

**Geography and Institutions:
A Review of Plausible and Implausible Linkages**

Working Papers in Economics No 106
(September, 2003)

Ola Olsson

Department of Economics
Göteborg University
Box 640, Vasagatan 1, 405 30 Göteborg
SWEDEN
Email: Ola.Olsson@economics.gu.se

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Ola Olsson*

Department of Economics,
Göteborg University
email: ola.olsson@economics.gu.se

September 25, 2003

Abstract

In recent years, empirical investigations have shown that various aspects of physical geography are closely related to the quality of a country's economic institutions. For instance, distance from the equator in latitude degrees is positively correlated to both institutional quality and to levels of economic development. In order to reach a better understanding for this type of regularities, this article reviews the growing empirical literature on geography and institutions, as well as a large body of older and newer theoretical works on the social impacts of geography. It is argued that the most plausible candidates for explaining the broadest cross-continental variance in institutional quality are those focusing on historical differences in biogeographical potential for early agriculture and on the importance of disease geography for European colonization strategy.

Keywords: geography, institutions, topography, geology, biogeography, climate, development.

JEL Codes: N40, N50, P33.

1 Introduction

Recent research on long-run economic development has shown that geography is a central factor for understanding the current distribution of prosperity across the world. However, for many decades, economists used to start their analysis by just taking as given certain patterns of trade, comparative advantage, and institutions like private property rights and a benevolent executive. Because of this neglect of both geographical factors and institutions,

*I would like to thank Philippe Aghion, Michael Rauscher, and seminar participants at Göteborg University and the DEGIT VIII workshop in Helsinki for their comments on an earlier draft. The research has received generous financial support from the Malmsten Foundation.

economic theory largely failed to account for the enormous international differences in income.

During the last six or seven years, geography has re-entered the research agenda as an ultimate factor in theories of economic development. Scholars in the field have, however, had very different hypotheses about the precise chain of causality. The main views are represented in Figure 1, based upon Rodrik et al (2002). The most obvious linkage is probably the direct influence of various aspects of geography on production (linkage 1). The key scholar in this tradition is Jeffrey Sachs and his coauthors who have studied the effects of mean temperature, distance to the coast, photosynthetic potential, amount of arable land, and prevalence of diseases on agricultural production in developing countries (Bloom and Sachs, 1998; Gallup et al, 1999; Sachs, 2001; Masters and McMillan, 2001). An older influential study that among other things discusses the implications of poor soil quality for agriculture in the tropics is Kamarck (1976).

The second chain of influence goes from geography to patterns of trade (linkage 2). Countries that are geographically well placed for trade with other countries should have a higher income level than landlocked ones and countries isolated by oceans or deserts, this hypothesis maintains (linkage 3). The most important work in this field is probably Frankel and Romer (1999).

Proponents of the third and perhaps most subtle hypothesis argue that institutions like private property rights, free trade, and the rule-of-law are the primary determinants of levels of economic development (linkage 6). However, the quality of a society's institutions is in turn strongly influenced by its geography. Climate, topography, geology, and biogeography all contribute to mould the rules that societies live by (linkage 4). Most of the major research efforts during the last two or three years have focussed on this connection and has shown that it appears to be the one that has the greatest empirical support (Acemoglu, Johnson, and Robinson (henceforth AJR), 2001a, 2002a; Easterly and Levine, 2003; Olsson and Hibbs, 2003; Rodrik et al, 2003). An even more complex causal chain has also been suggested from geography to trade to institutions (linkage 5; AJR, 2002b). This increased interest in the social effects of geography can also be found among prominent historians like Felipe Fernandez-Armesto who suggests a redefinition of the concept civilization as a relationship between man and nature (Fernandez-Armesto, 2000). An even more famous contribution on geography and long-run development is probably Jared Diamond (1997).

The broad aim of this review article is to look more closely into the specific linkage between geography and institutions with trade as a possible mediate factor (linkages 2, 4, and 5). The main motivation for this interest is my assertion that the important new empirical contributions in this field often report empirical relationships without a comprehensive theory of how

or why geography affects institutions.¹ This might in turn be a consequence of a deficient knowledge of or interest in the major works on the social influence of geography among current writers as well as readers. References are sometimes made in passing to older works like Montesquieu (1750), Huntington (1915), and Wittfogel (1957). But these theories have for so long been in disrepute among academic writers on economic development that most people are only dimly aware of what they actually propose. This article attempts to remedy that situation.

As an illustration of a statistical relationship without a good theory, let us consider Figure 2, which shows institutional quality (using a measure called GADP, taken from Hall and Jones (1999) and discussed further below) on the vertical axis and latitude degrees on the horizontal axis for 136 countries. Latitude degree is an often used variable in empirical studies since it is naturally correlated with several geographical indicators such as temperature, hours of sun, and type of vegetation. As the fitted non-linear regression line suggests, countries further away from the equator (such as Australia and New Zealand at -30 in the Southern Hemisphere and most Western European countries in the Northern Hemisphere at around +50) tend to have "better" institutions than countries near the equator. According to the data, former Zaire and Liberia, both near the equator, had the worst institutions in the world. The fit for this simple non-linear relationship is amazingly high; $R^2 = 0.51$. Is this just a spurious relationship or is there a structural explanation underlying the results?

As will be discussed at length below, there are two explanations for this broad pattern that appear to be more plausible than others. First, the emergence of sedentary agriculture was first initiated in mid-latitude areas where the biogeographical potential in terms of suitable plants and animals for domestication was most favorable, which in turn induced a sustained process of institutional development (Jared Diamond, 1997). The second explanation traces institutional differences in formerly colonized countries to the colonial strategy used by the colonists. In regions where the disease environment allowed white settlers to settle down, strong private property institutions were created whereas harmful, "extractive" institutions emerged in places where diseases prevented permanent settlements (AJR, 2001a).

This article contributes to the existing literature in the following ways. It is the first article to survey and compare the recent empirical contributions with a focus on their results regarding geography and institutions. Further, it presents a critical review of older and more recent theories in the field on the basis of a geographical categorization distinguishing between four central geographical aspects; climate, topography, geology, and biogeography. Lastly, the usefulness of existing theories for future research are evaluated.

¹AJR (2001a, 2002b) and Olsson and Hibbs (2003) arguably do have a theory behind their findings.

