).
8
9

10
11 Like the British colonial government, and largely for the same reasons, the French
12 colonial government gradually increased its investments in education after the First
13 World War. But until the end of the Second World War, the basic pattern established in
14 the French colonies already by the turn of the century did not change (Cowan et al.
15 1965:9).
16
17

18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

3.2 *Missionary Education*

Beginning in the 16th century, missionaries had brought European-style education to
Africa. During the first decades of colonisation, the British colonial government was
mainly occupied with maintaining law and order and missionaries remained the only
party active in providing formal education to African people in the British colonies
(Cameron 1970). An additional factor for leaving education to the missionaries was the
British desire, noted above, to contain the cost of colonial administration (Lugard 1929,
Bayly 2004). In contrast, the French Third Republic (1870-1940) enshrined the
separation of state and church in its constitution. While this was reflected in widespread
antipathy towards missionary education in the colonies, in practice, this resentment was
tempered by the government's recognition of the valuable role of missionary education in
the government's assimilation agenda. So was created a dual church-state educational

1
2
3 system, where missionary schools received state funding and functioned alongside state
4
5 schools, adhering to the French state's centralised educational policy.
6
7

8 The presence of missionary (rather than only state) schools arguable helped the
9
10 spread of Western-style education in the colonies. Both the Catholics in French Africa
11
12 and the predominantly Protestant (Anglican, but also other) missionaries in British Africa
13
14 realised, in the words of Bishop Joseph Shanahan, 'that those who hold the school hold
15
16 the country, hold its religion, hold its future' (as cited by Berman 1975: 22). Between
17
18 various churches, rivalry existed to reach as many people as possible. Helped by
19
20 improved means of communication, this stimulated the rapid spread of missionary
21
22 educational work in the first half of the 20th century, with enduring results (Cameron
23
24 1970). In those former French colonies where the missionary school system was more
25
26 developed (Madagascar, Central African Republic, Cameroon, the Congo and Gabon),
27
28 the overall post-colonial enrolment rates were highest (Debeauvais 1964; and Benavot
29
30 and Riddle, 1988). Missionary activity was even more determining to long-term
31
32 educational achievements in British Africa, where education was largely the domain of the
33
34 churches.
35
36
37
38
39

40
41 If the role of the churches within colonial education was markedly different
42
43 between French and British Africa, so were the missionaries. Unlike Catholic educators,
44
45 Protestants missionaries generally considered their presence temporary since they
46
47 envisioned independent, self-reliant indigenous churches (Berman 1975). This vision
48
49 required a relatively high standard of fairly broad-based education, from which a future
50
51 African church leadership could emerge. Also, due to the larger emphasis on individual
52
53 bible study in Protestant theology, Protestant missionaries placed more value on
54
55 spreading the key skill of reading among the whole population.
56
57
58
59
60

1
2
3 Both the colonial administration and the missionaries responded to most Africans'
4 initially hostile reaction to Western education differently, depending on the nature of the
5 local indigenous religion. In Muslim areas animosity to Western education was usually
6 respected and educational efforts restricted or abandoned. Large parts of Western Africa
7 were Islamicised already before the French arrival, and the French did not replace Islamic
8 education with their own system. In contrast, areas with traditionally animistic religions
9 were nearly all Christianised eventually, and schooling was an important instrument in
10 the process.
11
12
13
14
15
16
17
18
19
20
21

22 This policy had long-term consequences. As an illustration, the animistic southern
23 part of Nigeria was Christianised, while Christian missionary activity in the Muslim areas
24 of Northern Nigeria was forbidden (Sutton 1965). In consequence, by 1958 over 90
25 percent of the southern children were enrolled in primary schools, in contrast to only 9
26 percent in the northern part (Ogunsheye 1965; Morgan and Armer 1988). As Benavot and
27 Riddle (1988), Daun (200), Hanson II (1989) and Harrison (1988) show, colonial
28 education in French Africa, more of which covers traditionally Muslim areas than was the
29 case in British Africa, was clearly more restricted by this policy. Similarly, within the
30 French areas, predominantly Muslim West Africa shows lower formal educational
31 achievements compared to formerly animistic Equatorial Africa.
32
33
34
35
36
37
38
39
40
41
42
43
44

45 These differences in educational development have shown great stability over
46 time (Brown 2000). African educational standards in colonial times² correlate with
47 Africa's educational achievements in 1995³, with an R^2 of nearly 0.7. The post-colonial
48 African distributions of educational achievements have been so persistent in part because
49 many kept strong linkages to their colonial foundation (Lloyd et al. 2000). Newly post-
50 colonial independent government typically had limited resources and many challenges
51
52
53
54
55
56
57
58
59
60

1
2
3 and therefore did not take on extensive educational reforms: they 'hesitated to take over
4 *in toto* a system it had not the resources to run' as Cameron (1970: 25); and this reason
5
6 for continuity has remained relevant since - see Brown (2000) and Ntiri (1993). This
7
8 continuity lends partial support to our hypothesis that colonial education distributions had
9
10 an enduring impact on growth patterns. In the next section we illustrate this claim by
11
12 exploring the post-colonial development of educational systems in two countries:
13
14 francophone Senegal and Anglophone Uganda.
15
16
17
18
19
20
21

22 *3.3 Educational Continuity and Economic Development Illustrated: Senegal and Uganda*

23
24 Senegal's newly independent government inherited in 1960 the centralised educational
25
26 system characteristic of French colonies, with a relative large role for state-run schools. It
27
28 developed a new education policy aiming at free, universal and compulsory education
29
30 (Cain et al. 1994). Successive governments planned further reforms in 1969, 1979 and
31
32 1984 in order to develop a specifically African curriculum, to address issues of gender
33
34 inequality and urban/rural inequalities, to promote instruction in a national language, and
35
36 to provide more market-relevant skills. But as Evans (1994), Bakary (1995), and Cain et
37
38 al. (1994) all document, few of these plans were actually implemented and much of the
39
40 schooling system remained unchanged from the colonial period: most teaching is still in
41
42 French and the curriculum is still French-style. Financial restraints and the entrenchment
43
44 of elites benefitting from the status quo are among the reasons.
45
46
47
48
49

50
51 The allocation of educational resources in Senegal is heavily biased against rural
52
53 people: 93 percent of urban children but only 10 to 34 percent of rural children were
54
55 enrolled in schools during the 1990s (Cain et al. 1994). Senegal also has lower primary
56
57 enrolment rates and higher secondary and tertiary enrolment rates than most francophone
58
59
60

1
2
3 African countries (Evans 1994). Starting from very low literacy rates in 1960 when only
4
5 5 percent of the population could read, still in 1990 only 29 percent of adult population
6
7 was literate, increasing to 39 percent in 2006 (UNESCO; World Development Indicators
8
9 2006). Thus education has retained its colonial features of exclusivism and strong elitism,
10
11 mainly benefitting the better-off urban minority.
12
13

14
15 But despite these limitations and the relative inertia of the educational system
16
17 since colonial times, there is evidence that Senegalese education is positively linked to
18
19 economic development, for instance as measured by productivity in the manufacturing
20
21 sector (accounting for around 18 percent of GDP) as Mbay (2002: 17) finds.
22
23 Furthermore, Échevin and Murtin (2008:7) find that education is a productive input in all
24
25 formal sectors as well as in the services and trade segments of the informal sector (which
26
27 provides most employment in Senegal). Another education effect they find is that in
28
29 informal firms, the employer's level of education is positively associated with employee
30
31 wage levels.
32
33
34
35

36
37 In sum, the ex-French colony which is now Senegal has both retained many of the
38
39 colonial features in its educational system and has seen a positive contribution of
40
41 education to output, productivity and wage levels. The reach of its educational system has
42
43 remained limited, and so has the rate of its economic growth.
44
45

46
47 In contrast to Senegal, the British colony which is now Uganda had a colonial
48
49 primary school system predominantly run by churches (Cameron 1970). Although the
50
51 colonial government increasingly funded these schools to support educational expansion,
52
53 only 46 children per 1,000 population went to school around 1950. Soon after Uganda
54
55 became independent, the new government attempted to implement a more centralised
56
57 educational system compared to the decentralised system it inherited from the British
58
59
60

1
2
3 (Cameron 1970). It also laid heavier emphasis on primary education – a policy which
4 pushed up primary enrolment rates even in the 1970s and 1980s when Uganda went
5 through serious economic and political turmoil. This trend was reinforced and accelerated
6 when Museveni came to power in 1985, increasing the budget from the 10 percent it had
7 been under the Amin government to 23 percent (Byrnes, 1990). Literacy rates
8 consequently rose from 25 percent in 1974 to 56 percent in 1990 and on to 67 percent in
9 2006.

