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Jacek Rostowski, Bogdan Stacescu

The Wig and the Pith Helmet – the Impact of "Legal School" *versus* Colonial Institutions on Economic Performance (second version)

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Contents

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Abstract

The difference between common law and French civil law countries fails to have a statistically significant effect on economic growth, whereas the difference between British and French colonies has a strong effect when the two pairs of institutional variables are included separately in regressions. Moreover, when both pairs of variables are included together, the impact of the difference in legal school becomes highly insignificant, whereas the difference in colonial origin continues to be highly significant. Throughout we control for fundamental environmental and historical variables. Thus, we find that certain objective markers of historically based institutional differences do have an important impact on economic growth. We also find evidence that the incidence of malaria is endogenous to economic development. Our results have implications for the "geography vs. institutions" and "policies vs. institutions" debates on the deep determinants of economic growth.

1. Economic development and the role of institutions

Why different economies grow at different rates is one of the most important questions in economics. Barro's (1991) classical paper on economic growth across the world introduced dummies for sub-Saharan Africa and Latin America, and found that their coefficients were negative and significant, but did not explain why this was the case. Many empirical studies show that so-called 'total factor productivity' accounts for most of the observed cross-country variations in income levels, yet, although it may well be more important than the accumulation of capital, population growth and even educational improvement, productivity is "the unexplained part of economic growth" (Easterly and Levine, 2002).

One of the reasons for the presence of this "residual" in cross-country comparisons may be that the neoclassical framework ignores institutions, "the humanly devised constraints that structure political, economic and social interaction". These include both "informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)" (North 1991). Institutions are usually *stable* over time and they have a lasting effect that may explain the long-run persistence of discrepancies in economic performance. Two ways in which the impact of institutions can be introduced into standard models of economic growth are presented in Appendix 1. However, this institutional approach has been challenged by Gallup, Sachs and Mellinger (1999), who report that countries that are landlocked (apart from those in Europe) or situated in tropical areas are generally poor, and by Glaeser et al. (2004), who claim that most measures of institutional differences are subjective and/or endogenous to economic growth[1].

Our first aim is therefore to find "markers" of institutional differences between countries that would be both objective and exogenous to economic growth, so as to test whether differences in economic performance can be attributed to them. We describe the key elements of our investigative approach in Section 2. One way of classifying countries that is largely objective is according to the "school" to which their legal systems belong. We discuss why legal school might make a difference to economic performance and test for the impact of "legal school" on real GDP/capita growth rates (Section 3).

However, it may be that institutions at a higher or lower level of aggregation than "legal school" determine economic performance[2]. In order to test the hypothesis that a wider set of institutions than just "legal school" may be important, we next describe why countries having been either British or French colonies in the first half of the 20th Century may have affected economic growth, and test whether it did so (Section 4)[3].

Finally, in Section 5, we test our institutional explanations against what has been claimed by Gallup and Sachs (2000) to be the strongest environmental candidate for explaining growth differences, the incidence of malaria. In the Conclusion we discuss the implications of our findings for the institutional, geographical and policy explanations of economic growth.

2. Investigative approach

So as to be sure that we are not picking up spurious relationships, we consistently control in our regressions for a number of environmental and historical variables, that have been suggested in the literature to be

[1] They also claim that it is economic policies rather than political institutions that determine the accumulation of human capital, and that the latter is the main determinant of growth.

[2] Many studies have already examined the impact of more narrowly (functionally) defined institutions (such as the progressiveness of taxation, or the restrictiveness of trade or labour market rules) on economic performance.

[3] Table A3 in the Appendix shows the distribution of country observations across the institutional categories. The results of the regressions show that the effects of the two kinds of institutions can be distinguished in the data.

fundamental. However, we do not control for many of the variables commonly used in cross-country growth regressions, such as the growth rate of physical capital and the level of human capital (or their instruments, such as the investment rate or educational enrolment). Nor do we control for measures of good or bad policy, such as the openness of the economy to international trade or the rate of inflation.

We are looking for the impact of exogenous geographical and deep institutional variables, and if we find these to have an effect on growth, we would expect variables such as openness and physical or human capital stock to be largely endogenous to the institutional variables, and indeed to provide some of the *channels* through which institutions affect growth. The only exception we make to this rule is that, because of its huge destructiveness and the lack of clarity as to its causes, we do use an index of the incidence of war in our regressions.

Cross country, high population density in coastal areas is positively correlated with higher GDP per capita, while high population densities in interior regions have a negative correlation. The higher development of coastal areas is explained by the significant increase in transport costs for landlocked regions. Gallup, Sachs and Mellinger (1999) present two constant returns models (one with intermediate products and one without) in which transport costs affect not only levels of GDP/capita, but also their growth rates[4]. To control for such effects we introduce the proportion of a country's population living within 100 kilometres of the coast as an explanatory variable.

Jared Diamond (1997) and Paul Bairoch (1992) argue that tropical regions have been unable to adopt modern crop technologies developed in temperate areas. Tropical regions are also severely affected by diseases. To control for this effect we have used the percentage of a country's territory that lies in the tropics.

It has been argued that one of the major causes of tropical underdevelopment is the high incidence of malaria. Sachs (2003) provides indicators for the proportion of a country's population that is exposed to Malaria falciparum, the most dangerous form of malaria. Could initial incidence of malaria explain the differences in growth between countries in a subsequent period? Here one must be careful about the question of endogeneity, as richer countries can afford to fight malaria more effectively. We discuss the possible role of malaria in explaining growth differences between various groups of countries in Section 5.

Our two historical control variables are, first, an index indicating whether a country had suffered from war (the variable takes a value of 1 for each decade in which war occurred on the territory of the country, with the exception of the 1990s, for which we do not have information), and is taken from Easterly and Levine (1997), and second, the natural log of real GDP/capita in 1960 at purchasing power parities (as a measure of the amount of growth resulting from the convergence of real GDP/capita levels).

In using objective "markers" of current or recent institutional differences between countries we differ from the classical papers by Acemoglu, Johnson and Robinson (2001 and 2002) and Acemoglu and Johnson (2003), which use a distant hypothesised cause of institutional differences (settler mortality at the start of European colonization) which is objective, as an instrument for a subjective measure of current institutions (an index of perceived risk of expropriation). We feel justified in our return to a simpler approach by Albouy's work (2005), which shows that the data used by Acemoglu et al. suffers from manifold weaknesses that seriously undermine their results (see Appendix 2 for a brief summary of Albouy's finding)., Moreover, whereas we are concerned with the recent medium term (1960-95), Acemoglu and co-authors attempt to explain very long-term growth measured in centuries, in spite of the fact that modern economic growth began centuries earlier in some of the countries they examine than in others.

[4] Diminishing returns models of the Solow type cannot generate such an outcome.

3. Legal school as a determinant of economic performance

Theoretical Background

According to Posner the economic efficiency of common law is due to the ability of judges to adapt old rules and create new ones suitable for new and difficult to predict circumstances. Within these evolving rules, the principle of precedent and the ability of higher courts to make decisions that bind lower ones, mean that the common law provides more stability and predictability. Mahoney (2001) points out that "In the common-law system the judge is an independent policy maker occupying a high-status office, whereas in the civil-law system the judge is a (relatively) low-status civil servant without independent authority to create legal rules. This difference…fragments power more in a common law system". Such so-called "horizontal" fragmentation of power has been found to produce less economic redistribution (Persson et al. 2000)[5]. La Porta et al. (2004) find that, thanks to greater judicial independence, common law countries have more "economic freedom" (i.e. protection of property and contract rights) than others.

Hayek (1960) argued that the common law is superior to the civil law in its economic effects, not so much because of substantively different legal rules, but because of their differing assumptions about the rights of the individual and the state, which go back to the philosophical writings of Locke and Hume on the one hand and Rousseau on the other. Mahoney claims that this philosophical difference has a structural impact: "A central feature of the civil law is a sharp distinction between 'private' law (which governs relations between citizens) and 'public' law (which governs relations between the citizen and the state)." As a result, in the French civil law tradition ordinary courts are not allowed to review government action, and although specialized "administrative" courts exist, they are under the "direct supervision of the executive (and their) judges are trained at administrative schools alongside future civil servants"[6]. Furthermore, although "private" law places a strong emphasis on the protection of property and contracts, "public" law stresses the rights of the state to pursue social or national goals[7].