2 The Variables

The word geography is an imprecise term with numerous connotations. In the literature on geography and economic institutions, several aspects of physical geography have been suggested to have one effect or the other on human behavioral rules. In order to facilitate a discussion, I have chosen to divide the geographical characteristics into four subgroups, as shown in Table 1.² The first aspect of geography according to this classification is climate, or conditions above the ground surface. Among the climatic characteristics are mean temperature, precipitation, sunlight, humidity, winds, and currents. Not only average levels might play a role but also the variation in these levels with extremes (in parenthesis) such as floods, drought, storms, or blizzards.

The second category concerns topography, or the general, non-biological conditions of the ground surface. Any particular spot on earth might be described as being part of a mountain, plateau, island, ocean, and so on. More specific characteristics are also important such as the shape and orientation of a continent's landmass or the size, navigability, and seasonal variation of rivers. These are regarded as topographical features.³

The third category describes relevant non-biological conditions existing or originating from below the ground. Here we find geological aspects such as the character of the soil and the quantity and quality of existing minerals, as well as the prevalence of active volcanoes and earthquakes.

The three categories mentioned so far are all non-biological in the sense that they refer to non-organical conditions. The fourth category is concerned with biology, or the geography of living organisms (excluding human beings). Biogeography describes the spatial distribution of plants and animals and the types of vegetation that are created by combinations of flora and fauna, for instance steppe, taiga, rain forest, or desert. Within this category, I also include medical geography that deals with micro-organisms like virus and bacteria and the disease vectors that facilitate the diffusion of these micro-organisms to and among humans. The geographical distribution of virus and disease vectors depend in turn primarily on animals and climate.

In general, there are of course many associations between the four categories above. For instance, a rain forest - which implies a specific type of biogeographical features - are generally found in lowland plateaus (topography) with highly weathered soils (geology) and are associated with high precipitation, high temperature, and high humidity (climate).

²Since I am not a geographer by profession, this categorization might strike some readers as questionable. Nevertheless, it serves the purposes of my literature survey in the following sections.

³Admittedly, this is not an ideal term for the general character of the land since topography is often exclusively used to describe elevation. For lack of a better word, I will use it nonetheless.

The other key variable in this investigation is institutions. In line with North (1990), I use the standard definition of an institution as a formal or informal behavioral rule that is in some way related to economic life. Among the most important economic institutions are the right to private property, the right to form associations, free exchange of goods and services, and various constraints on the executive against random confiscations. Also included are more general aspects such as the rule-of-law in society, political stability and accountability, the absence of corruption, and norms encouraging thriftiness and entrepreneurship. "Good institutions" therefore really refers to a cluster of institutions that strengthen the incentives towards production, investment and exchange rather than consumption and various types of rent seeking (Hall and Jones, 1999; AJR, 2001a).

3 Empirical Evidence

Several recent articles document a strong link between various aspects of geography and the quality of countries' institutions (Table 2 gives an overview of some key empirical contributions). However, these results are usually not the outcome of investigations with a stated focus on linkages between geography and institutions, but are rather a by-product of analyses where levels of income per capita is the ultimate dependent variable. For instance, Hall and Jones (1999) was one of the first studies to show that absolute distance from the equator in latitude degrees (the absolute value of the measure used in Figure 2) was positively related to the quality of institutions. In their empirical model, distance from the equator was used as one of four primary instruments for "social infrastructure" in regressions with income per worker as the dependent variable.

Hall and Jones' index of social infrastructure was created by combining a measure of trade openness from Sachs and Warner (1995) with data on institutional quality distilled from a private company providing assessments of risk to potential international investors.⁴ Following Knack and Keefer (1995), Hall and Jones (1999) used five particular categories from the greater data set and calculated the average value for each category for the period 1986-95. The five categories were intended to capture the following institutional characteristics: (i) law and order, (ii) bureaucratic quality, (iii) corruption, (iv) risk of expropriation, and (v) government repudiation of contracts. They then calculated an equal-weighted average of these variables and referred to this measure as "Government anti-diversion policies" (GADP). How this GADP variable was correlated with geography was not reported in the paper (since that was not what the authors were interested in), but by using Hall and Jones' (1999) data, we obtain the U-shaped curve

⁴The firm's name is Political Risk Services and their publication is called "International Country Risk Guide".

in Figure 2.

AJR (2001a) constructed a similar setup but with some notable and important differences. Also their primary objective was to demonstrate the link between institutions and levels of economic development while explicitly recognizing the problem of joint endogeneity between institutions and income levels. Although the article contains several fascinating results, the key contribution was probably their use of a superior instrument for measures of institutional quality; settler mortality rates during colonial times in countries colonized by Europeans.⁵ In short, AJR:s conjecture was that European colonizers did not create permanent settlements in places with high settler mortality and therefore did not install good institutions like strong property rights. In "Neo Europes" like Australia, where settler mortality was low, the reverse was true.

Data on settler mortality was collected from works by the historian Philip Curtin. The major sources of settler mortality during these times, causing roughly 80 percent of all deaths, were malaria and yellow fever. Both illnesses are transmitted by mosquito vectors. Although AJR argued that the prevalence of malaria and yellow fever depended to a great extent on very local climatic features - implying that rough geographic measures such as distance from the equator or temperature were unlikely to account for the variation in mortality rates - their measure of settler mortality might certainly be regarded as a geographical variable according to the reasoning above. Their theory will be discussed further below.

The central empirical finding for the purpose of this article was that settler mortality, as predicted, had a clear negative relationship with AJR:s measure of institutional quality; risk of expropriation (Hall and Jones' (1999) fourth category). Furthermore, when distance from the equator was included as an independent variable alongside settler mortality in a regression on institutional quality, settler mortality retained its positive and significant relationship whereas distance turned out to be insignificant (AJR, 2001a, Table3). Hence, the results suggested that distance from the equator is not the key to understanding institutional variation but that it is correlated with one or more true causal variables like settler mortality.