10
11
12
13
14
15
16
17
18
19
20 But many aspects of the Ugandan schooling system remain similar to the colonial
21 system despite these reforms - as in Senegal, though not quite to the same extent.
22 National exams determine the advancement from one level to the next, as is customary in
23 the British system. The British curriculum remained in place until 1974, when it was
24 replaced by a national curriculum. Instruction in local languages is common in the first
25 few years of primary school in some regions (as it was during colonial times), but English
26 is still the official language (Byrnes, 1990; StateUniversity, 2008).

27
28
29
30
31
32
33
34
35
36
37 As in Senegal, there is clear evidence that Uganda's economic performance is
38 linked to its educational achievements. Empirical studies find that the increase in
39 educational coverage from the mid-1980s is reflected in rising agricultural productivity
40 and in higher wages. Appleton and Balihuta (1996) argue that both general skills (for
41 example numeracy and literacy) and specific knowledge enabled farmers to better
42 implement productivity-enhancing policies such as fertiliser and pesticide applications.
43 Using Uganda's first nationally representative household survey, they find that the sum
44 of the total years of primary schooling of farm workers increases farm output
45 significantly. If farm workers had 4 years of schooling, output was 7 percent higher than
46 if they had no schooling. Doubling the number of schooling years from seven to fourteen
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 years (equivalent to an increase from one primary graduate to two graduates) led to an
4
5
6 estimated increase in output of 13 to 19 percent compared to the no schooling alternative
7
8 (Appleton and Balihuta 1996: 426). Schooling was also found to have spill-over effects,
9
10 where farmers with better educated neighbours tended to be more productive themselves.
11
12 The results also show that secondary schooling does not lead to growth in farm
13
14 productivity, and that there is very large variation in the education effects across
15
16 Uganda's regions (Appleton and Balihuta 1996: 424). Thus, this study finds that
17
18 education can raise the productivity of farm workers in several ways.
19
20

21
22 Appleton (2001) in another study finds that better education is associated with
23
24 higher levels of household welfare, the effect depending on the level of education and the
25
26 household's portfolio of economic activities. Primary education is found to modestly
27
28 raise the earnings in households engaged in agriculture, and more substantially raise
29
30 earnings of households engaged in wage employment. It also opens up opportunities to
31
32 move into nonagricultural self-employment. In contrast to Appleton and Balihuta (1996),
33
34 secondary schooling is found to raise agricultural productivity as well as wage incomes.
35
36 University education only has an effect on the earnings from wage employment. Beyond
37
38 primary education levels, further education induces a trade-off between losses in
39
40 agricultural and non agricultural self employment income and increases in wages
41
42 (Appleton 2001: 20). Thus education is also instrumental in the structural transformation
43
44 from an agrarian livelihood towards participation in an industrial or service oriented
45
46 economy.
47
48
49
50
51

52
53 Summing up these two country narratives, in both Senegal and Uganda the legacy
54
55 of colonial educational policies can still be discerned, especially in the value placed on
56
57 universal (primary) education. While both countries officially adhere to the goal of
58
59
60

1
2
3 providing universal education, only Uganda actually implemented policies to reach that
4
5 goal while the Senegalese educational system remains more exclusivist and elitist. This
6
7 parallels the more active British colonial policies towards a basic level of education for all
8
9 (Lloyd et al. 2000) compare to the more passive French attitude to mass education.
10
11 Uganda's educational expansion can be consistently linked to its impressive economic
12
13 development over the last two decades, as Appleton (2001: 23) points out. In contrast in
14
15 Senegal, Appleton and Teal (1999) argue, institutional restrictions and lack of investment
16
17 in complementary factors of production (such as capital) have restricted the opportunities
18
19 for many people to work in the formal sector. But given the positive educational returns
20
21 to productivity observed in the informal sector by Échevin and Murin (2008), Senegal's
22
23 limited post-colonial increase in education did have a modest positive influence on its
24
25 economic development.
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

4. Data and Analysis

We use education data collected from the colonial yearbooks⁴ on the last years of African colonialism between 1945 and 1950 (Sudan was the first sub-Saharan country to gain independence in 1956) but before the European influence on the economic system started to decline (Hazlewood 1972; Giblin 1980; Hopkins 1973). Three variables from this data set are relevant to the present analysis:

(i) and (ii) the percentage of Europeans per total population and the number of Europeans per square mile. A salient feature of this newly compiled data are that in the 1940s, British colonies were on average about five times more densely populated than French colonies (27 as compared to 5 persons per square kilometre), but with 1 % of the total population, the British presence was still about twice as large as the French who formed 0.5 % of the population.

(iii) the number of primary and secondary pupils per 1,000 population, which proxies investment in educational institutions following for example Easterlin (1981). As already noted in section 2, the ratio of total pupils to the population were clearly higher in British colonies⁵.

The number of pupils per population will be our measure for educational human capital in colonial times. This measure is obviously not a perfect one – for instance, with its emphasis on coverage rather than quality it leaves important dimensions of colonial education unaccounted for. We therefore explored three alternatives in some detail. These are: the share of public investment from colonial budgets into the education system; literacy rates; and the pupils-to-teacher ratio as a proxy for educational quality.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54

In each case we ran into very serious data difficulties. One conceptual problem with the measure of *budget shares for education* is that it is an input measure which is only indirectly linked to the output of colonial educational achievements, which we are interested in. Additionally it varies with variations in total budgets, which need not reflect variations of actual resources allocated to education. For instance, where more expenditure went to increases in teacher salaries, this does not necessarily reflect an increase in the coverage or quality of education (Lloyd et al. 1999). Likewise, in the years after the Second World war, colonial governments changed their policies towards Africa and focused more on development. This shift in policy involved substantial changes in the level of public expenditure, also directed at the social sector (Hopkins 1973; Hazlewood 1953/54). Measuring it consistently over countries is not really possible, as French and British (let alone other) definitions for budget components differed substantially. For instance, the French colonial government ran a general budget and a budget for each separate country it occupied; but the British did not. In brief, we judged it not possible to construct reliable data for educational budget shares in colonial times.

55
56
57
58
59
60

We found that the measure of *pupil-to-teacher ratios*, which would capture quality of education, was available for 15 countries only – ranging from 134 in Burkina Faso to 15 in Mauritania. While this limited number of observations disqualifies the variable from our statistical analysis below, it does seem that pupil-to-teacher ratios are clearly and negatively correlated to long term growth, as would be expected in the ‘human-capital’ view on Africa’s long-term growth. The correlation coefficient of pupil-to-teacher ratios with 1995 GDP per capita levels is -0.33.

Similarly, the measure of *literacy rates* would arguably be a better variable than pupils per population, as it is a more direct measure of educational achievement.

1
2
3 Unfortunately, to our knowledge literacy rates during colonial times are not available.
4
5 The earliest literacy rates for only 19 sub-Saharan countries are available for 1960. This
6
7 is 'too little, too late': only 19 observations from a time well after decolonialisation had
8
9 started. Still, there is considerable correlation between our measure of pupils per
10
11 population and literacy rates in 1960 (correlation coefficient 0.49). Moreover, correlation
12
13 between literacy rates in 1960 and in 1990 and 2006 are 0.71 and 0.62 respectively,
14
15 whereas correlation between pupils per population and literacy rates in 1990 and 2006 are
16
17 0.72 and 0.69 respectively. In summary, pupils per population is the only variable for
18
19 educational achievement that we could credibly construct from the colonial data; but the
20
21 above explorations suggest that it also captures literacy levels.
22
23
24
25
26

27 We apply these data to the question of Africa's long-term growth in two ways.
28
29 First, we explicitly check the two intervening steps in the Acemoglu et al. (2001)
30
31 argument that higher settler mortality led to colonies being more thinly settled by
32
33 Europeans and that a lower density of Europeans in the population led to different
34
35 institutions, worse for long-term growth. Acemoglu et al. (2001) argue this based on the
36
37 literature but without primary empirical evidence. In Table 1 we show that both these
38
39 relations cannot be detected for sub-Saharan Africa. This then leads us to the second
40
41 application, to explore an alternative explanation for Africa's long-term growth in an
42
43 instrumental-variable estimation, using our measure of pupils per population.
44
45
46
47

48 In Panel A of table 1 we report results from regressions of the density of
49
50 Europeans in the population and density of Europeans per surface measure on settler
51
52 mortality. Neither regression gives statistically significant results, and the negative R^2
53
54 indicate that models A1 and A2 perform worse than a constant-only model. In Panel B
55
56
57
58
59
60

we regress the two index measures for colonial institutions used by Acemoglu et al. (2001)⁶ on the density of Europeans in the population, and again fail to find a relation.

Table 1: The Links from Settler Mortality to European Densities to Institutions in Africa.

