Université de Montréal

« Institutions Matter for Economic Development. A survey. »

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Résumé

Ce rapport de recherche se propose de dégager les principaux déterminants de la performance économique tels que considérés par l'approche institutionnelle de la croissance économique dans le domaine de l'économie du développement. Le fondement théorique de cette approche affirme que l'ultime cause de la croissance est la structure institutionnelle de la société, structure qui détermine le comportement des individus dans la société. Cette théorie est sujette à des tests empiriques, avec différents travaux sur la croissance qui emploient différentes mesures des institutions. Ici, l'on s'attardera sur l'approche institutionnelle telle qu'exprimée dans Acemoglu, Johnson, Robinson (2000). Également, nous voulons décrire deux possible critiques de cette approche : la vue géographique et celle néo-classique sur le développement. Nous conclurons avec un nombre de questions que cette littérature a laissée sans réponse, attendu que l'on peut se demander pourquoi on ne trouve jamais des modèles théoriques de la croissance, mais seulement des articles empiriques.

Mots clés : approche institutionnelle, approche géographique, croissance, économie du développement, théorie de la convergence.

Abstract

This report wishes to illustrate the main findings of institutionalism about the fundamental determinants of economic performance. The theoretical foundation of this approach to growth states that the ultimate cause of growth is the institutional structure of the society, as this structure determines the behaviour of individuals in that society. This theory is subjected to empirical testing, with different papers trying different measures of institutions to account for growth. Here, we will try to evaluate the institutional view as expressed in Acemoglu, Johnson, Robinson (2000). Additionally, we wish to describe two possible critiques of this view: the geographical view on development economics, and the neo-classical approach to growth. We will conclude our paper with a number of questions that this literature has left unresolved, as we can wonder why there haven't been any theoretical models of the institutional view, but only empirical papers.

Key words: institutionalism, growth, development economics, geographical view, theory of convergence.

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Introduction

An important aspect of economic research concerns economic growth, the evolution of output per capita over time. Since Adam Smith and David Ricardo, a number of theories have tried to explain growth or suggest reasons why it should be encouraged. Through Adam Smith's preoccupation with the "wealth of nations", or Ricardo's arguments in favor of free trade as a source of improving one's economy, obtaining a better performance out of economic factors has been a constant effort of thought and research.

Recent models of growth, Solow-Swan model in the 50's and Romer and Lucas in the 80's, have tried to analyze long-run growth analytically in order to find the causes underlining it. The neo-classical growth model posits a theory of convergence between countries with different growth rates. This theory shows that rich countries' growth rates increase up to a certain point until they reach their steady-state, where these rates become zero. The theory of convergence thus predicts that poor countries have higher growth rates, and eventually will converge towards the output levels of rich countries. Growth in this model is primarily driven by technological change as an exogenous parameter. As little evidence of convergence was found empirically, the endogenous model of growth proposed a different perspective for this cause of growth. It concentrated on the effects of human capital accumulation, knowledge and innovation on growth, thus treating technology as an endogenous parameter.

However, these theories have not been able to provide a sufficient explanation for the observed growth inequalities in the world. We do not know why productivities across countries differ, why some countries have a high rate of growth while others do not, and what are the causes of considerable differences in incomes across countries. It is certain that

accumulations of human capital matters, as well as the allocation of resources, but is there a more fundamental cause of growth?

While research in growth theory continued, the line of study moved toward a socially and politically aware area. Development economics especially couldn't be isolated from other facets of reality if an encompassing explanation was to be found. This is the main objection of institutionalism to neo-classical theory of growth. As North and Thomas (1973), its early defenders, point out: «the factors we have listed (innovation, economies of scale, education, capital accumulation etc.) are not causes of growth; they *are* growth» (italics in original)[1]. For them, a true cause of growth would be the institutions a country has. Institutions are the warrant of laws and rights affecting the incentives a person faces, defining what is possible and what isn't possible to do in a particular society or «the rules of the game» as North likes to say.

Hall and Jones (1999) showed that, in a regular OLS regression of log output per worker on human capital[2] and physical capital, the residual explained most of the variation in worker's productivity. This test revealed the difficulty of the basic question of development economics: why, given that advanced technology is universally available at present, there are still such enormous differences in productivity, and thus of wealth, across countries? Neo-classical theory states only that different technologies produce different growth rates, but cannot explain why there are still such technology differences. The example of Japan comes to mind, when considering the catching-up hypothesis, but then why didn't this technological progress take place for most African countries also in the past century?

[1] Acemoglu, Daron, Simon Johnson, and James Robinson (2004), "Institutions as the Fundamental Cause of Long-Run Growth", in *Handbook of Economic Growth*, Volume 1, Edition 1, edited by Philippe Aghion and Steven Durlauf, 2005, p. 1.

[2] Here, human capital is the average educational attainment, measured in 1985, as in Barro and Lee (1993). Physical capital is measured using a perpetual inventory method, with investment data going back at least till 1970. The output per worker is taken from Penn World Tables Mark 5.6, with adjustment for natural resources, as for the mining industry.

Hall and Jones (1999)'s answer was to instrument for a measure of institutions, as institutions is an endogenous parameter, depending on the level of growth, in order to show that the differences in productivity can be explained by how «good» or «bad» institutions of that country are. Others have chosen a different answer. For example, Knack and Keefer (1997), the initiators in the literature on institutions of employing Political Risk Services data as measure of property rights (Knack and Keefer 1995), investigate whether this variable is rather dependent on forms of «social capital», as defined by Putnam (1993). They use a measure of «trust» from surveys to take into account the level of social cohesion. According to Putnam's analysis, the importance of civic society can lower costs of transactions, and thus a better cohesion explains a more prosperous economic outcome.

Hence the modern line of research isn't focusing solely on institutions in trying to explain why progress wasn't as rapid or practically absent from other parts of the world. Other explanations may involve cultural reasons, or geographical ones. The cultural view could be traced back to Max Weber (1930), for whom the rise of capitalism is due in part to the Protestant ethic, in particular Calvinism. This cultural hypothesis appears in the empirical literature either as search of correlation between religious beliefs and GDP per capita (Barro and McCleary 2003), or a particular cultural background (Véliz 1994), the influence of Iberian heritage on Latin American growth as opposed to Anglo-Saxon heritage of North America).

The geographical view also has had a long history. De Montesquieu wrote in mid-18th century about the influence of climate on people's behavior and work productivity. He suggests that a warmer climate may induce laziness, whereas temperate regions, like France, are ideal for the spirit (De Montesquieu 1748). Recently, economic research explored the relation between climate, temperature and output growth. For example, Masters and McMillan (2001) show that countries with winter frost have higher GDP. Gallup, Sachs and

Mellinger (1998), McArthur and Sachs (2000), illustrate the importance of geography in general, whereas Bloom and Sachs (1998), Gallup and Sachs (2001), Sachs et Malaney (2002), Kiszewski et al (2004), all concentrate on the burden of disease environment, with particular attention paid to malaria. Geography also seems to influence workers' productivity, as well as costs of education, health, investment and savings, population growth and other variables which represent the growth in the neo-classical models.

In our survey of the growth literature, we wish to focus on the main arguments of the most recent research on growth, in particular institutionalism. In this paper, we will try to evaluate the institutional view as expressed in a very influential article by Acemoglu, Johnson, Robinson (2000) (AJR hereafter). We will report two major critiques that seemed the most relevant for the question of growth, which are represented by two papers that embody these two different theoretical perspectives. First, we will look at the geographical objections to the primacy of institutions, with particular attention to Gallup, Sachs and Mellinger (1998) (GSM hereafter). Second, we will return to classical theory of growth, taking into account the arguments of Glaeser, La Porta, Lopez-de-Silane and Shleifer (2004) (GLLS hereafter), as they prove the frailty of institutional measures and difficulty in assessing causality in such a matter.

Our paper considers the institutional view as an exploratory start. We would like to illustrate the main findings of this view about the fundamental determinants of economic performance. The theoretical foundation of this approach to growth states that the ultimate cause of growth is the institutional structure of the society, as this structure determines the behaviour of individuals in that society. Given the institutional structure, one can then look for what is and isn't possible to achieve in terms of economic performance. This theory is subjected to empirical testing, with different papers trying different measures of institutions to account for growth. We have chosen AJR (2000), as this paper exemplifies this theory at its

best. The ingenuity of the tests places this paper at the forefront of the literature on institutions, making it the seminal paper in the field.

Additionally, we wish to describe two possible critiques of this paper. The institutional view still encounters resistance on the part of researchers in growth theory, and this due to very specific reasons. First of all, we shall examine the geographical view, because this view poses a very important question for the causality problem. Geography is the only exogenous parameter that can influence growth, and thus it is legitimate to ask whether this actually is the fundamental cause of growth. Such a perspective would place the institutional framework on a secondary place, rendering it less important for growth. Secondly, we will inspect the validity of the institutional view's strategy of empirical examination. This theory has departed from the traditional, neo-classical, way of conducting empirical research on growth, motivated especially by the problems encountered by convergence theory's problematic fit with reality. But has this strategy improved the results? In other words, did this strategy arrive at explaining the growth in real world? GLLS show us how this strategy failed, or at least partially failed, as it has not yet become the all-encompassing explanation behind growth.

We will conclude our paper with a number of questions that this literature has left unresolved. After reading many empirical papers on growth, we can wonder why there haven't been any theoretical models of the institutional view. We see that different empirical tests seem to predict some influence of institutions on growth, but at a theoretical level, none have tried to prove these findings. We wonder whether this is not because of more and more emphasis on history in these economic studies, a social science which has its own rules, but especially lacking predicting power. The conclusion of most of the literature is that a higher attention paid to the particular situations and diversity of human peoples around the world is key to a better understanding of growth. This is an important aspect, as it implies serious consequences for policy-makers: recommendations for improving economic performance

might be to start from scratch as a consequence of this research. The neo-classical framework, applied to development economies didn't produce many successes, and where there has been economic success, other methods seemed to have also applied (as is the case with China for example). Our view is that one has to be careful when categorizing different regions around the globe with the same standard, as this might not reveal anything pertinent about the true state of the world economy, nor what can be done to improve it.