Results similar to AJR (2001a) were obtained by Easterly and Levine (2003). The preferred measure of institutional quality in Easterly and Levine is the average of six indicators reported by Kaufmann et al (1999); (i) voice and accountability, (ii) political instability and violence, (iii) government effectiveness, (iv) regulatory burden, (v) rule of law, and (vi) corruption. Easterly and Levine's primary geography variables are distance from equator and settler mortality as in AJR (2001a). However, unlike AJR, Easterly

⁵Olsson and Hibbs (2003), AJR (2001a), McArthur and Sachs (2001) and others have argued that distance from the equator is flawed as an instrument for institutions in a regression on income levels since it is likely that a country's latitudinal position is strongly related to agricultural productivity, and hence has a direct effect on income levels.

and Levine (2003, Table 3) find that when settler mortality and latitude are included as independent variables, both have significant impacts on institutions with the expected signs. Thus, the influence of distance from equator appears to be conditional on what institutional measure that is used. A geography-related (dummy) variable, taking on the value of 1 if any of eleven particular crops or minerals is produced in a country, also appears to have a positive impact on institutions.⁶ Beyond its effect on institutions, Easterly and Levine show that geography does not seem to have a direct effect on levels of income.

The setup in Rodrik et al's (2002) investigation with regard to the links between geography and institutions is almost identical to that in Easterly and Levine (2003). The same institutional and geographical measures are used with the difference that the former use a somewhat larger sample of countries. This does not change the result that institutional quality is positively related to distance from equator and negatively related to settler mortality. In their robustness checks, Rodrik et al include a number of alternative geographical variables such as percent of a land's area in the tropics, access to the sea, number of frost days per month in the winter and the area covered by frost (the latter two measures taken from Masters and McMillan, 2001), and mean temperature. Although the estimates are not reported, the authors claim that most of these measures are significant determinants of institutional quality (Rodrik et al, 2002, footnote 7). In a discussion of the relation to the previous literature, Rodrik et al are critical of AJR (2001a) for treating settler mortality as an integral part of a full theory linking geography (settler mortality) to institutions to development, when in reality settler mortality is just an instrument for institutions with certain desirable statistical properties. In Rodrik et al's words: "An instrument does not a theory make." (Rodrik et al, 2002, p 18).

As discussed above, AJR (2001a) was primarily concerned with institutional formation and economic development in former colonies. In AJR (2002b), however, attention is now shifted to Europe. What explains the rise of Europe after 1500, or more precisely the rise of Western, Atlantic Europe? AJR (2002b) argue convincingly that the key factor was the emergence of trade with America, India, and East Asia. This new opportunity, available only to the countries with access to the Atlantic, had obvious direct economic effects. AJR's central hypothesis is that Atlantic trade had its most important beneficiary effects through its impact on institutions. The new trade potentially strengthened merchant groups in the bourgeoisie which then opted for strengthening the institutions of private property. The authors provide some econometric evidence in favor of this view. Using an existing index that is supplemented from various sources, they construct a

⁶As we shall see, this latter variable has some similarities to a "Biogeography"-variable constructed by Olsson and Hibbs (2003).

cross-country measure of "Constraint on the executive" for the period 1300-1850. When the average of this index is treated as a dependent variable in an OLS regression, a variable capturing the extent of Atlantic trade has a significant positive effect (AJR, 2002b, Table 9). Further, a simple time series shows that whereas institutional quality was relatively similar up to 1600, the countries involved in Atlantic trade started to diverge after that with the really great divergence happening around 1750 (AJR, 2002b, Figure 8).

But even among the Atlantic traders, there are significant differences. Countries that had good initial institutions, such as Britain and the Netherlands, experienced a greater improvement in their institutions after 1500 than more absolutist countries like Spain and Portugal, in line with the theory of North and Thomas (1973). In any case, it is important to note that the underlying factor behind the rise of Western Europe in AJR's (2002b) story was geographical; access to the sea routes of the Atlantic.

The empirical contributions above essentially show that the variation in institutional quality has its roots in the diverging experiences of countries from 1500 A.D. onwards, which in turn were determined by geographical features such as the prevalence of disease and distance from the harmful tropical zone. Olsson and Hibbs (2003) (as well as a more recent paper Hibbs and Olsson, 2003) trace the origins of the differences in technology and institutions much further back in time. Extending the work of Jared Diamond (1997), they develop two new geography-related measures relevant for explaining the timing of the Neolithic transition to agriculture around the world. The first measure is an index of the quality of biogeography capturing the number of wild plants and animals known to exist in prehistory that were particularly suitable for domestication. The hypothesis is that the greater this number, the earlier the transition to agriculture and the earlier the onset of sustained technological progress in a Malthusian world where greater production capacity is transformed into a greater population, eventually leading up to the industrial revolution when standards of living finally took off. Hence, a favorable biogeography should be positively related to institutional development and income per capita today.

The second variable is a composite index of four factors; distance from equator, the suitability of the climate for annual crop agriculture (based on the Köppen-Geiger scale), size of continent, and orientation of continent along an east-west or north-south axis. Olsson and Hibbs (2003) show that this measure is a good predictor of the biogeography index, as expected. Furthermore, both these underlying geographical conditions and the biogeography variable are strongly related to the GADP measure of institutional quality which was taken from Hall and Jones (1999). The geography variable alone even explains 45% of the variation in the GADP measure. Thus, Olsson and Hibbs' (2003) new measures of geography not only document a causal link from geography to institutions, but also, in line with their main

hypothesis, a positive relationship between biogeography and geography on the one hand and income per capita on the other, even after controlling for the quality of institutions. This result distinguishes their article from AJR (2001a), Rodrik et al (2002), and Easterly and Levine (2003) where geography only affects economic development via institutions.

4 Theory: From Montesquieu to Acemoglu et al

A common denominator of the recent empirical studies above is that they all suggest that geographical characteristics are important determinants of the quality of institutions. What is often lacking, however, is a theory of the nature of this causal relationship. Indeed, theories of how climate and the natural environment affect institutions and economic development have long been regarded with suspicion among social scientists. Many of the older works had a strong racist tone that certainly contributed to their present disrepute. Nevertheless, these theories and more recent ones offer comprehensive explanations to how geography and institutions are interrelated. The survey below is structured in accordance with the four geographical subcategories climate, topography, geology, and biogeography.

4.1 Climate and institutions

Although geography also plays a role in the political theory of Aristotle and Machiavelli, the first systematic framework was presented by Montesquieu in his classic treatise *The Spirit of Laws* (1750).⁷ Montesquieu's focus is almost exclusively on climate, or more precisely, on the effects of temperature. His theory is very clear and is outlined in the first sentence of Book XIV:

"If it be true that the temper of the mind and the passions of the heart are extremely different in different climates, the laws ought to be in relation both to the variety of those passions and to the variety of those tempers." (Montesquieu, 1750, p 246.)