<i>Panel A: Colonial density of Europeans is not explained by settler mortality</i>				
Independent:	Europeans/population		Europeans/km2	
settler mortality	-0.000		0.000	
	(0.001)		(0.007)	
(constant)	0.005		0.021	
	(0.007)		(0.040)	
R2	-0.06		-0.06	
N	18		18	
<i>Panel B: Institutional quality is not explained colonial density of Europeans</i>				
Independent:	'Democracy'	'Democracy'	'Constraints on executive'	'Constraints on executive'
Europeans/pop	88.665		49.778	
	(53.862)		(36.587)	
Europeans/km2		15.641		7.691
		(9.902)		(6.778)
(constant)	2.078***	2.078***	3.104***	3.149***
	(0.709)	(0.720)	(0.482)	(0.493)
R2	0.069	0.061	0.036	0.012
N	24	24	24	24

Source: Settler mortality: Acemoglu et al. (2001), institutional variables: Polity IV, and authors' calculations. Standard errors are in parentheses.

These results in an African sample differ from those reported by Acemoglu et al. (2001) in a global sample of former colonies. This leads us to question the link between settler mortality and early institutions. While Acemoglu et al. (2001, footnote 21) report that there is a 'weaker relationship between settler mortality and institutions in a sole Africa sample', we actually find no relationship in an African sample. Naturally, our sample size

1
2
3 is necessarily small, especially for panel A results, and this may (partly) cause the lack of
4
5 statistical significance. But at the least we conclude that there is no evidence that African
6
7 colonial-era institutions are well proxied by settler mortality⁷.
8
9

10 This is not to say that there cannot be a link between settler mortality and African
11
12 growth, or that institutions are irrelevant in this relation; only that the account of this link
13
14 presented by Acemoglu et al. (2001) finds no support in the African data. Alternatively,
15
16 settler mortality may have influenced other aspects of colonial institutions than its
17
18 extractiveness. We noted in section 2 above that one candidate for an alternative channel
19
20 is colonial human capital. Glaeser et al. (2004), Djankov et al. (2003) and Lipset (1959,
21
22 1960) suggested that colonial human capital may have influenced both colonial
23
24 institutions and current human capital, and – through either or both of these channels – it
25
26 may affect present GDP levels. It is this explanation of Africa's long-term growth that we
27
28 will now explore empirically.
29
30
31
32
33

34 We start with an Ordinary Least Squares (OLS) specification where we regress
35
36 our human capital variable PUPILS (per 1,000 population) on PPP per capita GDP levels
37
38 in 1995⁸. We test robustness to other explanations by adding a legal-origin variable
39
40 (COLONISER, which takes value 1 for British and 0 for French colonies) and up to four
41
42 geographical variables from the following set: MALARIA (index of 1994 malaria
43
44 prevalence), COASTPOP (the share of the population living within 100 km from the
45
46 coast), LANDLOCKED⁹ (absence of overland access to sea), TROPICS (the share of
47
48 territory located in the tropics)¹⁰ and HYCROCARBONS (proven reserves of natural gas
49
50 and crude oil in 1993, BTUs per person). In selecting these variables, we follow La Porta
51
52 et al. (2004) and Gallup et al. (1998). We take out one of these variables in turn and in
53
54 Table 2 reports OLS estimation results. We find that in four of the seven specifications,
55
56
57
58
59
60

PUPILS significantly correlates with 1995 per capita GDP. Apparently OLS results are not robust to adding control variables; in addition, as noted they are plausibly biased because of endogeneity. Only MALARIA is consistently correlated with lower 1995 income levels.

Table 2: OLS regressions of Colonial Education and Controls on 1995 GDP per capita

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PUPILS	7.679** (3.708)	7.011* (3.691)	8.266* (4.000)	4.673 (3.848)	8.446** (3.949)	7.115 (4.644)	4.158 (3.288)
COLONISER	-0.246 (0.283)	-0.244 (0.255)	-0.302 (0.264)	-0.203 (0.265)	-0.282 (0.267)	-0.256 (0.297)	
MALARIA		-1.235** (0.466)	-1.065** (0.470)	-0.933** (0.406)	-1.309** (0.483)		-1.357*** (0.464)
COASTPOP		0.776* (0.439)	0.560 (0.643)	1.128 (0.672)		1.141 (0.769)	0.884 (0.605)
TROPICS		1.004 (0.814)	1.002 (0.853)		1.257 (0.827)	-0.181 (0.795)	0.929 (0.798)
HYDROCARBONS		0.047 (0.031)		0.055 (0.040)	0.033 (0.037)	0.028 (0.043)	0.046 (0.033)
LANDLOCK			-0.239 (0.361)	0.186 (0.448)	-0.325 (0.298)	0.155 (0.503)	0.008 (0.372)
(constant)	7.084*** (0.193)	7.044*** (0.725)	6.933*** (0.763)	7.686*** (0.482)	7.100*** (0.762)	6.978*** (0.845)	7.136*** (0.711)
R2							
N	30	28	28	28	28	28	33

Sources: Geographical data: Gallup et al (1998), Settler mortality data: Acemoglu et al. (2001), Colonizer data: La Porta et al. (2004), pupil data: authors' calculations. Standard Errors in parentheses.

Since the above analysis faces the same endogeneity challenges as the Acemoglu (2001) account, the question is whether the findings are robust to an alternative approach, addressing the endogeneity problem. We instrumented the colonial-era education

1
2
3 measure PUPILS (the percentage of pupils in the population) with settler mortality
4 SETTMORT around 1800, as in Acemoglu et al. (2001). We then regress this
5
6 instrumented human capital variable on PPP per capita GDP levels in 1995¹¹. Panel A in
7
8 table 3 presents the second stage IV regression¹². Panel B reports the corresponding first
9
10 stage results. We test robustness to other explanations by adding controls, as above. We
11
12 include not more than five variables in total because of the limited number of
13
14 observations (23) in this instrumented-variable regression¹³.
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 3: Instrumented Colonial Education Correlates with 1995 GDP per capita

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A – 2 nd stage of 2SLS: regressing ln GDPpc in 1995 on PUPILS (instrument: settler mortality) and controls						
PUPILS (INST)	31.504*** (11.759)	28.220*** (8.767)	23.612* (13.918)	26.590** (13.244)	27.863** (13.012)	30.144** (11.853)
COLONIZER	-0.593** (0.302)	-0.550** (0.268)	-0.502* (0.269)	-0.556* (0.291)	-0.570** (0.285)	-0.606** (0.290)
MALARIA		-0.683* (0.389)	-0.701* (0.398)	-0.744* (0.447)	-0.709* (0.376)	
HYDROCARBONS		0.034 (0.030)	0.012 (0.041)	-0.001 (0.039)		-0.025 (0.035)
COASTPOP			0.288 (0.709)			
LANDLOCKED				-0.207 (0.342)	-0.177 (0.370)	-0.193 (0.353)
(constant)	6.536*** (0.308)	7.244*** (0.504)	7.264*** (0.532)	7.347*** (0.704)	7.281*** (0.614)	6.593*** (0.374)
R2 (%)	25	37	46	31	27	34
N	30	28	28	28	28	33
Panel B – 1 st stage of 2SLS: regressing PUPILS on settler mortality and controls						
SETTMORT	-0.011** (0.005)	-0.008** (0.004)	-0.009** (0.004)	-0.009** (0.005)	-0.008* (0.005)	-0.010** (0.005)
COLONIZER	0.013 (0.009)	0.008 (0.009)	0.008 (0.008)	0.009 (0.009)	0.007 (0.010)	0.010 (0.009)
COASTPOP		0.040*** (0.015)	0.038** (0.015)			
TROPICS		0.072 (0.082)	0.053 (0.078)	0.098 (0.094)	0.125 (0.093)	0.029 (0.086)
HYDROCARBONS			0.002* (0.001)	0.001 (0.001)		0.001 (0.001)
LANDLOCKED				-0.011 (0.012)	-0.017 (0.011)	-0.008 (0.012)
(constant)	0.087*** (0.029)	-0.010 (0.086)	0.018 (0.082)	-0.014 (0.096)	-0.045 (0.095)	0.061 (0.090)
R2 (%)	19	29	46	39	35	26
N	24	23	23	23	23	23

Sources: Geographical data: Gallup et al (1998), Settler mortality data: Acemoglu et al. (2001), Colonizer data: La Porta et al. (2004), pupil data: authors' calculations. Standard Errors in parentheses.