Institutions Matter

A Neo-Classical Theory Approach

The neo-classical approach to growth consists of taking an aggregate production function as the starting point of the analysis, and then comparing the evolution of its factors across countries. The aggregate production function represents individual choices, as each individual has the option of having a firm. The assumption of neo-classical models that markets are perfect and productivities across countries are the same, results in an aggregate production function that summarizes the world economy. Therefore convergence is not only possible, but a definite outcome, as all countries should end up equally rich.

As presented in Barro and Sala-i-Martin (1995), convergence is predicted from the initial value of output, knowing the level of the steady-state[3]:

$$(1/T)\cdot\log\left[(y(T)/y(0)\right] = x + \left[\left(1-e^{-\beta T}\right)/T\right]\cdot\log\left[\hat{y}*/\hat{y}(0)\right] \qquad (1)$$

where $(1/T)\cdot\log\left[(y(T)/y(0)\right]$ is the average growth on the time interval from 0 to T, $\hat{y}*$ is the steady-state value and β is the convergence coefficient. This is the basis for the later empirical testing.

The usual critique to the neo-classical growth model involves the assumptions of the convergence theory. One could say either that markets are not perfect and capital might not move the way it should, or that the returns on investment aren't those predicted. One could also object to the form of the production function in general, and say that the production function has fixed costs, or that it doesn't present constant returns to scale, and so on. Therefore, when Barro and Sala-i-Martin (1995) test empirically for the evolution of growth,

[3] Barro, Robert J., and Xavier Sala-i-Martin, *Economic Growth*, McGraw-Hill, New York, 1995, p. 81, eq. 2.35.

they include a number of control and environmental variables to account for the determinants of growth. These controls determine the true steady-state level of the country in question.

Thus, we have a function of growth of the form:

$$Dy_t = F(y_{t-1}, h_{t-1}; ...) \qquad (2)$$

where Dy_t is the per capita growth rate, y_{t-1} is the initial output per capita, and h_{t-1} is the initial level of human capital per person, which are the state variables, and the rest (…) being the control variables[4]. For the state variable, Barro and Lee (1993) constructed a human capital measure, consisting of school attainment at various levels, which is used throughout the literature[5]. As control variables, Barro and Sala-i-Martin (1995) suggest public spending on education, trade, political stability, and other variables employed in the literature.

Consequently what is usually estimated is:

$$\ln(Y_i) = \beta_0 + \beta_1 I_i + \beta_2 M_i + \beta_3 Z_i + \varepsilon_i \qquad (3)$$

where $\ln(Y_i)$ is the average income per capita, I_i are variables always included in the regression (such as initial levels of GPD and schooling, and health variable Life expectancy at birth), M_i is the variable of interest, Z_i is for other variables, potentially important as explanatory variables and ε_i is the error term[6]. The coefficient β_1 will show if there is or not convergence.

[4] Barro, Robert J., and Xavier Sala-i-Martin, *Economic Growth*, McGraw-Hill, New York, 1995, p.421, eq. 12.1.
[5] Average years of female and male secondary and higher schooling.
[6] For an analysis of sensitivity of growth regressions of this type in the literature, see Levine and Renelt (1992).

The New Framework: Institutionalism

In order to think in a novel way about the growth that rose with institutionalism, a whole different range of estimations is required. As no convergence exists in this theoretical approach, no convergence is tested. What remains to be tested is the influence of the explanatory variables themselves on growth. The equation (3) above changed to:

$$\ln(Y_i) = \beta_0 + \beta_1 M_i + \beta_2 Z_i + \varepsilon_i \qquad (4)$$

One can notice immediately that such an equation is difficult to estimate, because almost all the explanatory variables are correlated with growth, as well as with each other. The only exogenous sources of impact on growth are the geographical variables, when even the state of the technology was conceived as endogenous in the later neo-classical models. In view of that, many empirical papers searched for possible instrumental variables for the different explanatory variables.

The empirical testing of the influence of institutions had two prime solutions for finding a relevant enough instrument to resolve this endogeneity problem. It either employed geographical variables (such as the distance from the equator, by Hall and Jones (1999), as proxy for the Western influence), or cultural ones (as the French origin of legal system and origin of the colonizer by La Porta et al. (1998, 1999), in studies paying particular attention to ancient colonies of Europe). These were not entirely convincing, as they could always be dependent on other factors directly affecting the growth of output per capita (geographical or cultural influences could have been primary). "The Colonial Origins of Comparative Development: An Empirical Investigation" is a surprising article in the literature on institutions, because it constitutes a break with the paradigm of previous research. AJR's

innovation comes from finding an instrument which has no other meaning than being an econometric measure, and thus facilitating the discussion on the influence of institutions.

AJR's fundamental contribution lies in the ingenuity of their instrumental variable in regressions of growth, and thus launching a new trend of regressions on historical variables. Their instrument is the European settler mortality in the colonies between the 17th and 19th century[7]. Their choice of instrument is motivated as follows: "Colonies where Europeans faced higher mortality rates are today substantially poorer than colonies that were healthy for Europeans."[8] When Europeans colonized other regions of the world, where they encountered difficulties in settling in large numbers, they created «extractive institutions». The extractive institutions existed through exploitation of local population and persisted to the present day as «bad» institutions, detrimental to growth. Where Europeans managed to settle, they replicated their home institutions, protecting individual rights to a higher degree, and giving way to the «good» institutions of today.

They claim their instrument is valid: first, because settler mortality in the past does not influence in any way income per capita today, and second, because of the chain of causality relating settler mortality to current institutions. This chain of causality is: where the mortality rate was lower, colonizers from Europe made settlements, created early institutions, which then persisted through time, became embodied in the current institutions, and now influence the current economic performance of these countries.

The equation they are testing[9] is:

$$\log y_i = \mu + \alpha R_i + \mathrm{X}_i^{'}\gamma + \varepsilon_i \qquad (5)$$

where $\log y_i$ is the economic outcome (GDP per capita 1995 PPP adjusted) , R_i is the measure of institutions (Protection against expropriation Risk Index[10]), $\mathrm{X}_i^{'}$ represents other variables

[7] See Appendix 1 for a discussion on the construction of the sample for this instrument.
[8] Acemoglu Daron, Simon Johnson, and James Robinson, "The Colonial Origins of Comparative Development: An Empirical Investigation", *American Economic Review*, vol. 91(5), 2001, p. 1370.
[9] We report the equations as they appear in AJR's paper.

influencing GDP, ε is the error term and α, the coefficient they are looking for, which represents the impact of institutions on growth of GDP.

They also want to show that their instrument of institutions affects growth through the desired causality: from settler mortality (M_i) to past settlement in colonies (European population in 1900, S_i), to early institutions (circa 1900, C_i), to current institutions (R_i).

$$R_i = \lambda_R + \beta_R C_i + \mathrm{X}_i' \gamma_C + \upsilon_{Ri} \qquad (6)$$

$$C_i = \lambda_C + \beta_C S_i + \mathrm{X}_i' \gamma_C + \upsilon_{Ci} \qquad (7)$$

$$S_i = \lambda_S + \beta_S \log M_i + \mathrm{X}_i' \gamma_S + \upsilon_{Si} \qquad (8)$$

Knowing $Cov(R_i, \varepsilon_i) \neq 0$, as we know that institutions are endogenous with respect to economic development (countries with higher levels of income investing in better institutions), if M_i, settler mortality, is a valid instrument, then:

$$Cov(R_i, M_i) \neq 0 \qquad (a)$$

$$Cov(M_i, \varepsilon_i) = 0 \qquad (b)$$

and the valid identification strategy for α, would be a 2SLS regression, with the first stage being:

$$R_i = \zeta + \beta \log M_i + \mathrm{X}_i' \delta + \upsilon_i \qquad (9)$$

After verifying the channels of causation through regressions of equations 6, 7, 8, and finding close relationships, they give the results of their IV estimation (equation 9 and 5). Because of the confirmation of the chain of causality with high correlations between variables, and the theoretical respect of the conditions a, b, for the instrumental variable, the problem of reverse causality and omitted variables is considered resolved. The difference between the

[10] Political and Risk Services are a private company which provides data on risk of investing in each country mainly for foreign investors. Knack and Keefer (1995) showed that this measure of foreign investment is highly correlated with domestic investment. It is a good proxy for a certain level of institutions comparable worldwide because foreign investment is considered more homogeneous across countries.

OLS estimate of α, 0.54, compared to the estimate of the IV regression, 0.94, shows that the measurement error bias is higher then reverse causality bias, and consequently nothing seems unusual about the IV regression[11].

As it appears in Table 1, this estimation of a highly significant influence of institutions on growth doesn't depend on the «Neo-Europes» (Canada, United-States, Australia and New Zealand): the estimate for α increases only a little, to 1.28, showing increased importance of institutions for growth, as expected. Another issue is Africa, which changes slightly the results: without African countries, α is still high, 0.58. This implies that Africa doesn't have growth, especially because of its poor institutions and not because of cultural or geographical differences (if the latter would have been the case, it should have influenced the whole sample, but the coefficient on growth seems to have stayed the same)[12]. A curious result is the non-significance of geography as captured by latitude variable. This is the first point of controversy which motivated AJR robustness checks.

Robustness checks first surprise by the fact that they eliminate cultural differences as a possible explanation of growth, as British and French origin dummies are almost irrelevant for the results (the same irrelevance of culture demonstrated above with the continent dummies, as we have seen with Africa). AJR's conclusion is that the previous literature, emphasizing the British system of laws, saw this as better than anyone else's by pure chance: the British just had more colonies where Europeans could safely settle. The second surprise comes from the analysis of the disease environment and the impact of geography. AJR prove that geography affects income only indirectly, through their effect on institutions.

[11] AJR consider instrumenting the institutions variable with another institutional measure (constraints on the executive), to see how large the measurement error is, and they conclude it has the right order of magnitude.
[12] Another theoretical objection against geographical reasons for which Africa would be poorer, is the fact that local populations usually have higher immunity to their disease environment, even when this was lethal for foreigners, Europeans, in the present study. Therefore they should have been able to create means of growth for themselves, as Europeans did in their native region. We will see later on the problems with this argument.

The question of whether the disease environment or other geographical variables affect output per capita directly is crucial, because it could accordingly invalidate their IV strategy. If the instrument used - settler mortality of colonizers in the past - is correlated to the current disease environment, then settler mortality might not be a good instrument of institutions, or a weak one. We can see in Table 2 that none of the usual health variable used in the literature is significant, except infant mortality. As health in general is endogenous with respect to the level of wealth, AJR expect the estimate on institutions to be smaller, but it is still highly significant (0.55 with infant mortality as geographical variable in the regression).