Montesquieu then goes on with an argumentation based on anecdotal evidence that people in colder climates are generally less sensitive, less suspicious, more courageous, more disciplined, and more determined than people in warmer climates. The reason is primarily biological; the blood runs faster through the veins in a colder climate and the heart has more power. People in temperate climates therefore tend to be more vigorous. It also follows that due to these differences in "tempers and passions", societies will adopt different kinds of laws and institutions. For instance, people in southern countries are by nature relatively lazy. Reason will not make such

⁷His correct full name is Charles-Louis de Secondat, baron de La Brède et de Montesquieu.

men work so other lazy but more powerful men have to force them. This is one (of several) reasons behind slavery, in Montesquieu's mind. The link between temperature, human biology, human behavior, and various social institutions is therefore clear.

A similar line of reasoning is presented in Ellsworth Huntington's major work in the genre *Civilization and Climate* from 1915. Based on field experiments, survey questionnaires, and the results of earlier similar studies, Huntington attempts to explain scientifically the links between an area's climate and its social institutions such as work norms, respect for law, and stable and honest government. Two aspects of climate are particularly important; temperature and humidity, with the first being the most important. From experiments on working people, Huntington concludes that the ideal climate is one in which mean temperature in winter does not fall below 38° F and does not exceed 65° F. Such temperatures are for instance found in northern California, southern Chile, the London area, and on New Zealand. But temperatures should not be constant throughout the year. At places like Quito, Ecuador, the difference in mean temperature between the warmest and coldest seasons is only two degrees, and the result of this dreary uniformity in temperature manifests itself (at least among the white population) "...in weaknesses such as drunkenness, immorality, anger, and laziness." (Huntington, 1915, p 136).

This direct effect of climate on people's work effort and productivity is also reflected in the quality of their institutions, which is roughly equivalent to what Huntington refers to as the "status of civilization".⁸ Huntington's basic theory appears to be that energetic people, i.e. people living in areas with just the right levels and variation in temperature and humidity, have a greater ability to be honest, to retain self-control, and to take initiatives. In his own words:

"The nature of a nation's religious faith, its form of government, its social organization, its ease of intercourse with other nations, and various other conditions play a fundamental part in the distribution of civilization. Yet each is conditioned by the degree of energy possessed by a people...Energy, in turn, seems to depend upon climate, and thus climate becomes an essential element in determining the status of civilization." (Huntington, 1915, p 207)

Throughout his book, Huntington is careful to point out that climate is just one of several factors that determine how civilized a nation is. Race

⁸The literature on the characteristics and history of civilization includes classical works like those of Alfred Toynbee and Fernand Braudel, as well as Samuel Huntington's (1996) recent book *The Clash of Civilizations*, all nicely surveyed by Fernandez-Armesto (2000).

might be just as important.⁹ Nevertheless, the striking (visual) correspondence between the regions of high human energy potential and those with a high level of civilization is interpreted by Huntington as supporting his theory.

In a similar vein, Gilfillan (1920) tries to explain how it could be that early civilizations actually arose in hot climates, despite the disadvantages pointed out by Huntington and others. The foundation of Gilfillan's argument is his construction of a graph showing the "coldward course of progress" from the early centers of Sumer and Egypt in the early third millennium B.C. (with an average temperature of around 74° F), via Rome in antiquity (60° F), to Berlin in early twentieth century (48° F).¹⁰ Gilfillan's explanation to this "temperate drift" is that simple agriculture most easily emerges in hot climates, but that as civilization and technology progresses, leadership will move northward where the conditions for mental ability and vigor are better. Only during periods of cultural stagnation - as during the Dark Ages after the fall of the Western Roman empire - will civilizational leadership move southward.

Although neither the Huntington/Gilfillan data, nor the inference from that data impresses a modern economist, closely related arguments are presented in David Landes' book *The Wealth and Poverty of Nations* (1998). Landes simply claims that as a general rule, the discomfort of heat exceeds that of cold (Landes, 1998, p 6). He further argues in the spirit of Montesquieu that there is a clear link between hot climates and the use of slavery since white men, unadapted to heat, were unable to work on colonial plantations in the tropics, an idea that I will return to below. Whereas Huntington reports results from experiments with workers in order to demonstrate the deleterious effects of heat, Landes cites a Bangladeshi diplomat who claims to feel "reinforced and stimulated by the temperate climate...".

Among the climatic factors, also precipitation is important. One of the key advantages of Europe is its heavy and dependable supply of rain, especially along the Atlantic coast. This characteristic in turn depends on the Gulf stream that brings warm currents as far north as Norway and Ireland. According to Landes, Europe is also less prone to be hit by climatic extremes such as floods, drought, or hurricanes than for instance Asia and North America. Although Landes does not develop an explicit theory of the causal chain from climate to institutions, his verdict is clear: "Life in poor

⁹In the beginning of chapter two, titled "Race or place", Huntington (1915, p 11) considers a hypothetical example of what would have happened if what he describes as "two of the most contrasted races, Teutons and negroes" were to populate two identical uninhabited lands. Even after a thousand years, Huntington believes that the Teutons probably would have the superior society, but he admits that the initial differences might have diminished.

¹⁰His prediction for the future is that Scandinavia might become the center of civilization by 2000 A.D.

climes, then, is precarious, depressed, brutish.” (Landes, 1998, p 14).

4.2 Topography and institutions

According to several notable scholars, topography - or the general character of the land - is another important determinant of societal development. The most famous and controversial contribution in this area is probably Karl Wittfogel’s *Oriental Despotism* from 1957. The main argument in Wittfogel’s book is that ”riverine civilizations” based on irrigation agriculture gave rise to highly stratified, ”hydraulic” societies with significant economies of scale but where private initiatives were nearly non-existent. This pattern of ”oriental despotism” then supposedly prevailed throughout most of history in most of Asia.

Wittfogel starts his analysis by noting that unlike most other environmental factors like temperature, soil quality, or the lay of the land, water can be relatively easily controlled and managed by man. The need to manage water is of greatest importance in arid or semi-arid areas where rainfall agriculture is impossible. The presence of great rivers with highly alluvial soils in otherwise relatively arid regions provided the ideal environment for irrigation agriculture. Such environments are found primarily along the Yangtze and Yellow Rivers in China, in the Indus Valley, along the Nile, and on the shores of the Euphrates and Tigris rivers.