La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) found that "countries with poorer investor protections, measured by both character of legal rules and the quality of law enforcement, have smaller and narrower capital markets." Accordingly, countries belonging to the "French civil law school" (a subset of all civil law countries) have the weakest investor protection and the least developed financial systems. Ownership is more concentrated in such countries because of poor shareholder rights, while corporate valuation is lower. Anglo-saxon, "common law" countries tend to have the opposite characteristics. We therefore call the view that the common law leads to better economic performance than French civil law the "Hayek-La Porta hypothesis"[8].

On the other hand, legal scholars have pointed out that civil law courts do in practice often follow precedent and the decisions of higher courts, and that in some civil law jurisdictions high courts give "guidance" on how statutes and codes should be applied. Moreover, common law courts (especially in the United States) often promote wealth destroying and rent-seeking litigation (Tullock 1997). Thus, the difference in the impact of the two legal schools on economic performance may be more apparent than real.

[5] "Vertical" fragmentation is that between different levels in a federal structure.

[6] In common law jurisdictions the same courts judge both types of cases.

[7] Such deep structural assumptions in the law may be very important given the large numbers of lawyers in the executive and legislative branches in many countries, so that the influence of Rousseau's political philosophy on the law comes full circle and influences the assumptions of lawyer-politicians

[8] Although they point to differences in the "quality of government" between the two groups of countries (1999) and to the findings by King and Levine (1993) and subsequent authors, indicating that financial development promotes economic growth, La Porta et al. do not themselves claim that the "school" a country's legal system belongs to influences its economic performance.

Investigative Approach

In his empirical investigation into the economic impact of the common law, Mahoney (2001) found that over the period 1960-90 common law countries in general had significantly higher growth than civil law countries. He regressed growth of GDP/capita on whether a country uses the common law and a number of control variables, such as levels of schooling at the start of the period (a measure of human capital), the investment rate (a measure of physical capital), inflation (a measure of sound macroeconomic policy) and exports/GDP (a measure of openness, and thus of good macro and microeconomic policy). He also controlled for a number of more fundamental variables, such as the degree of ethnic fractionalisation, the religious composition of the population and whether a country is in Latin America or Africa.

We find this approach wanting as a way of identifying institutional effects. This is because the control variables used are either: (1) likely to be endogenous to the institutional differences being tested for, as discussed in the last Section; (2) rather crude (the two "continental" dummies); or (3) prove not to be statistically significant[9]. Instead, we use only the geographical and historical control variables described in Section 2.

Furthermore, unlike Mahoney, who compares the common law to all civil law countries, we limit ourselves to the impact of countries belonging either to the common law or the "French civil law" school. This is because the common law is found by La Porta et al. to be the most supportive of financial development, and the French civil law the least supportive. If effects on growth are to be found, they should be found here. Also, these are the two legal schools with the largest number of countries. Finally, it is better to use the "legal school" to which all former French colonies belong, rather than a wider one, so that any differences that may be found in the impact of "legal school" and "colonial origin" cannot be ascribed to the inclusion in the civil law category of countries which have a legal system that differs in some important respects from the French one[10].

Data and Results

We constructed a dataset of 119 countries, for which we had growth rates of real GDP/capita over the period 1960-1995, and data for our environmental control variables[11]. We classified countries' legal school in much the same way as La Porta et al. with three caveats: (1) we reclassified some countries when we considered La Porta et al.'s classification to be mistaken, for instance we excluded Romano-Dutch law countries from the French school; (2) we extended our classification to those countries in our sample not covered by Djankov et al (2002)[12]. This was done on the basis of Wood (1995), the online CIA Factbook and searches for individual countries; (3) in our main regressions we exclude Hong Kong and Singapore from the sample, as they are extreme outliers in terms of real GDP/capita growth (although retaining them gives very similar results in our key eq.3)[13].

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[9] We find the ethnic fractionalisation index to be insignificant when it is inserted into our key regression (eq. 3 in the text), and the results for the significance of the differences between the two pairs of institutional dummies remain qualitatively the same as in eq.3 without ethnic fractionalisation. We get similar results when the percentages of Catholics, Muslims and Protestants are inserted into eq. 3. The difference between the legal school dummies is very insignificant while that between the colonial origin dummies is significant, and only the coefficient for the percentage of Protestants is significant. We ignore the percentage of Hindus, as they were numerous only in a limited number of colonies, while Buddhists and Confucians were only present in small numbers in a few colonies. These results are presented in Table 4. The data for ethno-linguistic fractionalisation and for the shares of different religious groups in the population is taken from La Porta et al (1999).

[10] German and Scandinavian civil law systems are found by La Porta et al. to have better investor protections than French civil law systems. This is also the case for Romano-Dutch law (Wood, 1995). Former British colonies all use the common law, with a few exceptions that use French civil law (e.g. Mauritius).

[11] Data on GDP/capita and GDP/capita growth are from the World Bank database. The data for the share of the population lying within 100 km. of the sea and for the share of a country's territory lying in the tropics are taken from Gallup, Sachs and Mellinger (1999). The data is available only for countries with over 1 million inhabitants (108 countries). We were able to extend the sample to another 13 countries (marked by an * in Appendix 1). To test for the robustness of our results we also used a dummy for a country being landlocked or for any part of its contiguous territory being in the tropics. The results of these alternative specifications are reported in Table 1.

[12] This is a larger group, which subsumes that used by La Porta et al (1997).

Thus, we have 33 common law countries, 55 French civil law countries and 31 unclassified countries (which constitute the omitted category), which include German and Scandinavian civil law countries, Romano-Dutch law countries, ex-socialist countries and any other countries for which we have data regarding the other variables we use but for which their legal school is ambiguous (see Appendix 1).

The results indicate clearly that belonging to the "French civil law" school reduces a country's growth rate of per capita GDP both highly significantly and by a large amount, when we control for the incidence of war, the share of its territory located in the tropics, the share of its population near the sea and the impact of convergence[14].

$$\begin{aligned} \text{Growthrpc6095} = {} & 1.036 - 0.071 \bullet \text{War} - 0.668 \bullet \text{Tropicar} + 0.598 \bullet \text{Pop100km} \\ & (0.000) \quad (0.125) \quad (0.000) \quad (0.000) \\ & -0.368 \bullet \text{Frenchcivil} - 0.232 \bullet \text{Commonlaw} - 0.184 \bullet \text{Convergence} \\ & (0.001) \quad (0.057) \quad (0.004) \end{aligned} \qquad \textbf{(1)}$$

Adjusted $R^2 = 0.406$, 119 observations

Dependent variable = real per capita GDP growth between 1960 and 1995; War = an index which is equal to 1 for each decade in which the country was involved in foreign or civil war; Tropicar = the proportion of a country's land area between the Tropics; Pop100km = proportion of a country's population living within 100 km of the sea. Frenchcivil, dummy = 1 for French legal origin (as classified in Appendix 1); Commonlaw, dummy = 1 for common law countries; Convergence = natural log of GDP/capita in 1960.

Although common law countries do grow faster than French civil law ones, so that the difference in growth rates between the two groups goes the way the Hayek-La Porta hypothesis would lead us to expect, this difference is not significant (p-value: 0.181)[15].

When we use cruder measures of our environmental variables (dummies for whether a country is landlocked or for whether any contiguous part of it lies in the tropics, see Table 1) we get lower goodness of fit. Again, although as expected French civil law is found to reduce growth very significantly and by a large amount in all specifications, the difference between the legal schools is again not significant in any of the specifications.

Thus, in contrast to Mahoney's results, we find that the Hayek-La Porta hypothesis does not perform well in the presence of reasonable environmental and historical control variables, even when we compare growth only in the two legal schools between which we would expect to find the clearest difference in outcome.