AJR's theoretical conceptions of growth have been empirically tested in this article: the institutional structure is the primary cause of growth, all other variables having at most an indirect influence through the institutional framework. They admit that the measures for institutions are very relative at this point of the research, and it is not at all clear what an improvement of institutions would mean. They refrain from practical recommendations.

Critiques to Institutionalism

The Geographical Critique

The first question that comes to mind about the instrument that AJR uses in an analysis of the causes of growth, is whether this instrument is itself related to income per capita today, as it might be related to current disease environment. If it is the current disease environment that affects GDP growth, it means that geography would be a more accurate direct cause of growth, and institutions would be an outcome of this circumstance. If geography is the primary cause of growth, than AJR's strategy didn't work, as they would not have been able to prove that it's the institutions that matter more.

McArthur and Sachs (2000) answer AJR by asking how could geography not influence directly the growth of output per capita today, if they admit it did influence it in the past, even to the point of giving rise to the wrong or good institutions. Geography should then still influence the working conditions, the agricultural productivity, the fertility rate, and so on. It is rather the institutions that are constantly influenced by geography. The authors believe that AJR's result comes mainly from bias created by the sample size which doesn't permit enough variation in geographical climates. Indeed, the reduced number of countries chosen by AJR are mostly tropical or sub-tropical, so there is no possible influence of different climate situations to be observed[13].

AJR's main response to the geographical view has been another article, AJR (2002), which raises the question of the «Reversal of Fortunes» for countries through history. If the geography would be the main determinant of development, then no radical change could ever

[13] AJR's answer to this critique was that they included countries like the Neo-Europes in their sample, and that these provide enough variation…

appear with time, as those geographical differences should be the same. This is certainly the best argument against the geographical view, but there remain a few factual problems. If there has been some reversal of fortunes in the past, as with the Caribbean Islands, the only significant reversal remains the so called Neo-Europes (US, Canada, Australia and New Zeeland). If one looks at the latest Maddison data set, the rule seems to be the opposite: tropical countries were poor and still are[14]. Empirically, the reversal seems to be the exception, and maybe reasons to each singular case can be found.

But for AJR, the claim that institutions shape the economic environment in the first place extends itself to the African countries, which is an understandable quest for coherence. For example, AJR stress the immunity of local peoples to malaria, the primary cause of death in the colonies, and the inherent basis of the settler mortality measure. Their suggestion is that this disease environment is a relevant measure of institutions also because it only affected the Europeans trying to colonize those countries. If it would have affected everybody, then the distinction between those who did create good institutions and those who didn't would rest entirely on those particular people, either through their culture, or different knowledge[15].

The problem with this argument is that studies on malaria show that even though immunity can be acquired at a young age, and quite rapidly (up to two months), this immunity also is lost just as easily (within a year) when the population moves to a different region[16]. AJR themselves admit that there were high mortality rates for *African* laborers, taken as slaves across Africa, or brought to America!

The malaria burden seems quite important when examined in greater detail. An adult receives hundreds of biting of mosquitoes per year. Thus his work productivity is reduced by hours of work lost on frequent recoveries. If a person moves to another city in search for a job,

[14] See Przeworski (2004 a) for a direct answer to Acemoglu, Johnson and Robinson (2002). We will come back to this in our conclusion.
[15] These two possibilities are in fact an alternative perspective, and have been tested as such, as we will see in the analysis of our last article, that looks for influence of human capital.
[16] See Sachs and Malaney (2002), Kiszewski and al. (2004) for more details.

it is very unlikely that this person would be willing to go back, as it incurs the risk of illness again and therefore labor mobility will be drastically reduced in those regions. School absenteeism for children translates itself in lower human capital and higher costs of education. All these effects, as well as other costs of disease environment (like health care costs for treatment and prevention, hired labor to compensate for morbidity within household, foreign investment etc.), make malaria an important factor for development.

Sachs (2003) tests for influence of geography on GDP growth, reproducing AJR's sample, as well as two other samples of studies showing the primacy of institutions on growth[17]. To show the impact of malaria, he uses an instrument called Malaria Ecology (ME), because malaria is endogenous with respect to wealth, inasmuch as health measures could contribute to lowering a possible death rate. This instrument is constructed by Kiszewski et al (2004) and takes into account the temperature as well as the density and different types of fatal mosquitos[18]. Being constructed on climatological factors, ME is exogenous to programs of public health and to individual's revenue.

The equation to be estimated[19] is the same as in AJR:

$$\ln(Y_i) = \beta_0 + \beta_1 QI_i + \beta'_2 Z_i + \varepsilon_i \qquad (10)$$

where $\ln(Y_i)$ is the income per capita (log GDP PPP adjusted 1995), QI_i is the measure for institutional quality (here we will have three: expropriation risk used by AJR, and an index of institutions from Kaufman, et al. (1999, 2002), used by Easterly and Levine (2002) and Rodrik, Subramanian and Trebbi (2002) respectively), Z_i is for other variables, such as geographical variables, that have an impact on GDP and ε_i is the error term.

[17] The samples he uses are from: AJR (2000), Easterly and Levine (2002), Rodrik, Subramanian and Trebbi (2002) (RST hereafter).
[18] Temperature is important because the parasite in the mosquito needs a life-cycle to become infectious, and if the temperature is lower, the mosquito takes longer to accomplish that life-cycle, if it ever gets there (below 16 degrees it becomes unlikely for the mosquito to survive long enough). This is the basis for tests on temperate climate or seasonality in studies like Masters and McMillan (2001) on winter frost, for example.
[19] As presented in Sachs (2003).

Sachs tests whether geography has no direct impact on income growth, and as a result he is testing whether the null hypothesis on β_2 cannot be rejected, knowing that the geographical variable he will use will be a malaria index.

The instruments employed are the settler mortality variable, created by AJR, the Malaria Ecology and a variable representing the share of a country's population in temperate ecozones that controls for the geographic region, in order to isolate just the contribution of the disease and no other geographical parameter. As seen in Table 3, the results are significant, so the null hypothesis is rejected. Malaria definitely seems to impinge on economic growth[20].

In a more elaborate description of the influence of geography on subsequent economic development, Gallup, Sachs and Mellinger (1998) test a growth equation that can reveal if catching-up effects can take place. Estimating by OLS the equation for convergence of Barro and Sala-i-Martin (1995), GSM use annual growth of GDP between 1965 and 1990, with initial year being 1965. We have reconstructed the equation as follows:

$$\ln(Y_i) = \beta_0 + \beta_1 \ln Y_{0i} + \beta_2 S_{0i} + \beta_3 \ln Life_0 + \beta_4 Open + \beta_5 QI_i + \beta_6 Z_i + \varepsilon_i \qquad (11)$$

where $\ln(Y_i)$ is the average GDP per capita from 1965 to 1990, $\ln Y_{0i}$ is the initial GDP in 1965, S_{0i} is the initial level of education in 1965, $\ln Life_0$ is life expectancy at birth in 1965, $Open$ is a measure of the openness to trade (Sachs and Warner (1995 b)'s index), QI_i is the measure for institutional quality (the index of institutions from Knack and Keefer 1995), Z_i is for other geographical variables (here: tropics, population 100 km from the coast, distance from the core markets, and malaria) and ε_i is the error term.

From Table 8, we notice that GDP growth is inversely related to the initial level of GDP, hence confirming the convergence theory, but also establishing that being in the tropics

[20] In Gallup and Sachs (2000), we have a list of countries that have succeeded in eradicating malaria, and see that none of those having a decent growth now (Greece, Italy, Spain, Portugal, US South) were tropical, and only few successes exist for developing countries (these are Jamaica, Mauritius and Taiwan). The growth in these last countries is obviously linked to eradication of malaria. Nonetheless, see tables 4, 5, 6 and 7 for the magnitude of change in growth after malaria eradication.

highly reduces growth, as well as being affected by malaria. When geographical variables are introduced simultaneously, the results are weaker, indicating that either the variables are picking from each other some of the justification, or that there are still missing variables. For example malaria might end up being used as a proxy for more diseases than just one, as the data of this kind is hard to collect accurately, where many deaths are undeclared officially and some are from combinations of diseases.

However the tests for agglomeration effects on the economy in columns 6 and 7 show that being a coastal economy presents a potential for positive growth, whereas having high densities of population landlocked reduces growth (the coefficients on log coastal and log inland densities are positive and, respectively, negative). A quick look at the maps render obvious these conclusions, by first almost perfectly mapping the evolution of malaria to the GDP growth, and second by predicting the large rise of population in the places most adverse to growth (fertility being inversely related to the level of income per capita, as investment in the *quality* of human capital rises)[21].

Unfortunately, this is the alarming conclusion of the geographical view. When emphasizing institutions only, essential facts are overlooked. Development economics must pay particular attention to geography if poverty is to ever be decreased in the future.

The Importance of Human Capital

Another criticism to AJR (2000) comes from Glaeser, La Porta, Lopez-de-Silane and Shleifer (2004), whose first objection is the expressed skepticism towards the manipulation of «ideal» institutions by the institutional view. Thus GLLS review the main institutional

[21] The maps added in the tables section at the end of this paper are taken from GSM.

measures employed in the literature and manage to show the limits of such measures in evaluating growth. They want to show that the constraints representing the level of institutions are a *consequence*, and not a cause, of the growth of the income per capita of the countries in question. GLLS test their hypothesis by simultaneously comparing results on income growth from institutions measures and human capital accumulation.

We show below how GLLS discredit the choice of variables as measures of institutions, by looking in detail at theses choices. We will then see how these measures, theoretically representing the bulk of the justification for economic development in the institutional view, compare to more classical measures, such as human capital. Here, GLLS go over the neo-classical approach in order to show that the new literature on growth doesn't yet prevail over the traditional ways of evaluating growth. Human capital appears, in fact, to be a stronger predictor of growth than constraints on governments are, to take just one example.