1
2
3 In model (1) we include only a colonial origin variable. In model (2) we add MALARIA
4 and HYDROCARBONS, in model (3) also COASTPOP. In model (4) we replace
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

In model (1) we include only a colonial origin variable. In model (2) we add MALARIA and HYDROCARBONS, in model (3) also COASTPOP. In model (4) we replace COASTPOP with LANDLOCKED and in models (5) and (6) we run this model without HYDROCARBONS and MALARIA, respectively. We similarly vary control variables in the first stage equation. We find that variation in specification affects the model fit as expected, but not the key results. Panel B shows a significant negative effect of settler mortality on colonial education levels in all models, supporting the panel A specification¹⁴. And panel A shows that the instrumented PUPILS variable is positive associated with 1995 GDP levels in all specifications.

We conclude that the link between settler mortality and GDP in 1995, which Acemoglu et al. (2001) conjectured to run through ‘extractive institutions’, in Africa is most likely to run through human capital investments made in the colonial era through education¹⁵. This conclusion is robust to including controls for geography and legal origin. It connects to the description given by Acemoglu et al. (2001: 1374-1375) of extractive institutions as *inter alia* involving low educational and healthcare investments; but in view of the lack of support for the intervening steps in the Acemoglu et al. (2001) argument, presented in table 1, this interpretation is tenuous for the African setting. A more plausible understanding of the findings is to see them as support for the hypothesis that human capital, as distinct from the broader framework of production-and-commerce oriented institutions, was the more important factor for long-term growth (Glaeser et al., 2004). This view finds additional support in the lack of significant findings for institutional measures, such as ‘democracy’ and ‘constraints on the executive’ variables, reported in table 1.

1
2
3 In addition, our estimates offer support for the legal-origin explanation of growth:
4
5 the coefficient is negative and significant, implying that British colonization is correlated
6
7 with lower 1995 income levels than is French colonization¹⁶. However, the significance
8
9 of this exogenous variable is not robust to an OLS specification in Table 2, perhaps
10
11 because COLONISER captures some other systemic difference between British and
12
13 French colonies other than legal origin; for instance, the qualitative differences in
14
15 education systems noted in section 3. Another explanation is offered by Joireman (2006)
16
17 who observes significant heterogeneity with respect to colonial and post-colonial legal
18
19 experiences within the group of British (ex-) colonies. This reality may undermine a
20
21 single 'COLONISER' effect. Of the geographical variables, MALARIA is a robustly
22
23 negative influence on growth, both in OLS and IV specifications.
24
25
26
27
28

29 Having established a robust relation of colonial education with current per capita
30
31 income levels, we now pursue the 'educational' line of reasoning further by examining
32
33 the additional hypotheses that (i) colonial education achievements persisted (that is that
34
35 colonial education achievements statistically 'cause' present educational levels) and that
36
37 (ii) colonial human capital caused colonial institutions. On (i), table 4 shows that
38
39 instrumented education levels in the 1940s correlate to present enrolment rates, both
40
41 primary and secondary¹⁷. Thus, a first channel through which exogenous, colonial-era
42
43 investments in human capital have affected present growth is through the 'persistence
44
45 effect' mentioned above, by durable increases in levels of human capital till the present.
46
47 It is important to note that human capital persisted over time, while institutional measures
48
49 did not, as discussed above. This is in contradiction to the argument put forward by
50
51 Acemoglu et al. (2001) on the durability of institutional quality, but it is in line with the
52
53
54
55
56
57
58
59
60

Glaeser et al. (2004:274) argument that human capital is ‘the more basic cause of growth’.

Table 4: Colonial Human Capital Persisted

IV regression of colonial human capital on present human capital

Panel A – Second stage of 2SLS: regressing PUPILS (instrument: settler mortality) on primary and secondary enrolment rates in 1995

<i>2nd stage dependent:</i>	PRIM95	SEC95
Constant	0.843** (0.342)	-0.096 (0.206)
PUPILS	35.634*** (9.246)	15.060*** (5.561)
 <i>first stage dependent:</i>	 PUPILS	 PUPILS

Panel B - First stage of 2SLS: regressing settler mortality on PUPILS

Constant	0.111*** (0.032)	0.111*** (0.032)
SETTMORT	-0.013** (0.005)	-0.013** (0.005)
Obs.	19	19
R ²	0.63	0.49

Source: education data: Barro and Lee (2001), settler mortality data: Acemoglu et al (2001), pupils data: colonial yearbook and authors’ calculations. Standard errors are in parentheses.

Finally in table 5 we explore another channel by examining the influence of human capital investments on contemporaneous institutional indicators. We consider

1
2
3 institutional indices both on democracy and on constraints on the executive as used by
4
5 Acemoglu et al. (2001), and find positive and significant correlations of PUPILS with
6
7 both in an OLS framework. These findings are however not robust to using instrumented
8
9 education, so that the results may be partly driven by endogeneity of education to
10
11 institutions¹⁸. We conclude that the major channel through which colonial education
12
13 affects current growth is through the persistence effect in educational quality, more than
14
15 through institutional quality.
16
17
18
19
20
21

22 *Table 5: Colonial Education and Current Institutions*

23
24
25

<i>OLS regression of current institution on colonial education levels</i>		
Dependent:	DEMOCRACY75	CONSTRAINT
Constant	1.154 (0.733)	2.641*** (0.501)
PUPILS	37.990*** (13.346)	19.086** (9.133)
N	37	37
R ²	0.16	0.09

26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

44 Source: institutional data: Polity IV, pupil data: author's calculations. Standard Errors in parentheses.
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

5. Summary, Future Research and Conclusions

Acemoglu et al. (2001) conjecture that high settler mortality led colonising powers to introduce 'extractive' institutions, which set the economy on a long-term path of low and volatile growth. Low settler mortality, in contrast, supposedly caused colonisers to build institutions more conducive to growth. When we implement this analysis for a sample of only African countries, *both* these correlations disappear. Higher settler mortality did not lead to African colonies being more thinly settled by Europeans, and a lower density of Europeans in the population did not lead to different institutions, worse for long-term growth. While it is noteworthy that these findings might well be due to small sample size, they leave sufficient room to pursue an alternative explanation of long-term growth differences between African countries, based on colonial education rather than colonial extractive institutions. We collect archival material from colonial yearbooks to construct a novel data set on European and total population densities and investments that the colonial powers made in schooling.

In our analyses we find that African colonial education does possess both properties ascribed to institutions in the global Acemoglu et al (2001) study: it correlates well both with settler mortality and with current measures for human capital. Instrumenting education with settler mortality, we obtain again a robust explanation of long-term development which does not suffer from endogeneity and which is specific to Africa. We establish the robustness of this explanation by introducing controls for the legal origin of institutional systems and for a number of geographical variables, both of which have additional explanatory power. Further investigation of the channels through which education fostered growth suggests its positive impact on both current education

1
2
3 and on colonial institutions, though the causality between colonial institutions and
4 colonial education seems two-way.
5
6

7
8 There are several loose ends to this study, which provide opportunities for future
9 research. A big one relates to a relatively neglected issue in this strand of literature: what
10 was there before colonialism¹⁹? Obviously pre-colonial Africa was not *tabula rasa* with
11 respect to education. A next step in this literature would therefore be to enlarge the scope
12 of analysis one step further compared to the Acemoglu et al. (2001) and similar
13 frameworks (including this one) by noting that long-term growth may have depended not
14 only on colonial education, but also on pre-colonial African education levels. In line with
15 the human capital definition, this would include organized efforts by Africans to create or
16 pass on skills and knowledge that contributed to long-term growth of their economies –
17 either directly or by providing a basis for colonial education systems to be more rapidly
18 or slowly. One might conjecture, for instance, that peoples used to education of some sort
19 were more willing to have their children attend colonial schools; or conversely, that
20 indigenous and colonial education were rivals and so the presence of pre-colonial
21 education hampered the spread of colonial education. But as in the present study, a
22 simple causal approach would be amiss in that it ignores an endogeneity problem similar
23 to the one addressed in this paper. Namely, pre-colonial education cannot be assumed to
24 simply determine (positively or negatively) colonial education; instead, both are plausibly
25 jointly caused by underlying factors.
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

50 In light of the literature reviewed in this paper, one might speculate about two
51 strong candidates for this underlying factor: Islam and population density. Societies where
52 Islam - a 'religion of the book' - had spread before Western colonisation arrived, were
53 more likely to have more extensive pre-colonial formal schooling systems and higher
54
55
56
57
58
59
60

1
2
3 literacy levels. Bayly (2004:261), writing on pre-colonial states, observes that 'in Muslim
4 West Africa, the state crept forward in alliance with elite literacy and the spread of purist
5 Islam'. At the same time, as we noted in section 3, colonisers restricted colonial
6 education in Islamic areas. So 'Islam' may well be a factor jointly fostering pre-colonial
7 and hindering colonial education systems. A second candidate for the underlying factor is
8 population density, which is one sign of a society's potential for economic and social
9 development, including the development of schooling systems. Population density may
10 also be systematically related to origin of the coloniser. We learn this, for instance, from
11 Lange et al. (2006) who explain that 'Britain tended to colonize most extensively
12 precolonial regions that were sparsely populated and underdeveloped' (p 1412). This is in
13 comparison to the Spanish; in our data we detect that British colonies (mostly in east
14 Africa) were far more densely populated than other, predominantly French colonies,
15 many in arid West Africa. The densities are 27 and 5 persons per square kilometre,
16 respectively, and the correlation coefficient between population density and British origin
17 is a high + 0.26. In section 3 we describe how Britain also achieved higher enrolment
18 rates in its colonial schools than did the French, partly by making more use of missionary
19 education. Combining these facts, we have again that population density is an influence
20 both on colonial education and on pre-colonial education – in this case, both influences
21 are positive.