[13] While their presence in the sample reduces the adjusted R^2 of eq.(3) by almost 10%, the addition of a joint dummy for the two of them adds over 20% to the adj. R^2 (Table 4). We conclude that these two territories are indeed special cases. Nevertheless, with the two in the sample, eq. (3) gives results that are almost identical to those of the basic specification shown in the text. The difference between legal schools is highly insignificant, while the difference between colonial origin dummies is highly significant and there are large and significantly negative common law and French civil law dummies, etc. This is the case both with and without the joint dummy for Hong Kong and Singapore.

[14] From an econometric point of view, there do not seem to be major problems with heteroscedasticity in our regressions. We have used robust (White) residuals in the two regressions (the regressions using Tropical and Tropical and Landlock in Table 2, in the Appendix) where there was a slight suspicion of heteroscedasticity (at a 10% level based on the White test). Residuals are normal in all regressions, hence the significance tests should be valid. The only issue is that of the possible multicollinearity between the legal and colonial dummies, as discussed in Section 3 below.

[15] All control variables have the expected signs. Growth should be lower for countries with more war, a larger proportion of their territory in the tropics and a higher initial level of GDP/capita, while it should be higher for those with a larger proportion of their population close to the sea.

4. The colonial heritage

A possible explanation for the disappointing result regarding the economic impact of "legal school" is that a more comprehensive set of institutions than just the legal system influences economic performance. But how could one find countries that share a wider set of institutions than just their legal system? We decided to explore the possibility that a common colonial past might prove an important and statistically significant determinant of growth.

Theoretical Background

The fact of countries having been colonies of a single colonial power is a possible indicator of shared institutions between them, since the imperial powers tended to implant similar institutions across their colonies, and even after independence in the second half of the 20th century, former colonies tended to copy new institutions from the metropolis. This imposition of institutions was largely exogenous to the pre-colonial development of the territories concerned[16]. Furthermore, colonial borders often cut across ethnic communities and eco-systems and grouped together areas with different climate, traditions and religions. For example, British and French colonies alternated along the coast of West Africa.

The patterns of colonization adopted by various European powers were different at many points. Historical studies suggest that the differences between British and French colonies were particularly stark and went well beyond legal origin. In French colonies, the ideal of *assimilation* derived from "the constitutional relationship between colonies and metropolis…[and] the republican principles of 1789. The republic was one and indivisible: colonies were an intrinsic part of it…" (Fieldhouse, 1966: 308)[17]. The administrative structure, civil liberties, taxes and tariffs were supposed to be identical and there was no separate colonial military. French colonies were also ruled in a more centralised way than British colonies. Furthermore, the French system of direct rule in the colonies meant that a hierarchical system of civil servants was organised (Isnard 1971:109). Native rulers could only maintain their authority at the village level, and they could be promoted, transferred and dismissed much like ordinary civil servants (Miles 1987). At the same time, the French administration tried to speed the setting up of modern infrastructure - such as railways - and to improve native agriculture. Thus, Conklin (1998) quotes a French civil service report arguing that "[f]or a long time yet it will be necessary for our subjects to be brought to progress against their will"[19]. However, such intervention was often disruptive and included forced labour, state regulation of crop choice by peasants, relocation of villages and conscription[20].

The goal of British policy on the other hand was to ensure a cheap and flexible administration of the colonies (Isnard 1971:110). Local inhabitants were to preserve their autonomy and much of their traditional institutions, under a system known as ***indirect rule***. The ideas behind indirect rule were less idealistic than France's *mission civilisatrice*. While France offered the possibility of representation in the French Parliament (although this was extremely limited before the Second World War), Britain relied on *local* elected bodies - such as Town Councils and later on Legislative Councils for individual colonies (Goldberg 1986)[21].

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[16] Except that territories with well organized pre-existing states and with a higher level of technology were less likely to be colonized.

[17] This is reflected in the fact that all French colonies in sub-Saharan Africa except two became independent on the same day (when the "French Union" was transformed into the "French Community" in 1960). British colonies in Africa on the other hand achieved independence over a period of nine years.

[18] While the contiguous British territories in East and South Africa were organised as separate colonies and protectorates, the French preferred the unified blocks of French West Africa and French Equatorial Africa.

[19] The idea expressed in a directive was "to liberate the slaves, to ruin the great commands, to eradicate feudal vestiges."

[20] The *prestation* was established at 12 days per year. In theory, this work had to be remunerated at market rates.

[21] Voting rights were quite severely restricted in the case of British territories, while the Senegalese towns and the French Caribbean had universal male suffrage.

In British colonies, not only was common law probably more suited to local needs (because of its less formalistic practices and its stress on verbal contracts and evidence), but also tribal law was applied for cases where both parties were natives, or where one party was a native and "the strict letter of the English law would involve injustice" (Asmis 1912)[22]. There were also *native tribunals* for minor offences and "all complaints as to ownership or possession of (native) land" (Asmis 1913). In French colonies, "assimilation" meant that a single body of legislation was used everywhere[23]. Also, British loyalty to free trade meant that British colonial economies were more exposed to world competition than French ones. Thus, in the inter-war period, Nigeria alone exported five times as much as all the French colonies in West Africa.

The differences between the two empires were possibly most striking in education. A history textbook used in colonies in Africa and Indochina famously started with the words "*Nos ancetres les Gaulois étaient roux…*" ("Our ancestors the Gauls were red-haired…"). On the other hand, the Advisory Committee on Native Education in the British Tropical African Dependencies argued in its report that: "…the central…problem lies in finding ways to improve what is sound in the indigenous tradition. Education should strengthen…responsibility to the tribal community, and…be related to the…daily experience of the pupils." (quoted in Grier, 1999). Grier continues: "Students in British Africa were, for the most part, taught in their own languages and in their tribal villages…(while) in the French system most students were boarded…(and) were required to speak French (only)…". As a result, Corbett (1972) found that, whereas three quarters of pupils in British Africa completed primary education, only one third did so in French Africa.

Perhaps the most tangible sign of the different effects of the two systems of colonial rule is the movement of population across borders. Asiwaju (1976) documents a steady migration of the population from the Ivory Coast to the Gold Coast. Geographic conditions are similar in the two territories and migrants often belonged to ethnic groups divided by the new border; thus the difference was due to the institutions introduced by colonial rulers. The main reasons for discontent on the French side seem to have been conscription into the army, forced labour, higher taxes and administrative intrusion into crop selection by peasants.

Finally, these suppositions are supported to some extent by Treisman's (1999) cross-country study of the determinants of perceived corruption, which found that countries with a history of British rule were perceived as less corrupt after GDP per capita, openness to trade, legal school, length of democratic tradition and Protestant tradition were controlled for. Thus, it is possible that the institutions bequeathed before and upon independence by the colonial empires (or imported from the metropolis after independence) differed considerably across the imperial powers.

Data and Results

We therefore decided to test whether having a British or French colonial past had a discernible impact on economic growth, when we controlled for the same environmental and historical variables as in eq. (1). As with the two legal schools, we limited ourselves to these two imperial powers, since they had the largest number of colonies. It is important that the effects of the two kinds of institutions (legal school and colonial origin) can be clearly distinguished in the data (see eq. (3) and subsequent Tables). Table A4 in Appendix I shows the distribution of country observations across the institutional categories.

To qualify as ex-colonies, countries need to have been under British or French rule continuously from 1910 to 1948[24]. The purpose is to exclude ex-colonies of settlement (Australia, Canada, USA, etc.) and countries that were under British and French rule only briefly in the inter-war period (Iraq, Syria, etc.) from the two colonial

[22] Although the principal law used was English law supplemented by the special laws of the colony.

[23] Although Muslims were allowed to use their own family law.

[24] Countries in Africa that had been German colonies but continued as British or French colonies until 1960 (Tanzania, Togo, etc) were retained as British or French colonies.

categories. We thus keep as ex-colonies only those British and French dependencies where a wide range of common institutions were in place sufficiently long, and sufficiently recently, for them to affect post-1960 economic growth[25]. All remaining countries are consigned to the omitted category.