Last, we will apply this logic to AJR's paper in particular, in order to see the problems that involve AJR's strategy. The desired chain of causality, that AJR hoped for, cannot be certified by their method of estimation, because the instrumental variable's method doesn't say what can be inferred from it. Their instrument might stand for all sorts of other things influencing growth, not just for the British system of laws, as AJR would have liked. A very interesting illustration of this is Jared Diamond's book «Guns, Germs and Steel. The Fates of Human Societies». Diamond shows that peoples settled in different regions, starting from geographical factors like fertility of soil for food production, or location on earth axis, which favoured (or not) the diffusion of agricultural techniques, animals, plants and knowledge. In his view, these factors were the cause of the initial settlements and they influenced the development of the societies. Therefore the inference that AJR make from their settler

mortality data to the current institutions might itself have a «deeper» cause. This is GLLS's last restraint when considering the institutional literature.

First of all, GLLS question the choice of variables representing the «institutions» of a country. They go back to North (1981)'s definition of institutions: on one hand, institutions are a «set of rules», a number of constraints on behaviour, while on the other, they must have some long lasting feature, a certain durability through time. As a consequence, measures of institutions must present these two features. But the recent literature on institutions seems to have chosen as measures variables that have none of these qualities. The most frequently employed - risk of expropriation by government, government effectiveness, constraints on the executive - are outcome measures, defined in function of past actions of the respective governments. As outcomes, these measures can be considered a consequence of development, but not its causes.

These three «outcomes» may represent good policy choices, but not the institutions, as they represent mostly subjective assessments ex-post. More objective measurements are the constitutional measures of institutions, such as judicial independence, constitutional review, plurality and proportional representation, which are rather the classical choices. Table 9 shows the correlation between these measures. The subjective measures are greatly correlated with the growth of GDP per capita, with each other, and very little with the objective measures of institutions. This fact points towards the hypothesis of reverse causality: they might be better in the places where there is a better economic situation. It is true that conventional measures of institutions, judiciary variables, are less correlated with growth as they are typically very noisy: what happens in reality isn't exactly what is stipulated in the books of law. Even so, the fact that the most used measures of institutions are not correlated with the objective measures implies that they do not represent what institutions are actually

like, but rather circumstances of the political and social life. They can therefore change constantly, and become futile as measures.

GLLS give examples of such fluctuations of assessment. ICRG (International Country Risk Guide) used in AJR, collected by Knack and Keefer (1995) is described as follows:"(…) in 1984, the top ten countries with the lowest expropriation risk include Singapore and USSR. (…) Between 1982 and 1997, Iran moves from the score of 1 (highest expropriation risk) to 9 (close to the top score of 10), Libya from 1.5 to 9, and Syria from 1.5 to 9. We are not familiar with significant institutional constraints on the leaders of Iran, Libya, and Syria (…)"[22]

Aggregated index of surveys for government effectiveness, employed by RST (2002), collected by Kaufman, Kraay and Zoido-Lobaton (2003): « (…) the country that receives the highest score in the world is Singapore, a state known both for its one party rule and for this party's chosen respect for private property. »[23]

Constraints on executive, collected in Polity IV data: "The highest score for this variable is 7, the lowest is 1. The rich democracies, but also countries like Botswana, India and South Africa, tend to get the perfect score of 7. Dictatorships like Cuba, Iraq, North Korea, but also Pinochet's Chile, get the worst score of 1, the communist countries such as China and USSR are in the middle with 3's. It is difficult to see how property is more secure in Mao's China than in Pinochet's Chile, (…)"[24].

Secondly, GLLS proceed to a comparison between the institutional view and the neo-classical approach. If one compares the measures for institutions with other possible causes of growth, like the accumulation of human capital, the results show that human capital is more persistent through time than any of those measures, a characteristic that North had found

[22]Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silane, Andrei Shleifer, "Do Institutions Cause Growth?", *NBER Working Papers* No. 10568, 2004, p. 9.
[23]*Ibid*., p. 10.
[24]*Ibid*., p. 10.

essential to institutions. In table 5, GLLS regress growth of GDP by the decade variable on initial values of constrains on the executive[25] and initial years of schooling, using the equation suggested by Barro, seen above, and which we repeat here:

$$\ln(Y_i) = \beta_0 + \beta_1 \ln Y_{0i} + \beta_2 S_{0i} + \beta_3 QI_{0i} + \beta_4 Z_i + \varepsilon_i \qquad (12)$$

where $\ln(Y_i)$ is the average income per capita from 1960 to 2000 (by decade: 60-70, 70-80, 80-90, 90-00, and for the whole period 1960-2000), $\ln Y_{0i}$ is the initial GDP in 1960, S_{0i} is the initial level of education in 1960, QI_{0i} is the measure for initial institutional quality (constraints on the executive in 1960), Z_i is for other variables (here: share of population living in temperate zone, 1995) and ε_i is the error term.

The results in Table 10 are striking: whereas human capital seems to be significant at all periods of time, constraints on the executive are significant only during the 80's. The measures of institutions are not only less persistent in time than human capital, but they don't predict the evolution of GDP. GLLS confirm the classical theory of growth, which puts the investment in human capital at the fore of development, presenting the political constraints as the consequence of this investment.

Lastly, GLLS question the instrumental variable strategy that AJR use in order to demonstrate the primacy of institutions over all other causes of growth. In a direct answer to AJR, GLLS declare that human capital performs better as a predictor of growth, today as well as in the past, casting doubt about AJR's hypothesis that past institutions predict the level of institutions today through the settler mortality of the past. GLLS claim that the settler mortality instrument could be picking up all the effects of human capital. As figures 1, 2 and 3 show, education in the present (years of schooling in 2000) as well as in the past (primary school enrollment in 1900) are inversely related to settler mortality, and positively related to

[25] GLLS choose as measure of institutions the constraints on the executive, because they find it depends less on subjective judgment about institutions and more on the factual constraints to political power.

growth of output per capita (log GDP per capita 2000). In fact, the problem with the instrumental variables is that that they cannot tell what is the right chain of causality, what exactly is cause of what. "At a purely conceptual level one cannot infer from the patterns of European settlements that the asset being transplanted is institutions." That asset might have been their human capital, as it could have been anything else, like «guns, germs and steel» for example, a hypothesis advocated by Jarred Diamond (1997)[26].

We are told that AJR's instrument, settler mortality, is highly correlated with the new measures of institutions (executive constraints, expropriation risk, government effectiveness), but not at all or slightly correlated with constitutional measures (judicial independence, constitutional review, and plurality, proportional representation). Subsequently, the question arises: if there was an import of original institutions, especially through the form of legal rules, than one should see it in the laws. As no such correlation appears, the European settler mortality may indeed be instrumenting for something else than legal tradition.

In conclusion, we see that for GLLS, this debate isn't in reality about which are the best instruments to use in order to solve the endogeneity problem in asserting the influence of institutions on growth. The argument is more about the policy implications of a theory of economic growth for the developing countries. If one were to believe that institutions are the driving force behind development, one might end up encouraging the wrong policies to be implemented in a developing country. For example, the authors express skepticism at the idea of implementing democracy in a country with a level not high enough of human capital. This would eventually end up harming economic growth instead of stimulating it.

[26] Supporting Sachs, GLLS also test for correlation between settler mortality and the current disease environment, in order to show that this instrument could possibly catch the effects of malaria, for example, and not necessarily that of institutions (see table 11). The idea is the same, the instrument could in fact be correlated to the error term, so $Cov(M_i, \varepsilon_i) \neq 0$. At the same time GLLS report a two-stage regression, instrumenting executive constraints with settler mortality, or population density in 1500. Table 12 presents the results: human capital is the only significant variable for growth in the end.

Evaluation of Literature

As we have seen from this analysis, the institutional view resorts to multiple empirical tests to find correlations between institutional measures and output per capita levels. What we never see are theoretical models of institutions. This literature tried to devise itself what it still needs in order to be a satisfying alternative to neo-classical theory of growth. As AJR admit: «(…) while we have good reason to believe that economic institutions matter for economic growth, we lack the crucial *comparative static* results which will allows us to explain why equilibrium economic institutions differ (…).»[27](italics in original). AJR call for a theory about the persistence of institutions and the construction of formal models that could incorporate the nature of political institutions, as they vary with each country.

A few of the partisans of institutionalism point in a different direction, as is the case with Rodrik, Subramanian and Trebbi (2002). RST suggest a separation between the theoretical idea of institutions and the actual implementation of this idea in practice through the form of public policies. What matters most for development economics should be the practical solutions to diverse situations. However these cannot be conceived in a theoretical model, but rather must be treated each according to its specific characterization. As Rodrik (2004) illustrates, the universal principles of economics are implemented in diverse ways in institutional arrangements. What policies have been applied in Japan, could not have given the same result in China, Korea or Mauritius, which are the principal success stories Rodrik talks about.

[27]Acemoglu, Daron, Simon Johnson, and James Robinson (2004), "Institutions as the Fundamental Cause of Long-Run Growth", in *Handbook of Economic Growth*, Volume 1, Edition 1, edited by Philippe Aghion and Steven Durlauf, 2005, p. 2.

We will detail these two positions in the conclusion of our paper, as this suggests for us future directions of research, when thinking about the importance of institutions.

A Theory about Persistence of Institutions

The way the new institutionalism describes the importance of institutions for growth is intrinsically linked to the chain of causality that they believe gave rise to these institutions. As Engerman and Sokoloff (2002) document with historical data, a region's endowments determined the subsequent development. When Europeans came to the Americas, they created «bad», extractive institutions, in the places where natural endowments were favorable to exploitation and local population was abundant. In the regions where the climate was less welcoming, and the native population was less dense, the colonizers created «good» institutions, institutions that protected the property rights of individuals and gave way to legal equality. As it is costly to change the institutional framework, these institutions persisted to the present day.

AJR agree that the initial inequality in wealth further contributed to restrain access of individuals to markets and thus was detrimental to development. When the industrial revolution took place, the regions that had inherited «bad» institutions became isolated from growth because the elites blocked efficiently any change. The institutions that encourage economic growth are the "good" institutions. They are the ones that secure property rights, have effective constraints on governments or power-holders and have relatively few rents that can be captured by power-holders.

In general, such institutions are hard to implement if they do not already exist, as there is a fundamental problem of commitment on the part of power-holders. Even if these would

vow to commit to a set of institutions, that promise is never credible when it might hurt their status in society or affect the distribution of power overall and the allocation of resources between groups in society. The power-holders would always have an incentive to deviate since there is no impartial third authority able to guarantee enforcement of new rules. Therefore, for AJR, new institutionalism would lack a theory of political institutions which explains why institutions persist through time, and why they change[28].