22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48 In light of these supposed two underlying factors, 'Islam' and 'population
49 density', with opposite effects on pre-colonial education, a further observation is that pre-
50 colonial education itself is far from homogeneous. The most important distinction may
51 well be between types of pre-colonial education linked to the spread of Islam and with
52 more emphasis on formal schooling and literacy; and informal, indigenous pre-colonial
53
54
55
56
57
58
59
60

1
2
3 education which had developed in Africa itself, plausibly in settled communities with
4 high population densities. Valuable follow-up research would be to investigate how
5
6 different kinds of pre-colonial education affected colonial education, and so indirectly
7
8 shaped the long-term economic fortunes of Africa.
9
10

11
12 This is an avenue for future research. The contribution of this study was to
13 suggest and substantiate that African colonial education levels are among the long-term
14
15 determinants of African economic growth. A more general implication is that the human-
16
17 capital explanation of growth appears a fruitful issue to be explored in the development
18
19 literature.
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- Acemoglu, D., Johnson, S., Robinson, J.A. (2001) 'The Colonial Origins of Comparative Development: An Empirical Investigation', *American Economic Review*, 91 (5), pp. 1369-1401.
- Acemoglu, D., Johnson, S., Robinson, J.A. (2002) 'Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution', *Quarterly Journal of Economics*, 117 (4), pp. 1231-1294.
- Adeyemi, M.B and Adeyinka A.A. (2003) 'The Principles and Content of African Traditional Education', *Education Philosophy and Theory*, 35 (4), pp. 425-440.
- Appleton, S. (2001) 'Education, Incomes and Poverty in Uganda in the 1990s' *CREDIT research paper* 01/22, University of Nottingham.
- Appleton, S. and Balihuta, A.A (1996) 'Education and Agricultural Productivity: Evidence from Uganda', *Journal of International Development*, 8 (3), pp. 415-444.
- Appleton, S. and Teal, F. (1999) 'Human Capital and Economic Development' *Background paper prepared for the African Development Report 1998*.
- Bakary, T.D. (1995) 'Educational Systems, Social Stratification and the Construction of the State' in Kirk-Green, A. and Bach, D. (eds) *State and Society in Francophone Africa since Independence*. London: Macmillan Press Ltd.
- Bardhan, P. (1993) 'Symposium on Democracy and Development', *Journal of Economic Perspectives*, 7 (3), pp. 45-49.
- Barro, R. J., and Lee, J.W. (2001) 'International Data on Educational Attainment: Updates and Implications', *Oxford Economic Papers*, 53, pp. 541-63.
- Barro, R.J. (1996) 'Democracy and Growth', *Journal of Economic Growth*, 1, pp. 1-27.

- 1
2
3 Barro, R.J. and Lee, J.W. (1993) 'International Comparisons of Educational Attainment',
4
5 *NBER Working paper* 4349.
6
7
8 Bayly, C. (2004) *The Birth of the Modern World*. Oxford: Blackwell
9
10 Benavot, A. and Riddle, P. (1988) 'The Expansion of Primary Education, 1870-1940:
11
12 Trends and Issues', *Sociology of Education*, 61 (3), pp. 191-210.
13
14
15 Bennel, P. (1996) 'Rates of return to education: does the conventional pattern prevail in
16
17 Sub-Saharan Africa?', *World Development*, 24 (1), 183-199.
18
19
20 Berman, E.H. (1975) 'Christian Missions in Africa', in: E.H. Berman (ed) *African*
21
22 *Reactions to Missionary Education*, Columbia University, pp. 1-53.
23
24
25 Bloom, D.E. and Sachs, J.D. (1998) 'Geography, Demography, and Economic Growth in
26
27 Africa', *Brookings Papers on Economic Activity* 2:1998.
28
29
30 Bourguignon, F. and Verdier, T. (2000) 'Oligarchy, Democracy, Inequality, and Growth',
31
32 *Journal of Development Economics*, 62, pp. 285-313.
33
34
35 Bowman, M.J. and Anderson, C.A. (1963) 'Concerning the Role of Education in
36
37 Development' in: C. Geertz (ed) *Old Societies and New States*, London: Collier-
38
39 MacMillan Ltd., pp. 245-279.
40
41
42 Brown, D.S. (2000) 'Democracy, Colonization, and Human Capital in Sub-Saharan
43
44 Africa', *Studies in Comparative International Development*, 35 (1), pp. 20-40.
45
46
47 Burkhart, R.E. and Lewis-Beck, M.S. (1994) 'Comparative Democracy: The Economic
48
49 Development Thesis', *the American Political Science Review*, 88.
50
51
52 Bush, K. and Saltarelli D. (2000) *The Two Faces of Education in Ethnic Conflict*.
53
54 Florence: UNICEF Innocenti Research Centre.
55
56 Rita M. Byrnes (ed) (1990) *Uganda: A Country Study*. Washington: GPO for the Library
57
58 of Congress. <http://countrystudies.us/uganda/35.html>
59
60

1
2
3 Cain, J., Schuman, S., VanBelle-Prouty, D. and Duerbeck, D. (eds.) (1994) 'Lessons
4 Learned on the Integration of Health, Population, Environment, Democratization, and
5 Privatization into Basic Education Curriculum in Africa' *Technical Paper*, 14, Creative
6 Associates International, Inc., Washington DC.
7

8
9
10
11
12 Cameron, J. (1970) *The Development of Education in East Africa*, Columbia: Columbia
13 University Press.
14

15
16
17 Clignet, R.P. and Foster, P.J. (1964) 'French and British Colonial Education in Africa',
18
19
20 *Comparative Educational Review*, 8 (2), pp. 191-198.
21

22
23
24
25
26
27
28 Coleman, J.S. (1965) 'Introduction: Education and Political Development' in: J.S.
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Coleman (ed) *Education and Political Development*, Princeton University Press, pp. 1-
50.

29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Collier, P. and Gunning, J.W. (1999), 'Why has Africa Grown Slowly?', *Journal of
Economic Perspectives*, 13 (3), pp.3-22.

34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Collins, R.O. (1970) '*Problems in the History of Colonial Africa 1860-1960*', Prentice-
Hall, Inc, Englewood Cliffs, N.J.

40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Cowan, L.G., O'Connell, J. and Scanlon, D.G. (eds.) (1965) *Education and Nation-
Building in Africa*, New York: Frederick A. Praeger.

44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Crowder, M. (1964) 'Indirect Rule – French and British Style' in: R.O. Collins (ed)
Problems in The History of Colonial Africa 1860-1960, (1970), Prentice-Hall, Inc,
Englewood Cliffs, N.J, pp. 211-219.

52
53
54
55
56
57
58
59
60
Daun, H. (2000) 'Primary Education in Sub-Saharan Africa- a moral issue, an economic
matter, or both?', *Comparative Education*, Vol. 36 (19), pp. 37-53.

57
58
59
60
Davidson, B (1992) *The Black Man's Burden*. New York: Three Rivers Press.