We found that having been a French colony has a very significant and large negative effect on growth, while having been a British colony has no such effect:

$$\begin{aligned} \text{Growthrpc6095} = {} & 1.013 - 0.118 \bullet \text{War} - 0.732 \bullet \text{Tropicar} + 0.533 \bullet \text{Pop100km} \\ & (0.000) \quad (0.0175) \quad (0.000) \quad (0.000) \\ & -0.505 \bullet \text{Frenchcol} - 0.037 \bullet \text{Britcol} - 0.246 \bullet \text{Convergence} \\ & (0.001) \quad (0.731) \quad (0.000) \end{aligned} \qquad \textbf{(2)}$$

Adjusted $R^2 = 0.421$, 119 observations

Not surprisingly, the coefficients for British and French colonial origin are highly significantly different from each other (p-value: 0.001). Again, the control variables all have the expected signs and are very significant, and the adjusted R^2 is quite high (and slightly higher than for the regression using legal school). On average, real GDP/capita in ex-British colonies increased some 1.3% per annum more than that of ex-French colonies during 1960-95, after controlling for environmental variables, war and convergence. This is equivalent to a cumulative difference over the period of 60%[26].

The presence of the two environmental variables is particularly important in this regression, as it helps us to control for any selection bias by which Britain, as the stronger imperial power, may have obtained the economically more productive colonies at the time of conquest. Nor are former British colonies likely to have benefited particularly during the 1960-95 period from their trade links with Britain. Although Britain was still richer than France at the beginning of our period, over the period as a whole it was on average poorer, and French growth was higher than British for most of the period.

As with the regressions using the "legal school" variables, when we use the cruder measures of our environmental variables, we again get somewhat lower goodness of fit. The colonial origin coefficients are of similar size to the baseline described in eq. (2), and are similarly significantly different from zero as in the baseline (Table 1). Also, in every specification of eq. (2) the difference between the colonial origin dummies is significant at the 1% level.

When we test for the impact of legal school and colonial origin together, we again find that the impact of the French civil law and the common law are statistically indistinguishable (the p-value of the difference between the two coefficients is 0.521). These results are thus at variance with the Hayek-La Porta hypothesis[27]:

$$\begin{aligned} \text{Growthrpc6095} = {} & 1.110 - 0.118 \bullet \text{War} - 0.657 \bullet \text{Tropicar} + 0.541 \bullet \text{Pop100km} \\ & (0.000) \quad (0.015) \quad (0.000) \quad (0.000) \end{aligned}$$

[25] Grier (1999) and Bertocchi and Canova (2002) run regressions that purport to test the differential impact of colonial origin on growth. However, neither study distinguishes between "colonial origin" and "legal school" as we do, and both in fact test for "legal school" rather than "colonial origin" as we define the terms. This is because they include former Spanish colonies in Latin America and former British "colonies of settlement" like the USA in their regressions. Furthermore, like Mahoney both studies use potentially endogenous control variables (government consumption, inflation and education in the case of Grier, and the investment ratio and education, in the case of Bertocchi and Canova, who also use ethnic fractionalisation).

[26] It is worth remembering that former British colonies had a higher average income per capita in 1960 than did French ex-colonies (Appendix 1).

[27] The negative impact of the common law is actually larger than that of the civil law.

$$\text{–0.265} \bullet \text{Frenchcivil} - \underset{(0.023)}{0.362} \bullet \text{Commonlaw} - \underset{(0.031)}{0.394} \bullet \text{Frenchcol} + \underset{(0.008)}{0.152} \bullet \text{Britcol} - \underset{(0.348)}{0.210} \bullet \text{Convergence} \quad \textbf{(3)}$$
$$(0.002)$$

Adjusted $R^2 = 0.446$, 119 observations

On the other hand, while the British colonial origin dummy is not at all significantly different from zero, the French colonial dummy is highly significant, negative and large. Not surprisingly then, the *difference* between the colonial dummies is highly significant (p-value of 0.005). It is also large (about 0.55) making it about the same size as in eq.(2), which gives a similar difference in growth rates between the two groups of ex-colonies (1.6% per annum, 70% over the period).

When we add each of the two colonial dummies *separately* to eq.(1), the "legal schools" regression, the significance of the difference between the two legal school dummies collapses (to a p-value of 0.975 when the French colonial dummy alone is added, and to a p-value of 0.653 when the British colonial dummy alone is added - Table 2). Thus, with either one of the colonial dummies added to eq. (1) we get the same qualitative result as in eq.(3) - *the difference between the two legal schools has no statistically significant effect on real per capita economic growth*. Next, we add the French civil law dummy to eq.(2). The significance of the difference between the two colonial dummies falls, but it remains above the 5% level (p-value: 0.046)[28]. When the common law dummy alone is added to eq.(2), the significance of the difference between the two colonial origin dummies remains very high indeed (p-value < 0.001)[29]. To summarise, *the difference between British and French colonial origin has a highly significant impact on growth* ***even when we control for common law legal origin****, and it has a significant impact when we control for French civil law, while legal school has no significant impact when we control for either colonial origin*. We can therefore conclude that the difference between the performance of British and French ex-colonies is *not* due mainly to the use of the common law in former British colonies or of the French civil law in French ones - some other factors are at work.

When we use the cruder measures of our environmental variables in eq. (3) we get somewhat lower goodness of fit as usual (Table 1). However, the difference between the legal school dummies remains insignificant (p-values in excess of 0.221), while the difference between the colonial origin coefficients is significant at the 1% level in all the specifications.

5. Institutions *versus* malaria?

When we add the incidence of malaria falciparum as an explanatory variable to eq. (1) and (2), our results change considerably[30]. The difference between British and French ex-colonies, though still significant, is now the same as that for the difference between common law and French civil law countries (p-value: 0.035). When we add malaria to eq. (3), the differences between both sets of institutional variables become very insignificant - see Table 3.

However, we only have data on the incidence of malaria for 104 countries (compared to 119 for the larger sample)[31]. Moreover, there is the issue of endogeneity. Rich countries can afford to fight malaria more effectively

[28] The French civil law dummy itself is insignificant.

[29] The common law dummy is significant at the 10% level (p-value: 0.055).

[30] This is the most dangerous form of the disease, and we take the data for its incidence from Sachs (2003).

[31] The data is once again taken from Gallup, Sachs and Mellinger (1999), and includes only countries with a population of over one million inhabitants. In this case we were unable to increase the size of the sample, as we did not find information on the incidence of malaria in the countries marked with an • in Appendix 1.

than poor ones. In the first half of the 20th century malaria was present in large parts of East Asia, Latin America and Europe, from which it subsequently disappeared[32]. The British colonies in our sample were richer than the French colonies before 1964 (Appendix 1), so we would expect them to have reduced malaria more effectively.

Gallup and Sachs (2000), claim that there is a fundamental difference between malaria in temperate and sub-tropical zones, which it has been possible to eliminate or reduce considerably, and tropical malaria. Previously endemic malaria has been cleared from Spain, Italy, Greece and the southern USA. On the other hand, Gallup and Sachs claim, malaria in tropical zones simply cannot be eliminated for physical reasons at reasonable cost, except on islands. There are just too many mosquitoes and mosquito breeding grounds, and too many human carriers. Furthermore, not only does incidence in 1964 significantly (and considerably) affect subsequent growth, but a reduction in incidence (where it can be achieved, as in temperate zones) boosts growth significantly.

We find the first claim very dubious. There are several examples of sharp reductions in tropical zone malaria incidence over the 1966-94 period. The Dominican Republic reduced incidence from 94% to zero, while Haiti, the other half of the tropical island of Hispaniola, failed to reduce its 100% incidence at all. Although Hispaniola is an island, it is a very large island, four-fifths the size of England. More important, the persistence of 100% incidence in Haiti, means that epidemiologically the Dominican Republic was not an island at all, as there was always a reservoir of malaria available across the border. Other examples of large reductions in tropical malaria are Brazil (from 40% to 19%) and Bangladesh (from 63% to 16%). Additionally, the large *increases* in incidence observed in India (from 13% to 28%) and Malawi (from 52% to 100%), also suggest that tropical incidence is not exogenous or exclusively determined by the environment.