The only problem is, as Przeworski (2004) points out, that it is reasonable to discuss the persistence of institutions, but we must know to which institutions we are referring to, and the literature on institutions presents very peculiar choices. In his paper, «Geography versus Institutions», he examines the measure of institutions most employed in the literature, the constraints on the executive, and shows that this measure presents a high level of volatility. In a different paper, Przeworski et al. (2000), he shows that institutions (as measured by political regimes) do indeed persist in time, and little institutional change has been observed until now. Hence, if we agree that institutions represent a long-lasting feature of social organization, then one cannot employ as measure of institutions something that changes frequently.

The error might be at the core of the theory: the institutions we should look for as relevant to development are not in the first place those that protect property rights. As it seems well known in the literature, having political equality in a situation of economic inequality exacerbates the problems of distributions of resources and lowers investment. AJR themselves recognize that power holders tend to enforce their hold on property by legitimizing their claims with laws. These laws in turn make them stronger, rendering the development of «good» economic institutions for growth even less likely. Measuring the impact of institutions on growth through the lens of property rights cannot be a valid strategy, first, because this measure fluctuates throughout the period, when institutions are supposed to stay the same.

[28] Acemoglu, Johnson and Robinson (2004).

Second, even if property rights would measure institutions appropriately, this measure wouldn't be relevant to development economics, as other types of institutions would come first in the assessment of stimulating growth.

Looking at the data since 1500, Przeworski (2004) concludes that AJR's chain of causality hides a major flaw: the institutions are described as instances not linked to time, independent of circumstances. This would imply that any type of institutions should function in the same way if transposed to a different time or place. This is a current identification problem that arises in instrumental variables procedures, for example. One can only speculate what would have happened with the same institutions, when conditions would have been reversed. As this is not possible to be known, or tested, because it has never happened, the most one can do is hope that what happens in reality is as assumed.

As a result, the search for fundamental causes of growth might be futile. A more sensible quest could be to intensify the research in economic history and acquire more knowledge about each particular context. Institutions might matter for growth, but the form of these institutions is contingent on the histories of different peoples. Finding what is best for development also implies acquiring knowledge about each society and its ways of functioning.

Property Rights as Measure of Institutions: Distinction between policy and Institutions

Rodrik, Subramanian and Trebbi (2002) have an equally distancing position towards the institutional view as they explain, in the end of their paper, that one should distinguish between policies and institutions. For RST, past policies are what constitute the current institutions. They cannot be interpreted as separate things because institutional quality goes

through its capacity for change as well as its persistence through time. But it is nonetheless true that what interests us most is the effect of policies themselves on economic growth as they relate directly to possibility of action. "Our findings indicate that when investors believe their property rights are protected, the economy ends up richer. But nothing is implied about the actual form that property rights should take. We cannot even necessarily deduce that enacting a private property-rights regime would produce superior results compared to alternative forms of property rights"[29], (underlined in original). China has never instituted a private rights regime, and yet it presents more reliability to investors than Russia, which officially has such a regime.

The reason why differences in institutions persist might be because institutional measures incorporate a large amount of region specificity. A distinction needs to be made between sound economic principles, which are the same everywhere in the world, and a country's specificity. This is the only conclusion possible, since we know from the recent past that applying the Washington Consensus[30] to developing countries resulted in a poor performance. China and India ended up developing more than Latin America. Therefore growth should not mean western growth, but whatever makes a specific society better off.

[29] Rodrik Dani, Arvind Subramanian, Francesco Trebbi, "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development", NBER, Oct. 2002, p. 21.

[30] The Washington Consensus outlined a number of rules to follow in order to ignite growth. These rules referred to fiscal discipline, reorientation of public expenditures, trade liberalization, secure property rights, etc. For an entire description see Rodrik (2004) in *Handbook of Economic Growth* (edited by Philippe Aghion & Steven Durlauf, 2005). Rodrik gives multiple examples of development under different sets of rules, like the Chinese agricultural reform, which achieved full efficiency preserving the initial structure of society (which is indeed a very inspiring example, see p. 9).

Conclusion

The papers we've looked at so far have tried to determine what stays at the core of the increase in GDP per capita. A better understanding of the causes of growth could bring us closer to a solution to the widening gap in incomes and put forward proper policies for developing countries to further development.

The institutional view claims that institutions principally affect the evolution of future incomes in a country, influencing individual choice of investment in productive work, on which rests the possibility of a guaranteed participation in the returns to his investment. The geographical view criticized this and stated that the climate and location of a country defines a country's potential for growth, as geography influences directly the different income per capita levels, providing the setting in which production takes place. The neo-classical approach showed that human capital accumulation is still by far the most reliable variable predicting growth.

While there have been incontestable gains for health in the last century, such as life expectancy increase and infant mortality decrease, and thus a change in the geographical factors' influence, economic prosperity had not been distributed equally over the world. Considerable difference in incomes per capita is the most important concern at the present time, especially as the gap seems to widen instead of closing itself. Considering likewise that growth is a recent phenomenon, if we look back two hundred years, so that this doesn't constitute a historical necessity, the preoccupation with growth remains, since it would be very hard to think that different peoples around the world should have different standard of livings for no specific reason.

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List of Tables

Table 1

IV Regressions of Log GDP per Capita									
	Base sample (1)	Base sample (2)	Base sample without Neo-Europes (3)	Base sample without Neo-Europes (4)	Base sample without Africa (5)	Base sample without Africa (6)	Base sample with continent dummies (7)	Base sample with continent dummies (8)	Base sample, dependent variable is log ouput per worker (9)
Panel A: Two-Stage Least Squares									
Average protection against expropriation risk 1985-1995	0.94	1.00	1.28	1.21	0.58	0.58	0.98	1.10	0.98
	(0.16)	(0.22)	(0.36)	(0.35)	(0.10)	(0.12)	(0.30)	(0.46)	(0.17)
Latitude		-0.65		0.94		0.04		-1.20	
		(1.34)		(1.46)		(0.84)		(1.8)	
Asia dummy							-0.92	-1.10	
							(0.40)	(0.52)	
Africa dummy							-0.46	-0.44	
							(0.36)	(0.42)	
"Other" continent dummy							-0.94	-0.99	
							(0.85)	(1.0)	
Panel B: First Stage for Average Protection Against Expropriation Risk in 1985-1995									
Log European settler mortality	-0.61	-0.51	-0.39	-0.39	-1.20	-1.10	-0.43	-0.34	-0.63
	(0.13)	(0.14)	(0.13)	(0.14)	(0.22)	(0.24)	(0.17)	(0.18)	(0.13)
Latitude		2.00		-0.11		0.99		2.00	
		(1.34)		(1.50)		(1.43)		(1.40)	
Asia dummy							0.33	0.47	
							(0.49)	(0.50)	
Africa dummy							-0.27	-0.26	
							(0.41)	(0.41)	
"Other" continent dummy							1.24	1.1	
							(0.84)	(0.84)	
R^2	0.27	0.30	0.13	0.13	0.47	0.47	0.30	0.33	0.28
Panel C: Ordinary Least Squares									
Average protection against expropriation risk 1985-1995	0.52	0.47	0.49	0.47	0.48	0.47	0.42	0.40	0.46
	(0.06)	(0.06)	(0.08)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
Number of observations	64	64	60	60	37	37	64	64	61

Notes: The dependent variable in columns (1)-(8) is log GDP per capita in 1995, PPP basis. The dependent variable in column (9) is log output per worker, from Hall and Jones (1999). "Average protection against expropriation risk 1985-1995" is measured on a scale from 0 to 10, where a higher score means more protection against risk of expropriation of investment by the government, from Political Risk Services. Panel A reports the two-stage least-squares estimates, instrumenting for protection against expropriation risk using log settler mortality; Panel B reports the corresponding first stage. Panel C reports the coefficient from an OLS regression of the dependent variable against average protection against expropriation risk. Standard errors are in parentheses. In regressions with continent dummies, the dummy for America is omitted.

Source: Acemoglu Daron, Simon Johnson, and James Robinson, "The Colonial Origins of Comparative Development: An Empirical Investigation", *American Economic Review*, vol. 91(5), pp. 1369-1401, 2001

Table 2

Geography and Health Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Instrumenting only for average protection against expropriation						Instrumenting for all risk right-hand-side variables			Yellow fever instrument for average protection against expropriation risk	
Panel A: Two-Stage Least Squares											
Average protection against expropriation risk,985-1995	0.69	0.72	0.63	0.68	0.55	0.56	0.69	0.74	0.68	0.91	0.90
	(0.25)	(0.30)	(0.28)	(0.34)	(0.24)	(0.31)	(0.26)	(0.24)	(0.23)	(0.24)	(0.32)
Latitude		-0.57		-0.53		-0.1					
		(1.04)		(0.97)		(0.95)					
Malaria in 1994	-0.57	-0.60					-0.62				
	(0.47)	(0.47)					(0.68)				
Life expectancy			0.03	0.03				0.02			
			(0.02)	(0.02)				(0.02)			
Infant mortality					-0.01	-0.01			-0.01		
					(0.005)	(0.006)			(0.01)		
Panel B: First Stage for Average Protection Against Expropriation Risk in 1985-1995											
Log European settler mortality	-0.42	-0.38	-0.34	-0.30	-0.36	-0.29	-0.41	-0.40	-0.40		
	(0.19)	(0.19)	(0.17)	(0.18)	(0.18)	(0.19)	(0.17)	(0.17)	(0.17)		
Latitude		1.70		1.10		1.60	-0.81	-0.84	-0.84		
		(1.40)		(1.40)		(1.40)	(1.80)	(1.80)	(1.80)		
Malaria in 1994	-0.79	-0.65									
	(0.54)	(0.55)									
Life expectancy			0.05	0.04							
			(0.02)	(0.02)							
Infant mortality					-0.01	-0.01					
					(0.01)	(0.01)					
Mean temperature							-0.12	-0.12	-0.12		
							(0.05)	(0.05)	(0.05)		
Distance from coast							0.57	0.55	0.55		
							(0.51)	(0.52)	(0.52)		
Yellow fever dummy										-1.10	-0.81
										(0.41)	(0.38)
R^2	0.3	0.31	0.34	0.35	0.32	0.34	0.37	0.36	0.36	0.10	0.32
Panel C: Ordinary Least Squares											
Average protection against expropriation risk, 1985-1995	0.35	0.35	0.28	0.28	0.29	0.28	0.35	0.29	0.29	0.48	0.39
	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.06)	(0.06)
Number of observations	62	62	60	60	60	60	60	59	59	64	64

Notes: Panel A reports the two-stage least-squares estimates with log GDP per capita (PPP basis) in 1995, and Panel B reports the corresponding first stages. Panel C reports the coefficient from an OLS regression with log GDP per capita as the dependent variable and average protection against expropriation risk and the other control variables indicated in each column as independent variables (full results not reported to save space). Standard errors are in parentheses. Columns (1)-(6) instrument for average protection against expropriation risk using log mortality and assume that the other regressors are exogenous. Columns (7)-(9) include as instruments average temperature, amount of territory within 100 km of the coast, and latitude (from McArthur and Sachs, 2001). Columns (10) and (11) use a dummy variable for whether or not a country was subject to yellow fever epidemics before 1900 as an instrument for average protection against expropriation.