The type of hydraulic agriculture practiced in these areas involved the primary tasks of digging, damming, and dredging, as well as supportive activities such as tool making, feeding, and supervision of the workers. Food production was therefore carried out on a scale that required sophisticated organization and a far-reaching division of labor, something that could only be installed and maintained by an elite in control of the mass of workers. Very early in history, these cohorts of forced labor were then used also for the construction of public goods like roads, canals, or defense walls or for erecting monuments glorifying gods or divine leaders. Wittfogel’s thesis thus postulates a clear causal relationship between topography (the presence of alluvial, arid river valleys), agricultural technology (hydraulic, irrigation agriculture) and institutions (highly stratified societies with very weak private property rights).

Although this is not developed in Wittfogel (1957), it is implicitly understood that the riverine natural environment described above stands in contrast to conditions in Europe. Eric Jones (1981) and David Landes (1998) complete Wittfogel’s comparative analysis by discussing the specific features of European topography. According to Jones (1981), the European continent is naturally fragmented to an extent that most parts of Asia are not. Mountain ranges like the Alps and the Pyrenees, rivers like the Rhine (without vast river plains), the indented coastline, the irregular shape of the continent with peninsulas and large islands in the Mediterranean, and the

presence of hardwood forests all meant that no single core civilization on the scale of Sumer, Egypt, or China could develop in Europe. European societies, at least after the fall of the Western Roman empire, rather originated from a number of relatively small core areas, surrounded by water or forest, where no single power was great or strong enough to form a despotic empire like in the Orient. Furthermore, European farmers had access to a steady supply of rain which meant that they were not dependent on a river managing despot (Landes, 1997).

These circumstances were initially a disadvantage for Europe since production per square kilometer was much higher in the fertile river valleys. However, Europe's fragmentation would eventually prove to be advantageous since it fostered competition between the numerous small states. If an entrepreneur with a specific venture in mind was banned from a certain country for religious or conservative reasons, he could always try to convince some other prince in another country of why his project would be a good investment. A similar strategy could supposedly not be employed in the Asiatic empires. An often used example is the sudden decision in 1433 of a Ming emperor in China to abandon the country's very ambitious imperial sea-faring expeditions in the Indian Ocean. Only some decades later, the Genovese Christopher Columbus, on the other hand, could easily convince the Spanish court of financing an expedition to India in an attempt to steal the initiative from the Portuguese.

It is relatively easy to find flaws in the Wittfogel/Jones/Landes-theory. As many scholars have discussed, Wittfogel's identification of a specific Asian type of riverine, despotic empires is not convincing. Throughout its history, the Indian continent has been fragmented in much the same way as Europe and no single empire based on hydraulic agriculture has been established there. Ancient Sumer was divided into several city states in almost the same way as later Greece, but was then repeatedly overrun by foreign invaders such as Assyrians, Babylonians, Persians, Greeks, Romans, Ottomans, British, and, most recently, by Americans. Egypt fits the description of a stable hydraulic society with limited individual freedom, but Egypt is undoubtedly a part of the Mediterranean cultural and natural environment that also shaped the Greeks and the Romans. The Chinese civilization is probably the society that fits best into Wittfogel's schedule.

The fragmented nature of the European continent did not prevent it from being nearly united for several centuries under Roman rule or later during Frankish rule. One must also remember that national competition between European states often took the shape of immensely destructive wars that were detrimental to trade and private property. Still, there appears to be a certain logic in the argument that European topography with its scattered core areas often proved to be relatively favorable for trade, institutional competition, and individual freedom.

Yet another critique against the hypothesis above maintains that still by

1500 A.D, Europe was by no means richer or more technologically advanced than China, India, or the Muslim world. According to this explanation, it was another topographical feature that tipped the balance in Europe's favor; access to the Atlantic and to ocean currents that easily took sailing expeditions to America. Variants of this hypothesis are featured in older, Marxist-inspired works, and a relatively recent contribution in this tradition is Mark Blaut's (1993) *The Colonizer's Model of the World*. In brief, the argument here is that among all the prevailing Old World civilizations, the Atlantic countries in Western Europe had by far the easiest access to undeveloped America, which was exceptionally rich in gold and silver. The gold and silver that was pillaged from the American continent then funded the Industrial Revolution, which in turn made Europe race ahead of all the other continents.

However, this somewhat simplistic explanation provides no theory of the links between geography and the development of favorable institutions. In a major work mentioned above, AJR (2002b) give a similar but institutions-related explanation. Like Blaut (1993), they identify Atlantic trade - by which they mean more or less peaceful trade with non-European countries - as the primary factor behind the "rise of Europe". But the causal chain from Atlantic trade to the Industrial Revolution is different. Although the easy pillage of treasures in America played some role for the subsequent development, the lasting contribution of the opening of international trade was that it strengthened the merchant classes or the bourgeoisie. In countries like Great Britain and the Netherlands, the rising political strength of the merchant class gave rise to free trade legislation, a strengthening of property rights, and other capitalist institutions. These institutional changes in turn triggered the Industrial Revolution during the eighteenth century.

However, this favorable development only arose in states where the crown's powers were already constrained by 1500 A.D. As discussed by North (1990), Britain's history from Magna Carta to the Glorious Revolution in the 1600s was characterized by a gradual increase in Parliament's influence. When the windfall gains of Atlantic trade then materialized, the group that benefitted the most were the private traders and not the crown. In Spain and Portugal, on the other hand, the Crown was the primary organizer and beneficiary of the Atlantic ventures. After some two centuries as a superpower in the world, the failure of Spain to develop capitalist institutions and a constraint on the executive led to economic and political stagnation.

4.3 Geology and institutions

A much discussed empirical regularity that is usually referred to as the "curse of natural resources" shows that there appears to be a negative relationship between natural resource abundance and growth (Sachs and Warner, 1997). The variable that makes up "natural resources" in these empirical investiga-

tions contains everything from crops and vegetables to oil, gas, and minerals such as diamonds and iron.

There are two basic groups of explanations for the "curse" in the quickly growing literature. The first explanation focuses on Dutch disease effects, i.e. how a booming natural resource sector might appreciate the country's currency and thereby crowd out exports from the manufacturing sector. If the manufacturing sector is the long-run engine of growth, this crowding-out hurts development.