When we regress the proportional change in *malaria falciparum* during 1966-94 on GDP in 1960, we get a strongly significant effect, indicating that wealth does help reduce malaria:

$$\text{Lnmalfal94} - \text{lnmalfal66} = 1.856 - 0.985 \bullet \text{lnrpcgdp60} \qquad \textbf{(4)}$$
$$(0.064) \qquad (0.043)$$

Adjusted $R^2 = 0.049$, 64 observations

Although there is clearly a lot of noise, the coefficient has the expected sign and is quite strongly significant, so that a lower level of real per capita GDP leads to a lower reduction in the incidence of malaria falciparum in the subsequent period. Moreover, this effect is much stronger than that of initial level of malaria on subsequent real per capita GDP growth:

$$\text{Lnrpcgdp95} - \text{lnrpcgdp60} = 0.318 - 0.051 \bullet \text{lnmalfal66} \qquad \textbf{(5)}$$
$$(0.000) \qquad (0.137)$$

Adjusted $R^2 = 0.019$, 66 observations

Both the significance of the explanatory variable and the adjusted R^2 is much higher in the regression explaining the fall in incidence of malaria by initial GDP level, than in the regression explaining growth by initial malarial incidence[33].

[32] Mussolini famously drained the Pontine Marshes south of Rome in the 1920s to eliminate the breeding ground for malaria there, something Julius Caesar had done in the first century B.C. The last person to die of malaria in England did so in 1928.

We have tried to calculate the two effects in a way that would allow us to compare their strength: an increase in initial real per capita GDP by one standard deviation (starting from the mean of the sample) results in malaria incidence decreasing by an additional 17.6% over the 29 years from 1966 to 1994. This is a continuously compounded annual rate of approximately 0.6%. This *additional* reduction is slightly above the mean reduction in malaria incidence. In other words, a one standard deviation increase in 1960 GDP from the mean of the sample, more than doubles the reduction in malaria in the subsequent period. An analogous increase in initial incidence of malaria by one standard deviation from the sample mean, decreases the growth rate of real GDP/capita over the subsequent 35 years by 2.6%, an annual reduction in growth of 0.07%, which is less than one twelfth of the mean growth rate. Thus, the effect of a one standard deviation increase in initial real per capita GDP on malaria is slightly more than *twelve times* as strong as that of a one standard deviation increase in initial malaria incidence on subsequent real per capita GDP[34].

6. Conclusions

Legal School vs. Colonial Origin

When we regress economic growth separately on the two pairs of "legal school" and "colonial origin" dummies, we find that in all four specifications presented in Table 1 the difference between the two legal school dummies is insignificant and the difference between the colonial origin dummies is highly significant. We get the same outcomes when both pairs of dummies are used together in the same regression. This remains true when we add the percentages of the followers of various religions or ethno-linguistic fractionalisation to eq.(3), and also when we add Hong Kong and Singapore to the sample (both with and without a joint dummy for the two territories). Moreover, when either of the colonial origin dummies is added separately to the "legal school" regression, the impact of the difference in legal school on growth becomes highly insignificant. However, when the common law dummy is added separately to the colonial origin regression, the difference between the colonial origin dummies continues to be highly significant and very large, and it remains quite large and significant when the French civil law dummy alone is added (Table 2).

Thus, our results fail to confirm the "Hayek-La Porta hypothesis" that having a legal system based on the English common law is more conducive to economic development than French civil law. On the other hand, the results do support the view that a wider complex of institutions than just the legal system, such as that associated with having been a British rather than a French colony, does affect economic performance. A recent British colonial history is superior to a French one in enabling economic growth in the post-colonial period.

Importantly, the use of geographical variables helps us control for selection bias at the beginning of the imperial period. We also provide strong evidence that the incidence of malaria is endogenous to economic performance, and should therefore be ignored as a control variable when examining the determinants of economic growth.

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[33] In a cruder version of the same approach we calculated the correlation between the incidence of malaria falciparum for 1966 (for those countries in which there was malaria) and real per capita GDP in 1960 and 1970. We then repeated the exercise for real per capita GDP in 1990 and 1999 and malaria in 1994. The results were as follows:

corr(rpcGDP60,malfal66) = -0.59 corr(rpcGDP70,malfal66) = -0.52

corr(rpcGDP90,malfal94) = -0.54 corr(rpcGDP99,malfal94) = -0.59

suggesting that real per capita GDP may have "Granger-type caused" malaria in the 1960s and malaria may have "Granger-type caused" real per capita GDP in the 1990s.

[34] It is important that Gallup and Sachs do not find any significant effect of other tropical diseases on economic growth, so that malaria cannot be taken as an instrument for a general disease laden environment over and above what is identified by tropical location - something we control for independently in all our regressions.

Our results are consistent with those of Treisman (1999), who found that cross-country perceptions of corruption were negatively related to a history of British rule, but that after controlling for this, a common law tradition tended to increase the perception of a country's corruption.

The results of Grier for Africa suggest that better educational levels in former British colonies may be the main cause of their better growth performance. However, the results of Betrocchi and Canova are ambiguous as to the impact of colonial origin on education and growth. Examining the channels through which colonial origin could affect growth is therefore the first priority for further research.

Geography vs. Institutions

Our results also contribute to the "geography v. institutions" and the "policies v. institutions" debates, which have divided researchers in recent years. First, our preferred indicator of institutional differences (colonial origin) is far less subjective than those used by some researchers[35]. For instance, Dollar and Kraay (2000) use subjective indicators of property and political rights[36].

Second, the debate between Acemoglu, Johnson and Robinson (AJR) on the one hand and Sachs and co-authors on the other, comes down to whether differences in economic performance between what AJR call "colonies of settlement" and "colonies of extraction" are due, at least in part, to geographical conditions directly, or whether such conditions affect performance *only* to the extent to which they determine the (better) institutions the imperial powers decided to introduce in "colonies of settlement". Sachs (2003) points out that this choice is itself associated with geographical/environmental conditions that may be unhelpful for economic performance today. Furthermore, higher settler mortality at the time of colonisation is associated with lower levels of inherited human capital, as it is negatively correlated with migration from Europe, which was much richer than other parts of the world by the 19th Century, and thus had higher levels of human capital.

Whatever the merits of these arguments, our analysis excludes "colonies of settlement" from the "ex-colony" categories. It only compares what AJR call former "colonies of extraction" belonging to different empires. In spite of this restriction, we find that the institutional differences reflected in our classification (which according to AJR are far smaller than the differences between "colonies of settlement" and "colonies of extraction") have a highly significant and large impact on economic performance. Thus, we show that exogenously determined institutions do have an independent effect on economic performance, although unlike AJR we do not claim that geographical factors have no independent effect themselves[37].

Policies vs. Institutions

In their critique of institutional explanations of growth, Glaeser et al. stress the subjectivity and/or endogeneity of the institutional variables used by many researchers, an argument that - as we have seen - does not apply to the present work. They also show that measures of initial human capital stock (such as secondary school enrolment) explain subsequent real GDP/capita growth rates and improvements in institutional variables better than the initial level of various (largely subjective) indices of institutional quality explain subsequent growth of income and of human capital. Since the experience of the Soviet Bloc has shown clearly that education does not in itself generate a superior growth performance in the absence of private property and markets, and since they find that *political* constraints on government that would compel such respect do not have strong explanatory power in predicting growth, Glaeser et al. conclude that it is *policies* that respect property rights and

[35] Even the "legal school" variable may involve a greater degree of subjectivity, as some countries have a number of sources for their legal tradition, as discussed in Section 3.

[36] Such indices also suffer from the fact that they may be endogenous, with the quality of institutions improving as GDP/capita increases.

[37] We do not need to make such a claim, as our classification depends on the accidents of history, whereas AJR's depends on the supposed disease environment of countries at the time of colonisation.

encourage education which determine growth[38]. These, it is argued, may equally well be pursued by democracies, because they are compelled to do so, or by dictatorships out of the free choice of the dictators.