Source: Acemoglu Daron, Simon Johnson, and James Robinson, "The Colonial Origins of Comparative Development: An Empirical Investigation", *American Economic Review*, vol. 91(5), pp. 1369-1401, 2001

Table 3

2SLS regression of log income 1995 as a function of institutional quality and malaria risk

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Paper	AJR	AJR	AJR	AJR	EL	EL	EL	EL	RST	RST	RST	RST
Dependent variable	**logpgp95**	**logpgp95**	**logpgp95**	**logpgp95**	**logpgp95**	**lgdppc95**	**lgdppc95**	**lgdppc95**	**lgdppc95**	**lcgdp95**	**lcgdp95**	**lcgdp95**
Independent variable												
	0.29	0.45	0.53	0.56								
	(2.87)	(3.03)	(3.06)	(4.12)								
kk (Institutions Index)					1.38	1.32	1.59	1.51				
					(3.40)	(3.60)	(4.24)	(4.45)				
Rule									0.60	0.53	0.78	0.68
									(3.45)	(2.74)	(5.60)	(4.01)
MAL94P	-1.43	-1.07			-1.32	-1.37			-1.33	-1.43		
	(-3.99)	(-2.83)			(-2.55)	(-2.76)			(-4.60)	(-4.37)		
MALFAL			-1.04	-0.83			-1.15	-1.20			-1.13	-1.25
			(-2.74)	(-2.47)			(-2.35)	(-2.52)			(-4.53)	(-4.26)
R^2	0.73	0.69	0.62	0.60	0.67	0.68	0.61	0.63	0.78	0.71	0.77	0.68
N	101	59	73	59	62	62	62	62	133	69	133	69
Instruments for variables above	KGPTEMP, ME	KGPTEMP, ME, LOGMORT	KGPTEMP, ME	KGPTEMP, ME, LOGMORT	KGPTEMP, ME	KGPTEMP, ME, LOGMORT	KGPTEMP, ME	KGPTEMP, ME, LOGMORT	KGPTEMP, ME	KGPTEMP, ME, LOGMORT	KGPTEMP, ME	KGPTEMP, ME, LOGMORT

t-statistics are indicated in parentheses.
All regression equations are estimates with two-stage least squares and include a constant term (not reported).
First-stage regressions and (where relevant) overidentification tests support the use of the instruments in each case.
MALFAL and LOGMORT cover slightly different countries across papers, for consistency the corresponding authors' version of the variable is used.
The sample size in each regression varies slightly compared to the original regressions in AJR, EL and RST, respectively, due to differing coverage of the malaria and KGPTEMP variables. These minor variations in sample size do not appear to affect the substantive results.

Source: Sachs, Jeffrey D., "Institutions Don't Rule: Direct Effects of Geography on Per Capita Income", *NBER Working Paper* No. w9490, 2003.

Table 4

GDP per capita growth before and after malaria eradication in southern European countries (late 1940s)				
	GDP p.c. growth		Difference w/W. Europe	
	1913-38	1950-55	1913-38	1950-55
Greece	2.1	3.6	1.1	1.3
Italy	1.0	5.3	0.1	3.0
Spain	-0.4	6.2	-1.4	4.0
Western Europe	0.9	2.3	0.0	0.0

Table 5

GDP per capita growth before and after malaria eradication in Portugal (1958)			
	1953-58	1958-63	Change
Portugal	3.0	5.3	+2.3
Western Europe	1.9	3.8	+1.9
Difference	+1.1	+1.5	+0.4

Table 6

GDP per capita growth before and after malaria eradication in Taiwan (1961)			
	1956-61	1961-66	Change
Taiwan	2.8	5.8	+3.0
East Asia	3.4	5.5	+2.1
Difference	-0.6	+0.3	+0.9

Table 7

GDP per capita growth before and after malaria eradication in Jamaica (1961)			
	1956-61	1961-66	Change
Jamaica	3.4	4.1	+0.7
Central America and Caribbean	2.6	3.1	+0.5
Difference	+0.8	+1.0	+0.2

Source : Gallup, John Luke, and Jeffrey D. Sachs, "The economic burden of malaria", *The American Journal of Tropical Medicine and Hygiene*, vol. 64(1,2)S, pp. 85–96, 2001.

Table 8

GDP Growth							
	(1) gr6590	(2) gr6590	(3) gr6590	(4) gr6590	(5) gr6590 (TSLS)	(6) gr6590	(7) gr6590
GDP p.c. 1965	-2.3	-2.4	-2.5	-2.6	-2.7	-2.3	-2.4
	(7.70)	(8.02)	(8.06)	(7.87)	(7.60)	(7.41)	(7.09)
Years of secondary schooling	0.3	0.2	0.2	0.2	0.2	0.1	0.1
	(1.75)	(1.77)	(1.32)	(1.34)	(1.15)	(0.81)	(0.89)
Log life expentancy 1965	6.6	5.5	4.3	3.3	2.4	4.1	3.4
	(7.23)	(6.21)	(4.45)	(3.60)	(1.79)	(4.53)	(3.89)
Trade Openness 1965-90 (0-1)	1.9	1.9	1.7	1.7	1.7	1.8	1.8
	(5.49)	(4.79)	(4.79)	(4.70)	(4.39)	(4.79)	(4.66)
Public Institutions (0-10)	0.3	0.3	0.3	0.4	0.5	0.3	0.4
	(3.08)	(2.63)	(3.32)	(3.92)	(3.66)	(3.20)	(3.47)
LDistance		0.0					
		(0.24)					
Pop100km (%)		1.0	0.9	0.8	0.6		
		(3.07)	(3.01)	(2.64)	(1.91)		
Tropical area (%)		-0.9	-0.6	-0.5	-0.4	-0.7	-0.5
		(2.28)	(1.35)	(1.09)	(0.82)	(1.89)	(1.44)
Malaria index 1966			-1.2	-2.0	-2.6	-0.9	-1.6
			(2.15)	(3.60)	(3.87)	(1.86)	(2.89)
dMal6694				-2.5	-4.5		-1.9
				(3.93)	(2.12)		(2.94)
Log coastal density						0.3	0.2
						(4.91)	(4.34)
Log inland density						-0.1	-0.1
						(2.26)	(1.60)
Constant	-8.9	-4.1	1.3	5.9	9.8	0.7	4.1
	(2.90)	(1.17)	(0.34)	(1.57)	(1.76)	(0.19)	(1.08)
Observations	75	75	75	75	75	75	75
R^2	0.71	0.75	0.77	0.80	0.78	0.80	0.82
Robust *t*-statistics in parentheses							

Source : Gallup, John Luke, Jeffrey D. Sachs, and Andrew D. Mellinger, "Geography and Economic Development", *NBER Working Paper* No. w6849, 1998.

Table 9

Correlations of measures of institutions

	Log GDP per capita (2000)	Executive constraints (1960-2000)	Expropriation risk (1982-1997)	Autocracy – Alvarez (1960-1990)	Government effectiveness (1998-2000)	Judicial independance (1995)	Constitutional review (1995)	Plurality (1975-2000)
Executive constraints (1960-2000)	0.7119[a]							
Expropriation risk (1982-1997)	0.7906[a]	0.6378[a]						
Autocracy -- Alvarez (1960-1990)	-0.7388[a]	-0.8567[a]	-0.6864[a]					
Government effectiveness (1998-2000)	0.7860[a]	0.6349[a]	0.8297[a]	-0.5908[a]				
Judicial independence (1995)	0.0279	0.3465[a]	0.2629[b]	-0.1907	0.3006[b]			
Constitutional review (1995)	-0.0649	0.1904	0.1189	-0.0278	0.0482	0.2243[c]		
Plurality (1975-2000)	-0.2620[a]	-0.3570[a]	-0.1918[b]	0.2472[a]	-0.2044[a]		-0.0992	0.0040
Proportional representation (1975-2000)	0.2947[a]	0.3158[a]	0.2172[b]	-0.2151[b]	0.2052[b]	-0.1684	0.1284	-0.6118[a]

a=significant at 1 percent; b=significant at 5 percent; c=significant at 10 percent.

Source : Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silane, Andrei Shleifer, “Do Institutions Cause Growth?”, *NBER Working Papers* No. 10568, 2004.

Table 10

Economic growth, initial constraints on the executive and initial human capital

The table shows OLS regressions for the cross-section of countries. The dependent variables are the growth rates of GDP per capita for each decade between 1960 and 2000 and for the whole period. The specifications include a constant but we do not report the estimates in the table. Robust standard errors are shown in parentheses.