The second explanation concerns political economy and how natural resource abundance might induce rent seeking behavior (Auty and Gelb, 2001) or even armed conflicts (Collier and Hoeffler, 1998). In particular, extremely valuable minerals with a relatively simple extraction technology like diamonds might easily become the prize in an appropriative struggle between a kleptocratic ruler and a group of predators among the population. The struggle to control diamond deposits has been a key factor behind recent violent conflicts in Sierra Leone, Liberia, Angola, and the Democratic Republic of the Congo (Olsson, 2003). Botswana, however, seems to form a counter example since the huge diamond rents accumulated there since the early 1970s have rather contributed to the creation of a stable and relatively wealthy democracy (AJR, 2001b). In any event, geology appears to have an impact on social institutions.

How about seismology then? The relevance of extreme events such as earthquakes and volcanos for institutions is discussed primarily by Jones (1981) who claims that the economics of disaster is a neglected area of research. (The disaster category also includes hurricanes, floods, drought, epidemics, and warfare which admittedly have nothing to do with geology.) According to Jones (1981, Table 2.2), the Asian population has been disproportionately hit by earthquakes since the 1500s. Europe, on the other hand, has always been relatively calm.¹¹ Maps of volcanic activity in the world further suggest that Tropical and North-East Asia, the Middle East, Africa's horn, and the Western coasts of North and South America are more prone to outbreaks than Europe. However, Vesuvius' eruption in 79 A.D. that destroyed Pompeii and the gigantic eruption on the Greek island of Thera around 1500 B.C. - which is generally believed to have caused the rapid decline of the Minoan civilization on nearby Crete - demonstrate that Europe was severely affected on occasion.

Jones' (1981) theory of the linkage between geology and institutions is that the greater probability of death from a natural disaster for the average man in Asia had its consequences for the institutions of the family. In particular, having many children was a rational, insurance-like response to the

¹¹More recent estimates support this claim. A calculation based on data from Encyclopaedia Britannica (2003) shows that out of about 530,000 earthquake casualties in the world since 1950, only 8,000 (or 1.5 %) died in Europe (including Turkey).

greater likelihood of death by disaster. Also the practice of early marriage in Asia might have been a result of this riskier natural environment. Both these institutions were harmful for long-run development. High fertility rates prevented a rise in incomes per capita and crowded out investments in human capital, whereas early marriage supposedly prevented Asian adults from accumulating savings before they started producing children.

4.4 Biogeography and institutions

One of the most influential books in social science during recent years is probably Jared Diamond's (1997) *Guns, Germs, and Steel: The Fates of Human Societies*. The crucial variable in Diamond's theory is biogeographic potential, i.e. the quantity of wild plants and animals suitable for domestication in Neolithic times. The factors determining this potential were in turn a mixture of climate and topography: A temperate, mediterranean climate with wet winters and dry summers were ideal for annual grasses like wheat and barley. A great continental landmass meant a larger diversity of species whereas an east-west orientation of the continent implied similar day length and roughly similar temperatures which facilitated the spread of agricultural techniques.

Diamond identifies biogeographic potential as the primary factor explaining why certain regions developed agriculture earlier than others. Based on the food surplus from domesticated species, these regions then saw the emergence of sedentary, densely populated societies that gradually developed very complex systems of social organization. Soon regular states appeared with a far-reaching division of labor where the great majority of peasants provided seasonal labor to communal irrigation or the creation of public monuments. A small elite, only engaged in food production as managers, were then free to develop the hallmarks of civilization; writing, science, religion, and a state bureaucracy. In line with Wittfogel (1957) and many other works, Diamond then implicitly assumes a considerable degree of institutional persistence; the head start that was granted the old civilizations explains why their social organization was superior to other regions by 1500 A.D.¹²

Olsson and Hibbs (2003) develop a formal, growth-theoretic model along the lines above. As in Diamond (1997), the key event is the Neolithic agricultural revolution which induced the creation of a non-food sector that specialized in organization and the advancement of technological knowledge. For thousands of years, however, standards of living remained roughly the same all over the world since Malthusian population growth neutralized techno-

¹²Diamond's theory actually proposes that the early biogeographic potential gave especially Western Eurasia three proximate advantages apart from institutions; some resistance against epidemic diseases (that killed off most of the American native population), the horse (which proved to be an almost unbeatable weapon), and technology (ocean-going ships, guns, and steel).

logical progress. Olsson and Hibbs (2003) then go a step further and argue that the early start in the "development race" meant that some regions would also adopt industrial production earlier than others. Accordingly, the Industrial Revolution first happened in Western Eurasia where the Malthusian link for various reasons soon collapsed and income per capita started its well-documented nearly exponential rise.

The weakest link in the theory of Diamond (1997) and Olsson and Hibbs (2003) is probably their account of history from the rise of early civilizations to around 1500 A.D. A uniquely favorable biogeography implied that the area called the Fertile Crescent in the Near East was the first to develop intensive food production and complex states. These innovations then spread to the rest of Western Eurasia, which in Diamond's (1997) and Olsson and Hibbs' (2003) theory constitutes a single sphere of influence. But how can we explain the very different historical trajectories within Western Eurasia after the diffusion of agriculture? Why did the great colonial expansion start from Spain and Portugal rather than from Egypt, as the pure theory would have suggested? And why was Mesopotamia maybe two hundred years after the peripheral British islands to develop industrial production? Diamond's otherwise eloquent theory has very little to say about this "reversal of fortune" within Western civilization. On the other hand, the main question in *Guns, Germs, and Steel* is why it was that Western Eurasians colonized Americans instead of the contrary.

As discussed above, the Western reversal was specifically addressed by Gilfillan's (1920) theory of a temperate drift throughout history. Using Gilfillan's somewhat dubious empirical observations as an established fact, Lambert (1971) proposes an alternative hypothesis for the falling temperature in the centers of civilization; intense agricultural production meant an increasing population density and the emergence of urban populations. This greatly facilitated the spread of harmful parasites, mainly internal ones like hookworm. Supposedly, the great civilizations of Sumer and Egypt stagnated partly because of this climate-related health problem, and the center of civilization therefore gradually moved northwards where frosts and lower temperatures gave parasites a harder time.