While there were limits on arbitrary use of political power in both French and British colonies (especially in the 20th century), neither empire was run on anything approaching a democratic basis, and both gave native populations little voice. Furthermore, almost all the "colonies of extraction" of both empires became dictatorships shortly after independence, a situation that only began to improve significantly in the 1990s, towards the end of the period we cover. To this extent our results are compatible with the views of Glaeser et al.

We therefore interpret our results as throwing light on differences between the two empires regarding institutions that help sustain "economic freedom", rather than those that might ensure "political freedom"[39]. Such institutions consist in broadly defined property rights, including among others the right to a quick and fair trial (be it criminal or civil) according to comprehensible and clear laws, the right to protection from depredation by more powerful neighbours, the right to trade with whom one wishes, the right to save in a stable currency, and so on. They may also include access to an educational system adapted to local needs.

Of course, it is unclear which of these rights stem from policies and which from institutions. Are the rights to price stability and to trade freely "policies" or "institutions"? Are maintaining a more efficient and less corrupt police force and judiciary policies, or aspects of the institutions concerned? We would suggest that the answer depends on how long a given state of affairs is maintained, so that institutions can be defined by the characteristic of persistence. A short period of freer trade in an era of protectionism is a policy, maintaining free trade for an age is an institution. The same principle would apply to inflation, corruption, efficiency of the judiciary, etc. While we do not examine in this paper how such very varied "economic institutions" differed quantitatively between the two empires in the first half of the 20th century and in the post colonial period[40], we can infer that they did so sufficiently for economic growth to be clearly superior in the post-independence period in former British colonies than in former French ones.

[38] However, the arguments of Glaeser et al. are weakened by the results of Easterly and Levine (2003), which suggest that the three economic policies that are most often credited with hindering growth (protectionism, high inflation, overvalued exchange rates) fail to explain growth differences once institutions are controlled for.

[39] We use here the terminology of La Porta et al. (2004).

[40] We do attempt this in Rostowski and Stacescu (2005).

TABLE 1[41]

(Dependent variable: Growth of GDP/capita 1960-95)

	BASELINE	LAND-LOCK	TROPICAL	TROPICAL + LANDLOCK*
Legal School				
– adj. R^2	0.406	0.333	0.337	0.294
– Common Law	-0.232	-0.195	-0.293	-0.244
(p-values)	(0.287)	(0.088)	(0.040)	(0.113)
– French Civil	-0.368	-0.351	-0.415	-0.384
(p-values)	(0.001)	(0.009)	(0.004)	(0.008)
– difference	0.181	0.123	0.233	0.180
(legal) p-values				
Colonial Origin				
– adj. R2	0.421	0.377	0.335	0.320
– ex-British	0.034	-0.001	-0.057	0.019
(p-values)	(0.731)	(0.996)	(0.657)	(0.884)
– ex-French	-0.505	-0.562	-0.511	-0.552
(p-values)	(0.001)	(0.000)	(0.004)	(0.002)
– *difference*	0.001***	0.000***	0.002***	0.000***
(colonial) p-values				
Legal School and Colonial Origin				
– adj. R2	0.446	0.398	0.375	0.353
– Common Law	-0.362	-0.380	-0.443	-0.447
(p-values)	(0.031)	(0.011)	(0.013)	(0.005)
– French Civil	-0.265	-0.234	-0.318	-0.278
(p-values)	(0.023)	(0.071)	(0.010)	(0.046)
– ex-British	0.152	0.217	0.179	0.239
(p-values)	(0.348)	(0.136)	(0.302)	(0.123)
– ex-French	-0.394	-0.466	-0.377	-0.437
(p-values)	(0.008)	(0.003)	(0.017)	(0.008)
– *difference*	0.522	0.231	0.441	0.221
(legal) p-values				
– *difference*	0.005***	0.000***	0.007***	0.000***
(colonial) p-values				

[41] In all Tables, asterisks (*) indicate significance: * shows significance at the 10% level, ** at the 5% level and *** at the 1% level. They are shown only for the most important values.

TABLE 2

(Dependent variable: Growth of GDP/capita 1960-95)

	LEGAL SCHOOL with French Colonial	LEGAL SCHOOL with British Colonial	COLONIAL ORIGIN with French Civil Law	COLONIAL ORIGIN with Common Law
Constant	1.118	1.034	1.052	1.027
	(0.000)	(0.000)	(0.000)	(0.000)
War	-0.123	-0.070	-0.117	-0.119
	(0.011)	(0.117)	(0.025)	(0.030)
Lnd100km	0.553	0.571	0.552	0.519
	(0.000)	(0.000)	(0.000)	(0.000)
Tropicar	-0.649	-0.679	-0.691	-0.731
	(0.000)	(0.000)	(0.000)	(0.000)
Civillaw	-0.254	-0.371	-0.147	
	(0.028)	(0.005)	(0.182)	
Commonlaw	-0.224	-0.424		-0.182
	(0.034)	(0.003)		(0.055)
French colony	-0.428		-0.438	-0.510
	(0.003)		(0.006)	(0.002)
British colony		0.258	-0.099	0.114
		(0.043)	(0.458)	(0.382)
LnRPCGDP60	-0.231	-0.155	-0.246	-0.228
	(0.000)	(0.007)	(0.000)	(0.000)
Adj. R sq.	0.446	0.414	0.427	0.424
Difference Legal	0.975	0.653		
Difference Colonial			0.046**	0.000***
Sample size	119	119	119	119

TABLE 3

(Dependent variable: Growth of GDP/capita 1960-95)

	LEGAL SCHOOL	COLONIAL ORIGIN	LEGAL and COLONIAL
Constant	1.177	1.079	1.200
	(0.000)	(0.000)	(0.000)
War	-0.091	-0.115	-0.113
	(0.044)	(0.026)	(0.022)
Pop100km	0.513	0.481	0.513
	(0.000)	(0.001)	(0.000)
Tropicar	-0.373	-0.571	-0.394
	(0.012)	(0.000)	(0.009)
Malfal66	-0.464	-0.331	-0.413
	(0.003)	(0.046)	(0.011)
Civillaw	-0.459		-0.406
	(0.000)		(0.000)
Commonlaw	-0.236		-0.224
	(0.054)		(0.234)
French colony		-0.383	-0.188
		(0.014)	(0.234)
British colony		-0.044	-0.032
		(0.728)	(0.877)
LnRPCGDP60	-0.253	-0.292	-0.272
	(0.000)	(0.000)	(0.000)
Adj. R sq.	0.477	0.422	0.474
Difference			
Legal (p-value)	0.035**		0.325
Difference			
Colonial (p-value)		0.034**	0.511
Sample size	104	104	104

TABLE 4

(Dependent variable: Growth of GDP/capita 1960-95)

	ETHNIC FRACTION-ALIZATION	RELIGIOUS SHARES	HONG KONG & SINGAPORE	HONG KONG & SINGAPORE (with dummy)
Constant	1.162	1.311	1.067	1.110
	(0.000)	(0.000)	(0.000)	(0.000)
War	-0.099	-0.114	-0.113	-0.118
	(0.036)	(0.016)	(0.009)	(0.021)
Pop100km	0.459	0.551	0.602	0.541
	(0.000)	(0.000)	(0.000)	(0.000)
Tropicar	-0.653	-0.656	-0.597	-0.658
	(0.000)	(0.000)	(0.000)	(0.000)
Elf60	-0.156			
	(0.381)			
Catholic		0.104		
		(0.607)		
Protestant		-0.800		
		(0.001)		
Muslim		-0.246		
		(0.158)		
Hong Kong & Singapore				1.525
				(0.000)
Civillaw	-0.224	-0.556	-0.299	-0.265
	(0.057)	(0.001)	(0.019)	(0.037)
Commonlaw	-0.321	-0.505	-0.353	-0.362
	(0.047)	(0.003)	(0.008)	(0.008)
French colony	-0.368	-0.116	-0.384	-0.394
	(0.016)	(0.533)	(0.014)	(0.013)
British colony	0.159	0.270	0.213	0.152
	(0.301)	(0.091)	(0.104)	(0.249)
LnRPCGDP60	-0.210	-0.152	-0.195	-0.210
	(0.001)	(0.031)	(0.003)	(0.001)
Adj. R sq.	0.463	0.494	0.409	0.500
Difference				
Legal (p-value)	0.510	0.759	0.611	0.385
Difference				
Colonial (p-value)	0.006***	0.059*	0.000***	0.001***
Sample size	114	119	121	121