- 1
2
3 Debeauvais, M. (1964) 'Education in Former French Africa', in: J.S Coleman (ed)
4
5 *Education and Political Development*, (1965), Princeton University Press, pp. 75-91.
6
7
8
9 Dewey, J. (1916) '*Democracy and Education*', The Macmillan Company (electronic
10
11 resource was consulted, published 1997, Campaign, Ill.).
12
13
14 Diamond, J. (1999) '*Guns, Germs and Steel: the Fates of Human Societies*', W.W.
15
16 Norton.
17
18
19 Djankov, S., Glaeser, E.L., La Porta, R., Lopez-de-Silanes, F., Shleifer, A. (2003) 'The
20
21 New Comparative Economics', *Journal of Comparative Economics*, 31, pp. 595-619.
22
23
24 Djankov, S., La Porta, R., Lopez-de-Silanes, F., Shleifer, A. (2002) 'Courts: The Lex
25
26 Mundi Project', *NBER Working Paper* 8890.
27
28
29
30 Easterlin, R.A. (1981) 'Why Isn't the Whole World Developed?' *Journal of Economic*
31
32 *History*, 41 (1), pp. 1-19.
33
34
35 Easterly, W. and Levine, R. (1997) 'Africa's growth tragedy: policies and ethnic
36
37 divisions', *Quarterly Journal of Economics*, 112, (4), pp. 1203-1250.
38
39
40 Easterly, W. and Levine, R. (1997) 'Africa's Growth Tragedy: Policies and Ethnical
41
42 divisions', *The Quarterly Journal of Economics*, November 1997.
43
44
45 Échevin, D. and Murtin F. (2008) 'What Determines Productivity in Senegal? Sectoral
46
47 Disparities and the Dual Labour Market', *GRÉDI working paper* 07-15.
48
49
50 Evans, D.R. (1994) 'Education Policy Formation in Africa: A Comparative Study of Five
51
52 Countries', *Technical Paper*, 12, IDCA, Washington DC.
53
54
55 Gallego, F.A. (2006) 'Historical Origins of Schooling: The Role of Political
56
57 Decentralisation', *Working Paper*.
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Gallup, J.L., Sachs, J.D, and Mellinger, A.D. (1998) 'Geography and Economic Development', *NBER Working Paper* 6849.

Galor, O., Maov, O. and Vollrath, D. (2005) 'The Emergence of Human Capital Promoting Institutions in the Process of Development', *Working Paper* .

Gardner, P. (2005), 'A Characterisation of Growth in Sub-Saharan Africa', *ERN Economic Growth WPS*, 6 (55).

Gemmel, N. (1996) 'Evaluation the Impacts of Human Capital Stocks and Accumulation on Economic Growth: Some New Evidence', *Oxford Bulletin of Economics and Statistics* 58 (1), pp. 9-28.

Giblin, J. (1980), 'The Image of the Loyal African during World War II and its Post war Use by the French Communist Party', *Canadian Journal of African Studies*, 14 (2), pp. 319-326.

Glaeser, E.L. and Shleifer, A. (2002) 'Legal Origins', *Quarterly Journal of Economics*, 117 (4), pp. 1193-1229.

Glaeser, E.L., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2004) 'Do Institutions Cause Growth?', *Journal of Economic Growth* 9, pp. 271-303.

Glaeser, E.L., Ponzetto, G., Schleifer, A. (2006) 'Why Does Democracy Need Education?', *NBER Working Paper* 12128.

Greene, W. (2003) '*Econometric Analysis*', Englewood Cliffs, N.J.: Prentice Hall.

Hanson II, J.R. (1989) 'Education, Economic Development, and the technology Transfer: A colonial Test', *The Journal of Economic History*, 49 (4), pp. 939-957.

Harrison, C. (1988) '*France and Islam in West Africa, 1860-1960*', Cambridge: Cambridge University Press.

1
2
3 Hazlewood, A. (1953-1954), 'Colonial External Finance Since the War', *The review of*
4
5
6 *Economic Studies*, 21 (1), pp. 21-52.

7
8 Huber, E., Rueschemeyer, D. and Stephens, J.D. (1993) 'The Impact of Economic
9
10 Development on Democracy', *Journal of Economic Perspectives*, 7 (3), pp. 71-85.

11
12 Huntington, S. (1968) *Political Order in Changing Societies*. New Haven and London:
13
14 Yale University Press

15
16 IMF, *World Economic Outlook database* (2004), Washington DC: the IMF.

17
18 Inkeles, A. and Sirowy, L. (1990) 'The Effects of Democracy on Economic Growth and
19
20 Inequality: A Review', *Studies in Comparative International Development*, 25, pp. 126-
21
22
23
24
25 157.

26
27 Isham, J., Woolcock, M., Pritchett L. and Busby, G. (2003) 'The Varieties of Rentier
28
29 Experience: How Natural Export Structures Affect the Political Economy of Economic
30
31 Growth', *Middlebury College Economics Discussion Paper* no. 03-08.

32
33
34 Joireman, S. (2006) 'The Evolution of the Common Law: Legal Development in Kenya
35
36 and India', *Journal of Commonwealth and Comparative Studies* 41 (2), pp. 190-210.

37
38 Judson, R (1998) 'Economic Growth and Investment in Education: How Allocation
39
40 Matters', *Journal of Economic Growth*, 3(4), pp. 337-359

41
42
43 Kmenta, J. (1977) *Elements of Econometrics* New York: Macmillan.

44
45
46 Knack, S. and Keefer, P. (1995), 'Institutions and Economic Performance: Cross-Country
47
48 Tests Using Alternative Institutional Measures', *Economics and Politics*, 7, pp. 207-227.

49
50 Krueger, A. and M. Lindahl (2001) 'Education for Growth: Why and For Whom?'
51
52
53 *Journal of Economic Literature* 39(4), pp. 1101-1136

54
55
56 La Porta, R., Lopez-de-Silanes, F., Pop-Eleches, C. and Shleifer, A. (2004) 'Judicial
57
58 Checks and Balances', *Journal of Political Economy*, 112 (2), pp. 445-470.

1
2
3 La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. (1998) 'The Quality of
4 Government', *NBER Working Paper* 6727.

5
6
7
8 Landes, D. (1997) *The Wealth and Poverty of Nations*. New York: Norton

9
10 Lange, M., Mahoney J. and vom Hau, M. (2006) 'Colonialism and Development:
11 Comparative Analysis of Spanish and British Colonies', *American Journal of Sociology*
12 111(5) pp. 1412-1462

13
14
15
16
17 Limongi, F. and Przeworski, A. (1993) 'Political Regimes and Economic Growth',
18 *Journal of Economic Perspectives*, 7 (3), pp. 51-69.

19
20
21
22 Lindert, P. H. (1999) 'Democracy, Decentralisation, and Mass Schooling Before 1914',
23 *Working Paper* 104, Agricultural History Centre, University of Davis.

24
25
26
27 Lipset, S. M. (1959) 'Some Social Requisites for Democracy: Economic Development
28 and Political Legitimacy', *American Political Science Review*, 53, pp. 69-105.

29
30
31
32 Lipset, S. M. (1960) *The Political Man: the Social Basis of Modern Politics*, New York:
33 Doubleday.

34
35
36
37
38
39
40
41
42 Lloyd, C.B., Kaufman, C.E. and Hewett, P. (2000) 'The Spread of Primary Schooling in
43 Sub-Saharan Africa: Implications for Fertility Change', *Population and Development*
44 *Review*, 26 (3), pp. 483-515.

45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Lloyd, C.B., Kaufman, C.E. and Hewett, P. (2000) 'The Spread of Primary Schooling in
Sub-Saharan Africa: Implications for Fertility Change', *Policy Research Division*
Working Paper, 127.

Lugard, F.D. (1929) *The Dual Mandate in British Tropical Africa* William Blackwood
& Sons Ltd, London.

1
2
3 Lugard, Lord, F.D. (1919) 'Methods of Native Administration: Political Officers and
4 Native Rulers', in: R.O. Collins (ed) *Problems in The History of Colonial Africa 1860-*
5
6 *1960*, (1970), Prentice-Hall, Inc, Englewood Cliffs, N.J, pp. 103-118.
7

8
9
10 Maddison, A. (1995) '*Monitoring the World Economy 1820-1992*', Development Centre
11
12 Studies, OECD.
13

14
15 Marshall, M.G. and Jagers, K. (2002) 'Polity IV Project', Center for International
16
17 Development and Conflict Management, University of Maryland.
18

19
20 Mbay, A.A. (2002) 'An Industry Level Analysis of Manufacturing Productivity in
21
22 Senegal', *Africa Region Working Paper Series 41*.
23

24
25 Morgan, W.R. and Armer, J.M. (1988) 'Islamic and Western Educational
26
27 Accommodation in a West-African Society: A Cohort-Comparison Analysis', *American*
28
29 *Sociological Review*, 53 (4), pp. 634-639.
30

31
32 North, D.C. (1990) '*Institutions, Institutional Change and Economic Performance*',
33
34 Cambridge: Cambridge University Press.
35

36
37 Ntiri, D.W. (1993) 'Africa's Educational Dilemma: Roadblocks to Universal Literacy for
38
39 Social Integration and Change', *International review of Education*, 39 (5), pp. 357-372.
40

41
42 Nunn, N. (2007), 'The Long-Term Effects of Africa's Slave Trades' *MPRA Paper 4134*,
43
44 University Library of Munich, Germany.
45

46
47 Nunn, N. (2007), 'The Legacy of Exploitation: a Model of Africa's Underdevelopment'
48
49 *Journal of Development Economics*, 83 (1), pp. 157-175
50

51
52 Ogunsheye, A. (1965) 'Nigeria', pp. 123-143 in *Education and Political Development*,
53
54 (1965) edited by J.S Coleman, Princeton University Press.
55

56
57 Persson, T., Tabellini, G. (2000) '*Political Economics: Explaining Economic Policy*',
58
59 MIT Press.
60

1
2
3 Pritchett, L. (2000) 'Where Has All the Education gone?' *World Bank Economic Review*
4
5
6 15 (3).