It was mentioned in a previous section that the biogeography-category used here also includes medical geography, i.e. the geographical distribution of diseases. Like in Lambert (1971), disease plays an important role in AJR (2001). What they are concerned with is the comparative development among countries formerly colonized by Western powers. Institutions are the key variable for understanding current economic levels. The quality of a country's institutions today, as well as the quality hundreds of years ago, depends ultimately on the colonizing country's colonial strategy.

In essence, AJR (2001a) argue that colonialists settled down themselves and created institutions conducive to economic development where the disease environment - for climatic and topographical reasons - was favorable,

for example in New Zealand, Australia, and Northern United States. In regions nearer the equator with lowland tropical rain forests the probability of being killed by malaria or yellow fever was so high for the colonists that permanent settlements were often not a feasible strategy. Since they could not settle, they instead developed extractive institutions, aimed at squeezing the countries as much as possible. An example of this latter colonial strategy was king Leopold's management of his Congo Free State.¹³ The link from geography to institutions thus runs from climate and topography via the disease environment to institutions.

Whereas AJR (2001, 2002a) study the evolution of institutions in former colonies, Sokoloff and Engerman's (2000) biogeographic analysis deals with the variation in institutional configurations on the American continent. Sokoloff and Engerman also note a reversal in economic development in America; by the late eighteenth century, Caribbean colonies like Haiti, Cuba, and Barbados were richer than the United States and Canada. The reversal then happened which made North America prosperous whereas the Caribbean stagnated.

The fundamental reason for this development, according to Sokoloff and Engerman, can be traced back to geography (i.e. initial factor endowments). The climate and soil of the West Indies were extraordinarily well-suited for large scale plantations where staple crops like sugar were grown. These plantations had substantial economies of scale, and the native population was not numerous enough to cover the plantation-owners' need for labor. The solution was a massive importation of black slaves.¹⁴ The huge inequality between the small elite of wealthy plantation-owners and the working black population that prevailed even after the abolition of slavery, could only be kept in place with very strict institutions that protected the privileges of the rich. In contrast, in the northern parts of America, climate was not favorable for large scale sugar plantations, which implied a smaller importation of black slaves, a greater degree of equality between the mainly white settlers, and the creation of institutions strengthening individual property rights that in the longer run would prove beneficial for economic development.

5 A Grand Synthesis?

From all the theory and evidence presented above, is it possible to outline a universal theory of the historical links between geography and institutions that can help to explain the current state of institutions across the world? Such grand attempts should naturally be regarded with caution. But before

¹³AJR (2002a) complement this story by arguing that colonialists were more likely to set up extractive institutions where there were lots of easily lootable riches and a dense population that could be used as forced labor in mines and on plantations.

¹⁴The economics of American slavery has been analyzed extensively by Robert Fogel (1989).

we can say anything further, it is necessary to analyze the potential building blocks of such a theory. The title of the paper indicates that some theories can be judged as being more plausible than others. Choosing the term "plausible" rather than "probable" or even "validated" reflects my belief that the true historical relationship between geography and institutions can neither be satisfactorily estimated, nor be accepted or rejected with certainty by using the conventional tools of econometrics. What can be discussed is how plausible the various hypotheses are given the present stock of empirical evidence.

I would argue that most of the hypotheses regarding the direct link between climate and institutions seem rather implausible. My reading of modern physiology or psychology does not suggest that a hot climate corrupts the mind, makes people lazy and less "civilized" in the manner proposed by Montesquieu, Huntington, Gilfillan, and Landes. Figure 2 might of course be interpreted as supporting this "temperature hypothesis" of institutions, but as was discussed in the empirical section, there is convincing evidence that the effects of climate are primarily indirect, working through the geography of plants, animals, and disease vectors.

Wittfogel's theory of a specific Oriental despotism - prevailing throughout history - due to a natural inequality in those early agrarian societies that were dependent on a system of irrigation, does not seem very plausible either, although the argument might have some relevance for China. Jones' (1981) discussion of the importance of disasters for economic institutions is suggestive, but very little evidence is presented supporting his conjecture.

I would argue that if we should attempt to map the cross-continental differences in institutional trajectories back in time, two major events in world history stand out. The first one is the rise of Neolithic agriculture and the second is the wave of colonization starting around 1500 A.D. Both are highly related to physical geography, or more precisely, to what I refer to as biogeography. Agriculture based on domesticated plants and animals first appeared in regions that were well endowed with suitable wild species. Sedentary farming based on irrigation then led to the early civilizations with written language, science, and complex social organization. This development first happened in Eurasia because of a favorable climate and topology, as described by Diamond (1997). Biogeography and, in the background, climate and topography therefore were the ultimate explanations for the higher average level of institutional development in Eurasia by 1500 A.D.¹⁵ The empirical evidence in Olsson and Hibbs (2003) even suggest that the effect of initial biogeography can be registered today.

The second major influence was the European colonization movement, starting in 1492 and ending with the wave of independent states after World

¹⁵Not all scholars would agree on that last point. Blaut (1993) contends that Europe and Asia were at all ahead of Africa institutionally or economically by 1500.

War II. The colonists from Europe created good institutions where they could settle down and weak institutions where ruthless extraction was a more viable alternative. A key determining factor was the disease environment, as argued by AJR (2001a). Tropical regions are more prone to host disease vectors harmful to human beings, and Africa has the greatest share of its landmass in the tropics. Hence, we expect to find more extractive institutions in Africa than elsewhere, which indeed appears to be the case. Analogously, we would expect good institutions in regions with a climate and disease environment similar to Europe, a prediction that is also supported by the data (see New Zealand, Australia, and the United States in Figure 2).

The combination of these two universal theories accounts for the very broad pattern of why Eurasia and its offshoots in America, Oceania, and in other continents on average still have better institutions than the rest of the world. It should be repeated that a key assumption if we are to believe this story is institutional persistence, i.e. that a cluster of institutions are not easily changed once they are in place.

Apart from this macro picture, we might add several plausible theories of why institutions differ within continents. Europe's great degree of geographical fragmentation, discussed by Jones (1981) and Landes (1998), has probably both been a blessing and a curse. Although Europe had no early riverine civilizations, the cultural influences from Egypt and Sumer were significant. The many natural core areas in Europe meant a scatter of small societies which sometimes led each other on in peaceful competition but which just as often fought devastating wars. The best asset that Europe had geographically was probably the Mediterranean with its indented coastline, islands, peninsulas, and many natural ports. The Mediterranean basin is unique among the world's temperate regions in terms of climatic, topographical, and biogeographical variation. Its character has probably contributed to an institutional setting characterized by a favorable view on trade and exchange, pluralism, and individual freedom.