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Appendix 1

1. Modelling the effects of Institutions and Geography on Economic Growth

Diminishing returns to reproducible factors. We start with a Cobb-Douglas type production function with both human and physical capital**:**

$$Y(t) = K(t)^{\alpha} [A(t) L(t)]^{1-\alpha} \quad (1A)$$

where the symbols have the conventional meanings. We assume that $\alpha < 1$, which gives diminishing returns to capital and labour and constant returns to scale. With constant or increasing returns to capital we have endogenous growth, which we address below. The evolution of the economy is determined by:

$$\partial k/\partial t = s\, y(t) - (n + g + \delta)k(t) \quad (2A)$$

The steady state of the economy is defined by:

$$k^* = [s/(n + g + \delta)]^{1/(1-\alpha)} \quad (3A)$$

Substituting eq. 3A into eq. 1A and taking logs gives the log of steady state income per capita:

$$\ln [Y(t) / L(t)]^* = \ln A(0) + gt - [\alpha / (1 - \alpha)] \ln (n + g + \delta) + [\alpha / (1 - \alpha)] \ln s \quad (4A)$$

Better institutions can affect the rate of economic growth in two ways. The first is through better incentives for agents in a given country to adopt new technologies, which gives a higher rate of technical change *g* and thus a higher long run growth rate for the economy. This will be the case whether technical innovations are domestically produced, as in advanced countries, or imported from countries at the world technological frontier as occurs in poorer countries.

However, there a problem with this model: the adoption of new technologies must be assumed to be costless (otherwise it is a form of capital expenditure) and yet at the same time it is not automatic, occurring everywhere as soon as an improvement is devised at the world technological frontier, because then it would be uniform across countries. Bad institutions work in this framework to inhibit the adoption of innovations to such an extent that no amount of capital expenditure will overcome this handicap, whereas good ones allow the innovations to be adopted without the need for any special expense.

A second channel allows an *improvement* in institutions to affect growth. Such an improvement may increase the rate of return on capital, which increases the steady state level of per capita capital for any given saving rate given by eq. 3A. This increases the steady state level of per capita income. To the extent that the actual level of income is now below the steady state (or further below it), this increases the rate of growth of output per capita, which is given by:

$$\gamma = \lambda \{\ln [Y(t) / L(t)]^* - \ln [Y(t) / L(t)]\} \quad (5A)$$

Another way of thinking of this is that the increase in the marginal product of capital increases the growth rate of output/head for given increases in capital/head at the given saving rate assumed in the Solow model. Furthermore, if we go outside the Solow framework and make the savings rate endogenous and positively dependent on the rate of return on capital we will have an even faster increase in *k* and therefore in *y*.

However, in the Solow model countries that have had good institutions for a long time will *not* grow faster than those with worse institutions due to such effects *via* the productivity of capital. This is because faster growth *via* this channel can only occur as a result of a greater gap between actual and steady state income, something which is unlikely to be the case after particular institutions have obtained for a long period. The same is true for the positive or negative effects of geography, which operate in this model through the impact of $A(0)$ – representing endowments – on the steady state.

Constant or increasing returns. If we use a function with constant returns to broad capital (physical and human) we can write:

$$Y = AK \tag{6A}$$

Then we get the growth rate:

$$\gamma = sA - (n + g + \delta) \tag{7A}$$

Even if $g = 0$, γ will be constant as long as savings, population growth and depreciation rates are (and positive as long as $sA > n + \delta$). What is more, different countries will have different long-term growth rates depending on the values of these rates, and there will be no tendency for income levels to converge. In this case any factors that affect the savings (i.e. investment) rate, be they institutions or geography (e.g. *via* transport costs in the latter case as illustrated by Gallup, Sachs and Mellinger) will affect the long run growth rate of an economy.

The problem with the *AK* function is that it does not allow for any, even conditional, convergence of income levels. However, a "mixed" *AK* + Cobb-Douglas function will give us both differences in long term growth rates, which depend on the savings rate (and therefore may depend on institutions or geography), and shorter term convergence in income levels:

$$Y = AK + BK^{\alpha} L^{(1-\alpha)} \tag{8A}$$

Where $A > 0$, $B > 0$ and $0 < \alpha < 1$. In per capita terms the function is:

$$y = Ak + Bk^{\alpha} \tag{9A}$$

The average productivity of capital is given by:

$$y/k = A + Bk^{-(1-\alpha)} \tag{10A}$$

which decreases in k but approaches A (rather than zero) as k tends to infinity, so that given:

$$\lambda = s\, y/k - (n + \delta) \tag{11A}$$

$$\lambda = s\, A + s\, Bk^{-(1-\alpha)} - (n + \delta) \tag{12A}$$

a higher savings rate gives a higher growth of GDP/capita at a given population growth rate and rate of depreciation, but that higher rate is itself smaller the higher is k.

Table A1. Summary Statistics

Real per capita GDP in 1960:		
	Mean	Standard deviation
French civil law	1807/96	1631.03
British common law	2559.21	2765.56
French colonies	902.28	407.77
British colonies	1475.03	1483.35
Other countries	2696.96	2440.81
Real GDP per capita in 1995:		
	Mean	Standard deviation
French civil law	3609.35	4074.85
British common law	5124.72	5624.17
French colonies	1245.31	1038.35
British colonies	2980.65	2843.71
Other countries	6909.29	5503.65
Growth rates (yearly, continuously compounded):		
	Mean	Standard deviation
French civil law	1.152%	1.347
British common law	1.641%	1.674
French colonies	0.389%	0.563
British colonies	1.710%	1.531
Other countries	2.678%	1.668
Share of population within 100 km of the coast:		
	Mean	Standard deviation
French civil law	0.5131	0.3572
British common law	0.5347	0.4060
French colonies	0.3661	0.3121
British colonies	0.5352	0.4153
Other countries	0.4500	0.3994
Share of the land area within the tropics		
	Mean	Standard deviation
French civil law	0.7097	0.4293
British common law	0.6421	0.4506
French colonies	0.8233	0.3588
British colonies	0.7655	0.3894
Other	0.3063	0.4374
Ethnic fractionalisation (115 observations):		
	Mean	Standard deviation
French civil law	0.3545	0.3126
British common law	0.4422	0.3151
French colonies	0.6049	0.2758
British colonies	0.4683	0.3329
Other	0.3080	0.2977
Share of Catholic population:		
	Mean	Standard deviation
French civil law	0.5720	0.3882
British common law	0.2182	0.2099
French colonies	0.1574	0.1965
British colonies	0.2347	0.2502
Other countries	0.1572	0.2543
Share of Protestant population:		
	Mean	Standard deviation
French civil law	0.0525	0.0906
British common law	0.2085	0.1710
French colonies	0.0794	0.1334
British colonies	0.1796	0.1762
Other	0.2460	0.3381
Share of Muslim population:		
	Mean	Standard deviation
French civil law	0.2083	0.3504
British common law	0.1015	0.2706
French colonies	0.5412	0.4111
British colonies	0.2068	0.3000
Other	0.2513	0.3871

Table A2. List of countries in the sample

French civil law countries:

1. Algeria
2. Angola
3. Argentina
4. Belgium
5. Benin
6. Bolivia
7. Brazil
8. Burkina Faso
9. Burundi
10. Cap Verde*
11. Chad
12. Central African Republic
13. Chile
14. Colombia
15. Comoros*
16. Congo
17. Democratic Republic of the Congo
18. Costa Rica
19. Cote d'Ivoire
20. Dominican Republic
21. Ecuador
22. Egypt
23. El Salvador
24. France
25. Gabon
26. Greece
27. Guatemala
28. Guinea
29. Guinea-Bissau
30. Haiti
31. Honduras
32. Italy
33. Luxembourg*
34. Madagascar
35. Mali
36. Malta*
37. Mauritania
38. Mauritius
39. Mexico
40. Morocco
41. Mozambique
42. Nicaragua
43. Niger
44. Panama
45. Paraguay
46. Peru
47. Portugal
48. Rwanda
49. Senegal
50. Seychelles*
51. Spain
52. Togo
53. Tunisia
54. Uruguay
55. Venezuela