7
8 PRS Group, International Country Risk Guide (ICRG); www.prsgroup.com

9
10 Rajan, R.G., Zingales, L. (2006) 'The Persistence of Underdevelopment: Institutions,
11
12 Human Capital, or Constituencies?', *NBER Working Paper* 12093.

13
14
15 Rehme, G (2007) 'Education, Economic Growth and Measured Income Inequality',
16
17
18 *Economica* 74 (295), pp. 493-514

19
20 Rodrik, D. A. Subramanian, and F. Trebbi (2002), 'Institutions Rule: The Primacy of
21
22 Institutions over Geography and Integration in Economic Development', *NBER Working*
23
24
25 *Paper* 9305.

26
27 Rodrik, D. (1999) 'Where Did All the Growth Go? External Shocks, Social Conflict, and
28
29
30 Growth Collapses', *Journal of Economic Growth*, 4 (4), pp. 385-412.

31
32 Rodrik, D. (2002), 'Institutions, Integration, and Geography: In Search of the Deep
33
34 Determinants of Economic Growth', in: Rodrik (ed), *In Search of Prosperity: Analytical*
35
36
37 *Country Studies on Growth*, Princeton University Press, Princeton, NJ, 2003

38
39 Rodrik, D., Subramanian, A. and Trebbi, F. (2002) 'Institutions Rule: The Primacy of
40
41
42 Institutions Over Geography and Integration in Economic Development', *NBER Working*
43
44
45 *Paper* 9305.

46
47 Sachs, J.D. (2001) 'Tropical Underdevelopment', *NBER Working Paper* 8119.

48
49 Sachs, J.D. (2003) 'Institutions Don't Rule: Direct Effects of Geography on Per Capita
50
51
52 Income', *NBER Working Paper* 9490.

53
54 Sachs, J.D. and Warner, A.M. (1997) 'Sources of Slow Growth in African Economies',
55
56
57
58
59
60 *Journal of African Economies*, 6 (3), pp. 335-376.

1
2
3 Schultz, T.P. (1999) 'Health and Schooling Investments in Africa', *Journal of Economic*
4
5 *Perspectives*, 13 (3), pp. 67-88.

6
7
8 Schultz, T.W. (1961) 'Investment in Human Capital', *The American Economic Review*,
9
10 51 (1), pp. 1-17.

11
12
13 Sokoloff, K.L. and Engerman, S.L. (2002), 'Factor Endowments, Inequality, and Paths of
14
15 Development Among New World Economies', *NBER Working Paper 9259*

16
17
18 Sutton, F.X. (1965) 'Education and the Making of Modern Nations', in: by J.S Coleman
19
20 (ed) *Education and Political Development*, Princeton University Press pp. 51-74.

21
22 Stateuniversity (2008) <http://education.stateuniversity.com/pages/1585/Uganda->
23
24 [educational-stsem](http://education.stateuniversity.com/pages/1585/Uganda-educational-stsem). Accessed July 8, 2008.

25
26
27 Tanzi and H. Davoodi (1998) '*Roads to Nowhere: How Corruption in Public Investment*
28
29 *Hurts Growth*'. Washington, D.C.: International Monetary Fund.

30
31
32 Tilly, C. (1998) *Durable Inequality*, University of California Press, Berkeley.

33
34
35 Timmer, C.P. (2002) 'Agriculture and Economic Developem't in: B. Gardner and G.
36
37 Rausser (ed) *Handbook of Agricultural Economics*, (2002) volume 2.

38
39
40 Topel, R (1999) Labor Markets and Economic Growth, In: O. Ashenfelter and D. Card,
41
42 (eds.) *Handbook of Labor Economics*, Amsterdam: North Holland.

43
44
45 Vinod, H and Kaushik, S (2007) 'Human Capital And Economic Growth: Evidence From
46
47 Developing Countries', *American Economist* 51 (1), pp. 29-39

48
49
50 Weingast, B. (1997) 'The political foundations of democracy and the rule of law'
51
52 *American Political Science Review*, 91 (2), pp. 245-263.

53
54
55 Wesseling, H.L. (1991) '*Verdeel en Heers: de Deling van Afrika 1880-1914*'
56
57
58
59
60 Amsterdam: Bakker.

1
2
3 White, B.W. (1996) 'Talk about School: education and the colonial project in French and
4 British Africa (1860-1960)', *Comparative Education*, 32 (1), pp. 9-25.
5
6

7
8 Wiseman, J.A. (1996) '*The New Struggle for Democracy in Africa*', Aldershot UK.
9
10 *Working Paper* No. 4349.
11

12 World Bank, '*World Development Indicators 2005*', Washington DC: The World Bank.
13

14 World Bank, '*World Development Indicators 2006*', Washington DC: The World Bank.
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

¹ Obviously, this is not to say that education is therefore an unmixed blessing; the formation of human capital enabling economic growth may still co-exists with for example cultural repression perpetuated through educational systems.

² Total number of pupils divided by total population. See appendix B for sources.

³ Average years of primary schooling in the total population over age 15, taken from the Barro and Lee data set (Barro and Lee 2001).

⁴ See Appendix B for sources.

⁵ We present an overview of key statistics in the data Appendix A.

⁶ As proxies for colonial-era institutions Acemoglu et al. (2001) used a democracy index at the first year of independence, varying between the 1950's and 1975, an index measure for constraint on the executive at first year of independence, where more constraints reflect better institutions.

⁷ An important reason underlying this result may also be that the stability over time of institutions assumed in Acemoglu et al. (2001) should be questioned in the African context. African colonial-era institutions do not correlate well with current institutions (which cause current GDP). Twenty-four of the 44 African countries included in the Polity IV data experienced shortly after independence an (often sharp) decline in the democracy index used here and in Acemoglu et al. (2001). Of the 14 countries with a low initial measure for 'constraint on the executive', 6 countries showed an appreciable improvement subsequently. This volatility links in with a cross-country analyses of institutional indices by Glaeser et al. (2004) who note that these index measures tend to reflect short-term changes (for example election results) rather than the stabler, underlying institutions.

⁸ We chose 1995 to allow comparison to Acemoglu et al (2001).

⁹ Note that including COASTPOP and LANDLOCKED does not amount to the same thing since they are quite different variables. There are countries with coastlines (LANDLOCK=0) such as Kenya, but with coastal populations of only 6 percent. Compare also Mozambique (40 %), Sudan (2%) and Tanzania (16%) (Gallup et al. 1998:31)

¹⁰ TROPICS has little variation within Africa, with many values equal or close to 100 %. Excluding it improves the significance of findings, without qualitatively changing them.

¹¹ We chose 1995 to allow comparison to Acemoglu et al (2001).

¹² We combine an instrumental variable approach with generalized least squares, which accounts for the correlation structure in the disturbances across equations. This procedure, also known as 'three stage least squares', results in consistent estimates that are more efficient than 2sls without using the information contained in cross-equation correlations of

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

disturbances. We estimated our equations also without GLS (i.e. 'simple' 2sls), which produces qualitatively identical, but less significant estimates, as expected. See Kmenta (1977) and Greene (2003) for more detail.

¹³ An instrumented model without control variables, regressing LOG GDP pc in 1995 only on PUPILS (instrumented with SETTMORT) plus a constant, yields a similar coefficient estimate (0.24.941) and significance levels (s.e. is 12.897) for PUPILs as model (1), but has a negative R2 indicating under-specification.

¹⁴ Instrumenting colonial human capital with other (legal-origin or geographical) exogenous variables did not yield statistically significant explanations of 1995 GDP. Although colonial education does correlate with several of the exogenous variables considered here, only settler mortality is a suitable instrument for human capital variables in an equation explaining 1995 GDP. Results from these additional analyses are available on request from the authors.

¹⁵ Our newly compiled data set allowed us to also consider health, another dimension of human capital. In IV and OLS regressions of HOSPITALS, a measure for colonial healthcare (the number of hospitals per 1000 population health), again using settler mortality as the instrument, on 1995 GDpc, HOSPITAL yields a valid instrumental-variable explanation of present GDP levels. But model performance is very weak, with a negative R2 indicating that a constant-only model would predict better. Also, the relation between colonial health and present pc GDP relation was not robust to introducing controls.