	Panel A: Dependent variables are the growth rates of GDP per capita for each decade between 1960 and 2000 and for the whole period				
	1960-70	1970-80	1980-90	1990-2000	1960-2000
Share of population living in temperate zone (1995)	0.0290a	0.0225a	0.0294a	0.0085	0.0253a
	(0.0076)	(0.0070)	(0.0084)	(0.0073)	(0.0039)
Log initial GDP per capita	-0.0059	-0.0032	-0.0079b	0.0021	-0.0079a
	(0.0045)	(0.0043)	(0.0036)	(0.0037)	(0.0025)
Initial executive constraints	0.0008	-0.0004	0.0027b	0.0006	0.0013
	(0.0013)	(0.0014)	(0.0012)	(0.0016)	(0.0009)
Observations	77	99	102	95	72
R2	17%	6%	19%	6%	34%

	Panel B: Dependent variables are the growth rates of GDP per capita for each decade between 1960 and 2000 and for the whole period				
	1960-70	1970-80	1980-90	1990-2000	1960-2000
Share of population living in temperate zone (1995)	0.0136b	0.0204a	0.0220a	0.0123c	0.0175a
	(0.0066)	(0.0068)	(0.0082)	(0.0073)	(0.0049)
Log initial GDP per capita	-0.0027	-0.0158a	-0.0103b	-0.0048	-0.0092a
	(0.0040)	(0.0044)	(0.0048)	(0.0048)	(0.0034)
Log initial years of schooling	0.0075b	0.0147a	0.0114a	0.0102c	0.0073a
	(0.0033)	(0.0035)	(0.0043)	(0.0060)	(0.0024)
Observations	79	86	90	82	71
R2	22%	24%	16%	9%	38%

	Panel C: Dependent variables are the growth rates of GDP per capita for each decade between 1960 and 2000 and for the whole period				
	1960-70	1970-80	1980-90	1990-2000	1960-2000
Share of population living in temperate zone (1995)	0.0270a	0.0191a	0.0218a	0.0135c	0.0255a
	(0.0085)	(0.0070)	(0.0082)	(0.0077)	(0.0048)
Log initial GDP per capita	-0.0141a	-0.0130b	-0.0146a	-0.0073	-0.0189a
	(0.0048)	(0.0057)	(0.0045)	(0.0055)	(0.0034)
Initial executive constraints	-0.0004	-0.0017	0.0031b	0.0014	0.0008
	(0.0012)	(0.0016)	(0.0013)	(0.0015)	(0.0008)
Log initial years of schooling	0.0116a	0.0140a	0.0105b	0.0104c	0.0096a
	(0.0035)	(0.0035)	(0.0043)	(0.0060)	(0.0028)
Observations	61	80	86	81	57
R2	33%	20%	20%	9%	55%

a=significant at 1 percent; b=significant at 5 percent; c=significant at 10 percent.

Source : Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silane, Andrei Shleifer, "Do Institutions Cause Growth?", *NBER Working Papers* No. 10568, 2004.

Table 11

OLS regressions for the cross-section of countries

The table shows OLS regressions for the cross-section of countries. The specifications include a constant but we do not report the estimates in the table. Robust standard errors are shown in parentheses.

	Dependent variables:			
	Executive constraints (1960-2000)	Expropriation risk (1982-1997)	Autocracy -- Alvarez (1960-1990)	Government effectiveness (1998-2000)
Log settler mortality	-0.4351b	-0.3543b	0.0938c	-0.2034b
	(0.1965)	(0.1764)	(0.0507)	(0.0918)
Population at risk of malaria (1994)	-1.5215a	-0.9679b	0.4397a	-0.7745a
	(0.5504)	(0.3731)	(0.1597)	(0.2133)
Observations	74	66	74	77
R2	0.36	0.32	0.29	0.43

a=significant at 1 percent; b=significant at 5 percent; c=significant at 10 percent.

Table 12

Economic development, instrumental variable regressions

The table shows instrumental variables regressions for the cross-section of countries. Panel A reports the second-stage estimates from instrumental variables regressions with first-stage estimates shown in Panel B. The dependent variable in both second-stage specifications is the log of GDP per capita in 2000. Panel B reports the first-stage estimates for two sets of instruments. The first specification instruments executive constraints and years of schooling using the log of settler mortality and French legal origin. The second specification instruments executive constraints and years of schooling using the log of population density in 1500 and French legal origin. The specifications in both stages include a constant but we do not report the estimates in the table. Robust standard errors are reported in parentheses.

Panel A: Second-stage regressions

Dependent variable is log GDP per capita in 2000

	(1)	(2)
Years of schooling (1960-2000)	0.7894a	0.4836b
	(0.2753)	(0.1875)
Executive constraints (1960-2000)	-0.3432	-0.2965
	(0.2577)	(0.2410)
Share of population living in temperate zone (1995)	-1.6969	-0.0863
	(1.2053)	(0.7714)
Observations	47	55
R2	0.31	0.5

Panel B: First-stage regressions

	Dependent variables:			
	Executive constraints (1960-2000)	Years of schooling (1960-2000)	Executive constraints (1960-2000)	Years of schooling (1960-2000)
Share of population living in temperate zone (1995)	-0.1195	3.4975a	-0.0353	2.8397a
	(0.7202)	(0.8044)	(0.8359)	(0.8933)
Log settler mortality	-0.8212a	-1.0183a		
	(0.2053)	(0.2293)		
Log population density in 1500	-0.3737b	-0.6140a		
	(0.1582)	(0.1691)		
French legal origin	-1.4124a	-0.3770	-1.1988b	-0.5329
	(0.4258)	(0.4757)	(0.4538)	(0.4850)
Observations	47	47	55	55
R2	0.53	0.70	0.25	0.55
F-Test for excluded instruments	17.23		4.70	
Correlation of predicted values of executive constraints and years of schooling	0.8182		0.8163	

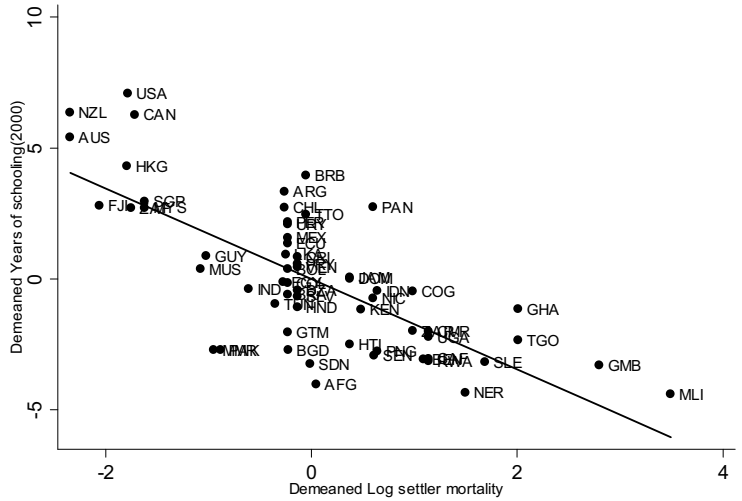
a=significant at the 1 percent; b=significant at the 5 percent; c=significant at 10 percent.

Source : Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silane, Andrei Shleifer, "Do Institutions Cause Growth?", *NBER Working Papers* No. 10568, 2004.

List of Figures

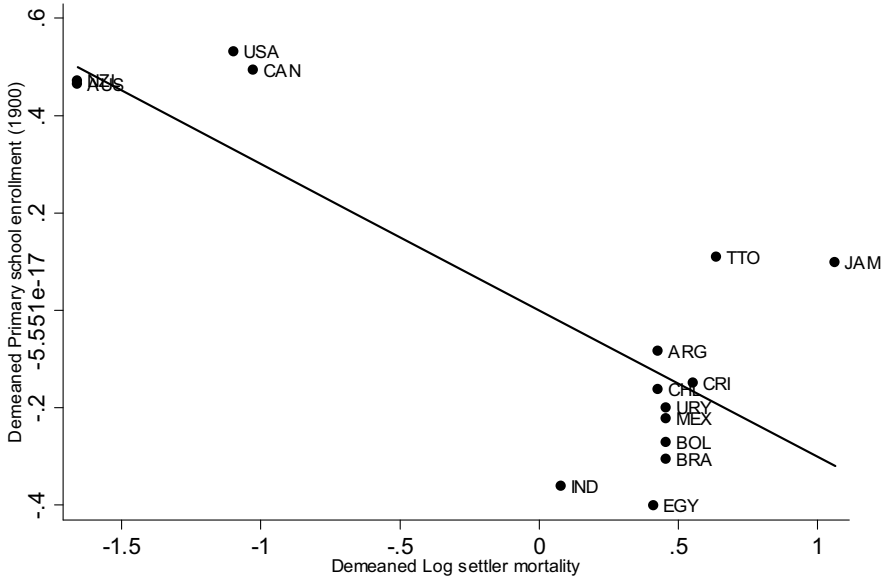
Sources : Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silane, Andrei Shleifer, “Do Institutions Cause Growth?”, *NBER Working Papers* No. 10568, 2004.

Figure 1
Years of schooling (2000) and Log settler mortality



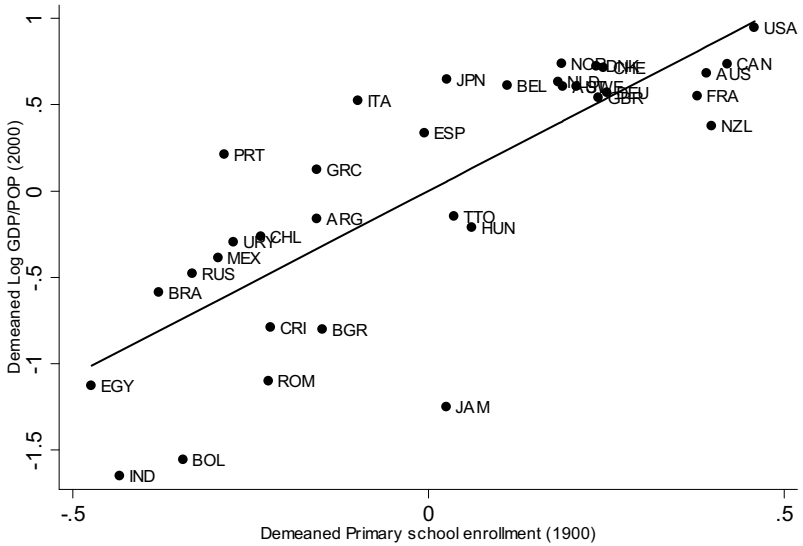
coef = -1.727679, (robust) se = .20195631, t = -8.55

Figure 2
Primary school enrollment (1900) and Log settler mortality



coef = -.30105869, (robust) se = .05789886, t = -5.2

Figure 3
Log GDP per capita (2000) and Primary school enrollment (1900)