Common law countries

1. Australia
2. Bahamas*
3. Bangladesh
4. Barbados*
5. Belize*
6. Botswana
7. Canada
8. Fiji*
9. Gambia
10. Ghana
11. Guyana
12. *Hong Kong*
13. India
14. Ireland
15. Israel
16. Jamaica
17. Kenya
18. Lesotho
19. Malawi
20. Malaysia
21. New Zealand
22. Nigeria
23. Pakistan
24. Papua New Guinea
25. Sierra Leone
26. *Singapore*
27. Sri Lanka
28. Swaziland*
29. Tanzania
30. Trinidad and Tobago
31. Uganda
32. United Kingdom
33. United States
34. Zambia
35. Zimbabwe

Other countries

1. Austria
2. Cameroon
3. China
4. Czech Republic
5. Denmark
6. Ethiopia
7. Finland
8. Hungary
9. Iceland*
10. Indonesia
11. Iran
12. Japan
13. Jordan
14. Korea (South)
15. Namibia
16. Nepal
17. Netherlands
18. Norway
19. Oman

20. Philippines
21. Romania
22. Saudi Arabia
23. South Africa
24. Sudan
25. Suriname*
26. Sweden
27. Switzerland
28. Syrian Arab Republic
29. Taiwan
30. Thailand
31. Turkey

French colonies

1. Algeria
2. Benin
3. Burkina Faso
4. Chad
5. Central African Republic
6. Comoros*
7. Congo
8. Cote d'Ivoire
9. Gabon
10. Guinea
11. Madagascar
12. Mali
13. Mauritania
14. Morocco
15. Niger
16. Senegal
17. Togo
18. Tunisia

British colonies

1. Bahamas*
2. Bangladesh
3. Barbados*
4. Belize*
5. Botswana
6. Fiji*
7. Gambia
8. Ghana
9. Guyana
10. *Hong Kong*
11. India
12. Jamaica
13. Kenya
14. Lesotho
15. Malawi
16. Malaysia
17. Malta*
18. Mauritius
19. Nigeria
20. Pakistan
21. Papua New Guinea
22. Seychelles*
23. Sierra Leone
24. *Singapore*
25. Sri Lanka
26. Swaziland*
27. Tanzania
28. Trinidad and Tobago
29. Uganda
30. Zambia
31. Zimbabwe

All countries not in the British or French colony categories are in the omitted category in eq. 2.

Although data are available for Hong Kong and Singapore, they are not included in the regressions, except for those shown in Columns 3 and 4 of Table 4.

Countries marked with an * have been added by us to the Gallup, Sachs and Mellinger (1997) sample.

Table A3. Distribution of countries in the sample across institutional categories

	French Colonies	Not French Colonies	Total
French Civil Law	18	37	55
	British Colonies	Not British Colonies	Total
Common Law	26	7	33
	Common Law	French Civil Law	Total
British Colonies	26	4	30
	French Civil Law	Not French Civil Law	Total
French Colonies	18	0	18
Others	-	-	30

Appendix 2

Data Problems in Acemoglu et al. (2001,2002,2003).

Based on "The Colonial Origins of Comparative Development: a Re-examination based on Improved Settler Mortality Data" by D.Albouy (2005).

Albouy's central point is that Acemoglu, Johnson and Robinson (2001, 2002) and Acemoglu and Johnson (2003) [henceforth AJR] use what are in fact only 36 data points on settler mortality at the beginning of the colonial period to generate the data for the 64 countries on which they base their statistical analysis. In fact the situation on data availability is even worse than this, as 3 of the supposed data points (which are used for the whole of Latin America) are in fact data on the mortality of Bishops over a ten-year period in what are supposed to be three different disease environments in the continent, based on the mean temperature of the cities concerned. The data come down to 4, 5 and 10 deaths out of populations of 24, 28.5 and 30.5 respectively. Given the tiny samples, the standard errors of the populations are very large (7.8, 7.2 and 8.6 according to Albouy), so that the Latin American mortality rates seem quite useless. The net result is that we have more or less reliable data only for Mexico, British Guyana (which is actually based on French Guyana)[42], Jamaica and Trinidad and Tobago in the whole of Latin America and the Caribbean (and so only on *one* Latin country), 14 countries of sub-Saharan Africa, three in North Africa, four "new Europes" (Australia, Canada, New Zeeland and the USA) and seven in Asia (a total of 32 data points).

This means that many of the most impressive results that AJR get are largely spurious. Take, for example the first stage result that the log of "settler mortality" at the beginning of colonisation predicts well "expropriation risk" today, even with dummies for Africa, Asia and "other continents", with "America" as the base case (Table 4, AJR 2001). AJR find that this instrument then performs very well in the second stage, where it is used to predict the log of GDP/capita in 1995.

This result is driven by the difference, between North America (the US and Canada) and Latin America within "America". But, in fact, for Latin America, there is only **one** data point (Mexico). This situation is hardly improved if we add the 3 Anglo-Caribbean countries we have, especially as Albouy's revision of settler mortality for the USA gives a figure that is 90% of the Mexican (instead of one quarter) and almost twice that of Guyana! Furthermore, there is in fact no independent data for Canada, and the US data is simply applied to it. Thus, the whole result is largely driven by two data points, one for the US and one for Mexico, the former of which is, according to Albouy, mistakenly underestimated by a factor of three.

[42] French Guyana is itself not used, presumably because of its tiny population (in the tens of thousands) and the fact that, as a French dependency to this day, it benefits from high subsidies.

Furthermore, Albouy demonstrates that even using *AJR's sample*, but putting the USA and Canada into the "other Continent" category and adding a separate dummy for North Africa (Albouy, Table 4, Col. 2), results in the log of "settler mortality" becoming quite insignificant as a determinant of "expropriation risk" (p-value: 0.35).

Except for Latin America, AJR's data comes from mortality rates for soldiers, yet they do not distinguish data from *campaigns* and that from *peacetime*. Yet "campaign" and "barracks" data for the same territory differ by a factor of 1.5-3.5 for countries for which both kinds of data are available (this difference applies to non-combatant deaths). Albouy distinguishes the two kinds of data. When he *adds a control dummy for data points based on "campaigns*" (still using AJR original data set), he finds that "settler mortality" predicts "expropriation risk" with a p-value of 0.13 (when "clustered" standard errors are also used, so as to take account of the fact that many countries share the same mortality data). Albouy points out that in IV estimations, even such a low p-value in the first stage leads to almost infinite confidence intervals in the second stage, because of so-called "weak instrument pathologies". Moreover, when Albouy adds the "campaign dummy" and excludes "new Europes" from the sample (and corrects standard errors for "clusters") he gets a p-value for log settler mortality predicting expropriation risk of 0.21. So that, when "new Europes" are excluded and "campaign data" and "clusters" are corrected for, settler mortality no longer predicts even expropriation risk reasonably well in the first stage.

Finally, when Albouy uses his *revised* "campaign" data (introducing 49 revisions, using more appropriate countries such as Kenya for Uganda, rather than Mali for Uganda) he finds that the first stage coefficients are massively insignificant in *all* the specifications with any controls (Table 2, Panel B). Moreover, he obtains exactly the same results with the "barracks revision" of the data (34 changes and 19 omissions, p.12), with the sole exception of the case when the control is so-called British or French colonial origin (Table 2, Panel C, Col. 7)[43].

[43] In fact this dummy represents common law and French civil law countries, rather than Colonial Origin in our sense - see Acemoglu, Johnson and Robinson (2004, Fig 16) which gives population density of so-called "British Colonies" in 1500, and which shows the "new Europes" included in this group.