¹⁶ Interestingly, Lange et al.(2006:1412) find that 'British colonization had comparatively positive effects' on economic development, that is compared to Spanish colonization.

¹⁷ Average years of primary schooling in the total population over age 15, taken from the Barro and Lee data set (Barro and Lee 2001). Using World Development Indicators as the source yields similar results.

¹⁸ Results from the 2SLS analysis are available on request from the authors.

¹⁹ We are grateful to an anonymous referee for suggesting this.

Appendix A: Geographical and Institutional Data

We thank Acemoglu for kindly providing the data on which the Acemoglu et al. (2001) results are based; and Gallup, Sachs and Mellinger for making their data on which the Gallup et al. (1998) results are based available on the Internet.

Data description

Variable	Year	Source
Settler Mortality	1800-1850	Acemoglu et al, 2001
Settler mortality is potential settler mortality measured in terms of deaths per annum per 1000 'mean strength' (raw mortality numbers are adjusted to what they would be if a force of 1000 living people were kept in place for a whole year).		
Democracy at first year of independence before 1975	Various years	Polity IV
Democracy indicator based on the competitiveness of political participation, openness and competitiveness of executive recruitment and constraints on the executive. Scale between 0 and 10, where higher scores indicate more democracy. Year of observation is the first year of independence as long as that is before 1975, otherwise the country gets a score of 1 (in line with Acemoglu et al 2001).		
Constraint on the executive before 1975	Various years	Polity IV
Measure of the extent of institutionalised constraints on the decision making powers of chief executives, whether individuals or collectivises. Scale between 0 and 7, where higher scores indicate more constraints. Year of observation is the first year of independence as long as that is before 1975, otherwise the country gets a score of 1 (in line with Acemoglu et al 2001).		
PopCoast	1994	Gallup et al 1998
Proportion of the population living within 100 km of the coastline.		
Landlocked dummy		Gallup et al 1998
A binary dummy, with a value one indicating landlockedness		
Malaria index	1966, 1994	Gallup et al 1998
Index of Malaria prevalence based on a global map of extent of malaria in 1966 (WHO 1967), and the fraction of falciparum malaria. 'The index is the product of the fraction of land area subject to malaria times the fraction of falciparum malaria cases'. (Gallup et al 1998)		
Life expectancy 1965	1965	Gallup et al 1998

Data Gallup et al took form the United Nations		
Tropic	1996	Gallup et al 1998
The proportion of a country's land area within the geographical tropics		
LEGALORIGIN		
Binary dummy, where value one indicates a former British colony.		Authors
Hydrocarbons	1993	Gallup et al 1998
Hydrocarbon deposits are total BTU's per person of proven crude oil and natural gas reserves in 1993, which Gallup et al collected from World Resource Database (1996-1997)		

Appendix B: Collected Colonial Data

Our newly constructed date set is comprised of data on former British and French colonies in Africa. Based on colonial yearbooks of the years 1945-1955 (detailed sources are below), we calculated variables that could serve as proxies for the general institutional environment between 1945 and 1950. The data set consists of four modules:

- a) population density and European presence (calculated as density per squared kilometre and as the proportion of Europeans to total population) in countries is collected.
- b) human capital: school pupils as a proportion to total population.

Sources

French West Africa (Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal)	Annuaire Statistique de L'Afrique Occidentale Francaise, 1949 Volume 4, and 1950 à 1955 Volume 5
French Equatorial Africa (Central African Republic, Chad, Congo Republic, Gabon)	Annuaire Statistique de L'Afrique Equatoriale Française, 1936-1950 Volume 1, 1951 à 1955 Volume 2
Madagascar	Annuaire Statistique de Madagascar, 1938 - 1951, Vol. 1
Botswana	Official Year Book of the Union [of South Africa] and of Basutoland [Lesotho], Bechuanaland Protectorate [Botswana] and Swaziland, 1950 no 26.
Ghana	Economic and Statistical Bulletin of the Gold Coast, April

		Digest of Statistics, November 1953, No. 4
Kenya		Statistical Abstract, 1955
Lesotho		Official Year Book of the Union [of South Africa] and of Basutoland [Lesotho], Bechuanaland Protectorate [Botswana] and Swaziland, 1950 no 26.
Malawi		Federation of Rhodesia and Nyasaland: Census of Population 1956
		Monthly Digest of Statistics, April 1955, Vol 2, No. 1
Mauritius		Final report on the Census Enumeration made in the Colony of Mauritius and its Dependencies on 11th June, 1944
		Blue Book of the Colony of Mauritius and its Dependencies, 1946/1947
		Yearbook of Statistics, 1959 No. 14.
Nigeria		Blue Book for the year ending 31st December, 1938.
		Digest of Statistics, Vol. 2, October 1952, No. 1 and 4.
		Digest of Statistics 1956
Sudan		Foreign Trade Report (with some internal statistics), 1949
		First population census of Sudan 1955/56, Final Report, vol. 1
Swaziland		Official Year Book of the Union [of South Africa] and of Basutoland [Lesotho], Bechuanaland Protectorate [Botswana] and Swaziland, 1950 no 26.
Tanzania		Statistical Abstract, 1938-1952 (Tanganyika)
Uganda		Statistical Abstract, 1957
Zambia		Federation of Rhodesia and Nyasaland: Census of Population 1956
		Monthly Digest of Statistics, April 1955, Vol. 2, No. 1
		Economic and Statistical Bulletin (Northern Rhodesia), February 1953, Vol. 5, No. 11
Zimbabwe		Federation of Rhodesia and Nyasaland: Census of Population 1956.
		Monthly Digest of Statistics, April 1955, Vol 2, No. 1
		Official Year Book of Southern Rhodesia, 1952, No. 4
Additional data on Education		Mitchell, B.R. (2003) 4 th edition The Statesman's Year-Book (1946, 1948, 1955).

Variable description and availability

Variable	Description	Year	Source
Population Density	Total population per squared kilometre	1948-55	French West Africa (Benin, Burkina Faso, Cote d'Ivoire,

		1950-55	French Equatorial Africa (Central African Republic, Chad, Congo Republic, Gabon)
		1946-51	Madagascar
		1948-53	Ghana
		1947-51	Kenya
		1946-51	Malawi
		1946-47	Mauritius
		1938-50	Nigeria
		1936,46,50	Botswana
		1936,46,50	Lesotho
		1949-55	Sudan
		1936,46,50	Swaziland
		1947-52	Tanzania
		1947-51	Uganda
		1946-51	Zambia
		1946-51	Zimbabwe
European density	Total European population per squared kilometre	1948-55	French West Africa (Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal)
		1950-55	French Equatorial Africa (Central African Republic, Chad, Congo Republic, Gabon)
		1946-51	Madagascar
		1948-53	Ghana
		1947-51	Kenya
		1946-51	Malawi
		1946-47	Mauritius
		1938-50	Nigeria
		1936,46,50	Botswana
		1936,46,50	Lesotho
		1949-55	Sudan
		1936,46,50	Swaziland
		1947-52	Tanzania
		1947-51	Uganda
		1946-51	Zambia
		1946-51	Zimbabwe
European pop	Total European population as percentage of total population	1948-55	French West Africa (Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal)
		1950-55	French Equatorial Africa (Central African Republic, Chad, Congo Republic, Gabon)
		1946-51	Madagascar
		1948-53	Ghana
		1947-51	Kenya
		1946-51	Malawi
		1946-47	Mauritius

1			
2			
3			
4			
5		1938-50	Nigeria
6		1936,46,50	Botswana
7		1936,46,50	Lesotho
8		1949-55	Sudan
9		1936,46,50	Swaziland
10		1947-52	Tanzania
11		1947-51	Uganda
12		1946-51	Zambia
13		1946-51	Zimbabwe
14			
15	Education	Total students in primary and secondary education to total population	
16		1948-1950/51	French West Africa (Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal, Togo)
17		1950-52	French Equatorial Africa (Central African Republic, Chad, Congo Republic, Gabon)
18		1947-49	Madagascar
19		1945	Gambia
20		1945-47	Ghana
21		1947-49	Kenya
22		1947-50	Malawi
23		1947-49	Mauritius
24		1949-50	Nigeria
25		1947-49	Botswana
26		1947-49	Lesotho
27		1947-49	Sudan
28		1948-50	Swaziland
29		1947-49	Tanzania
30		1949-51	Uganda
31		1948-51	Zambia
32		1948-50	Zimbabwe
33		1947-49	Angola
34		1948-50	Cameroon
35		1947-49	Mozambique
36		1947-49	Sierra Leone
37		1947-49	Congo DM
38		1950-52	Liberia
39		1945-51	Burundi
40		1945-51	Rwanda
41		1950	Guinea-Bissau
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			