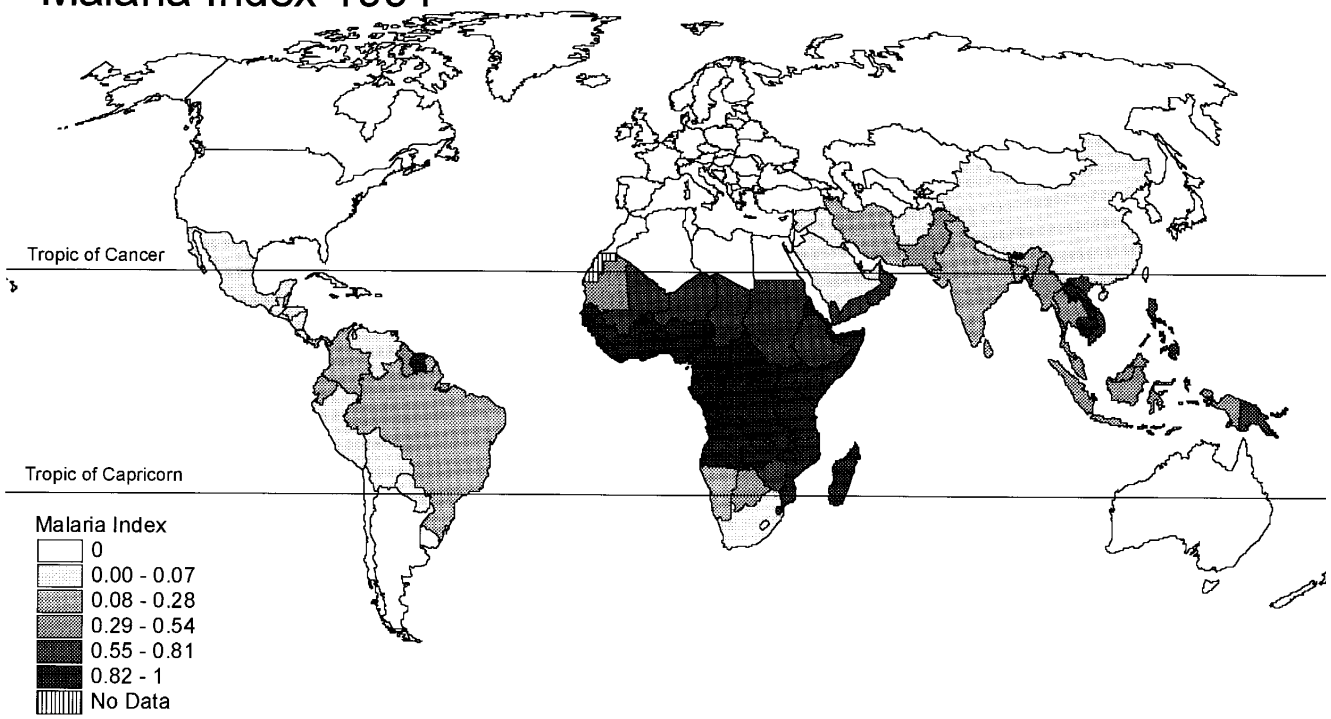


coef = 2.141442, (robust) se = .25222243, t = 8.49

List of Maps

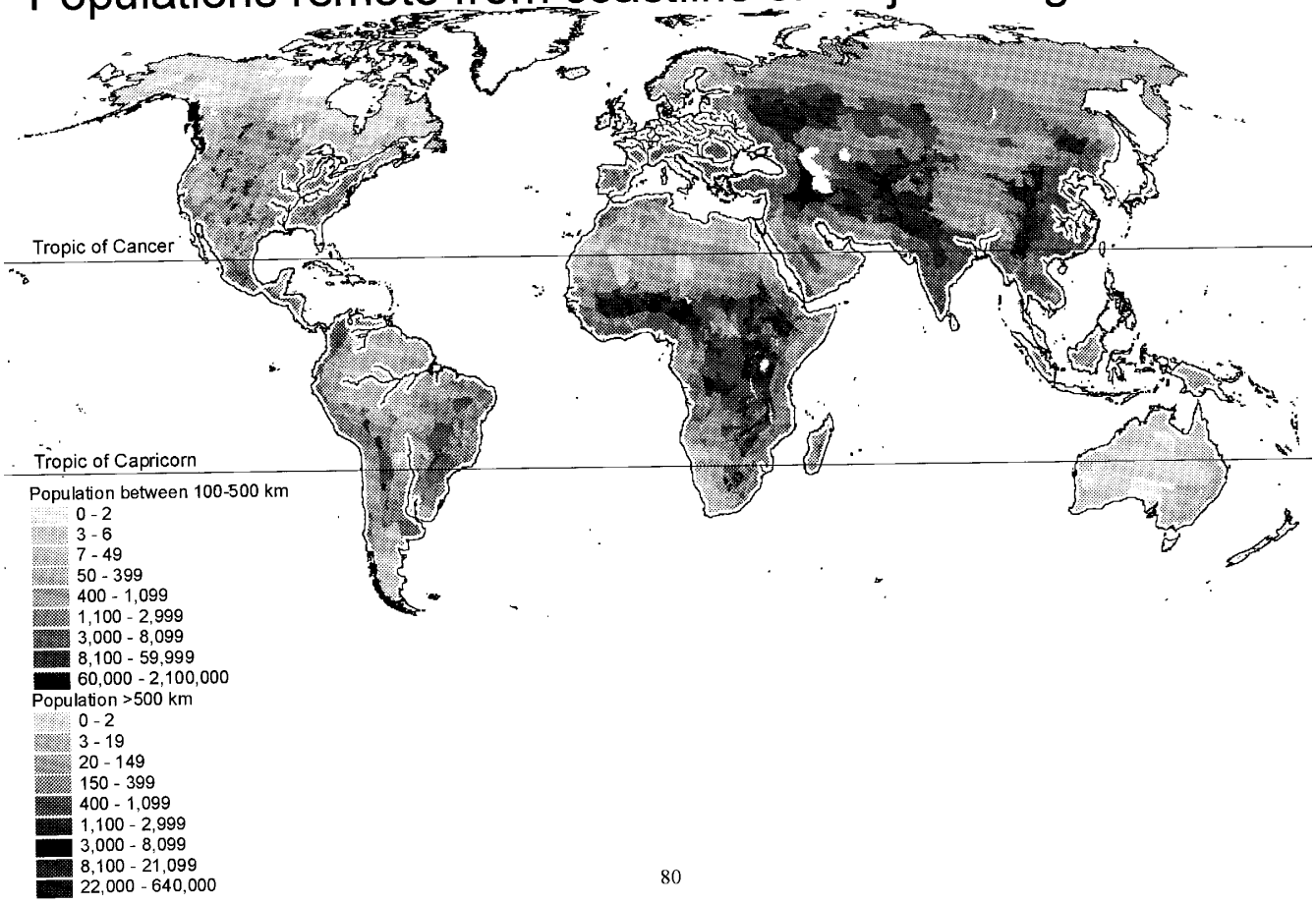
Source : Gallup, John Luke, Jeffrey D. Sachs, and Andrew D. Mellinger, “Geography and Economic Development”, *NBER Working Paper* No. w6849, 1998.

Malaria Index 1994

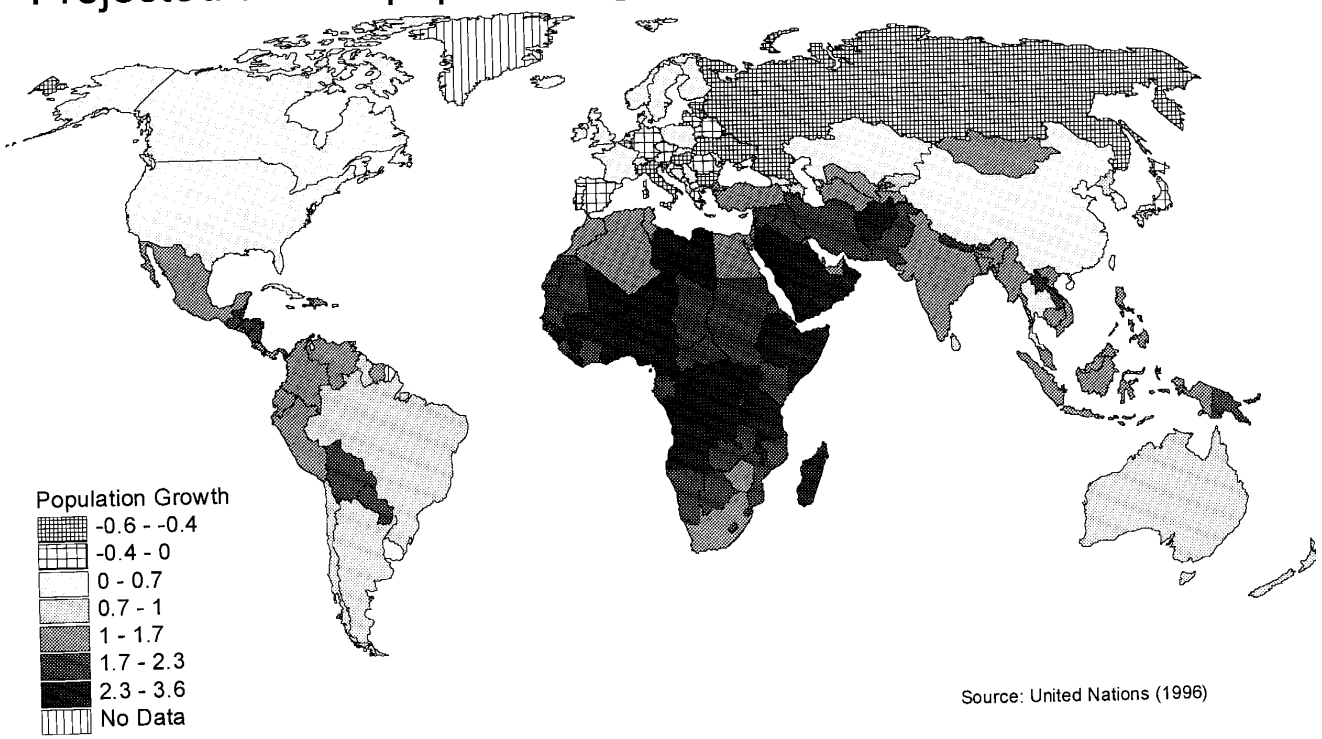


GDP per capita 1995

Populations remote from coastline or major navigable river



Projected annual population growth 1995 - 2030



Source: United Nations (1996)