Institutional differences between Central and Northern South America on the one hand, and North America on the other, presumably also depends to a great extent on geography. Geographical factors explain the large-scale slave plantations in the West Indies and forced labor in the mines of Peru, whereas conditions in North America favored small-scale agriculture with an equal population and relatively strong individual property rights (Sokoloff and Engerman, 2000). Differences within Africa can to a great extent be explained by the AJR (2001a)-argument of the linkages between disease environment, permanent settlements, and institutions. However, research has also indicated that colonization strategy depended specifically on who the colonizer was. Former British colonies in Africa have been shown to outperform French ex-colonies in terms of economic growth (Grier, 1999). Although this has not been analyzed econometrically, it would seem likely

that part of the explanation for this pattern is the fostering of different institutions.

In general, the literature on institutions and economic development is very "eurocentric", comparing all other regions with the situation in the Western world. AJR (2001a), for instance, explain in principal all institutional variation within ex-colonies with their colonial experience since 1500 AD. The importance of indigenous African or American institutions are rarely analyzed by economists. The great degree of ethnic fractionalization is generally believed to be a key factor for understanding African conflicts and weak institutions, but a deeper analysis of the links between geography, natural resources, ethnicity, indigenous institutions, and current institutions has so far not been carried out. This might be an area for future work.

6 Concluding Remarks

This article reviews the empirical and theoretical literature on the possible linkages between geography and economic institutions. The motivation for this undertaking is that although a lot of recent empirical research has focused on geography, many of them lack a theory of why institutions should depend on geography at all. Hence, a survey of the older works on geography and social development is presented. Since no certain conclusions can be drawn because of the limited amount of comparable historical statistics, it is argued that biogeographical factors as discussed by Jared Diamond and the effects of colonialism as discussed by Acemoglu, Johnson and Robinson are at least the most plausible candidates for explaining the very broadest pattern of institutional quality in the world today. A departure from the eurocentric paradigm is probably necessary to get a better understanding for why a continent like Africa appears to have persistently weak institutions.

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Figure 1: Linkages between income level, trade, institutions, and geography

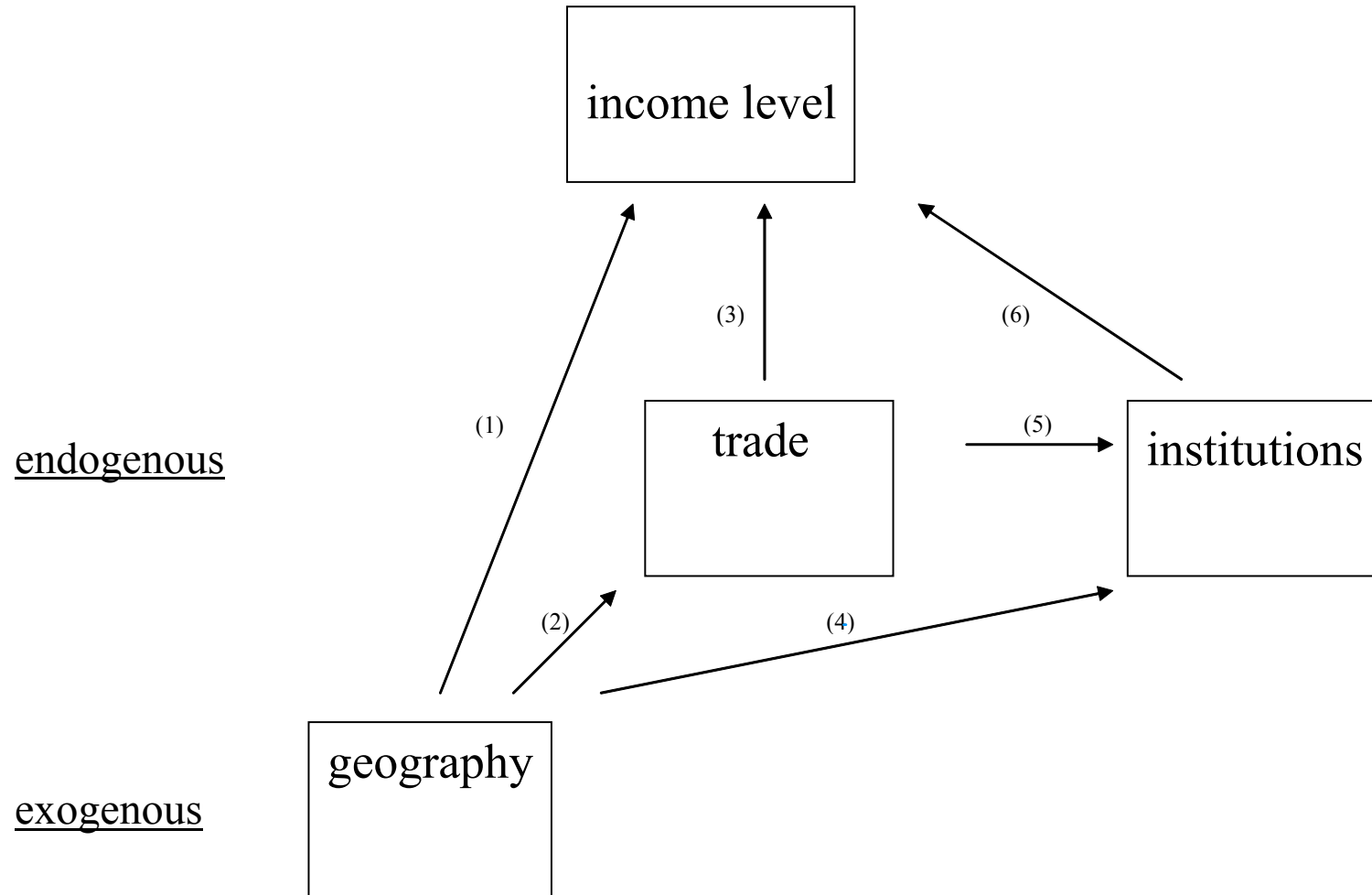


Figure 2: Average institutional quality 1985-95 (GADP) as a function of latitude degrees for 136 countries. (Fitted non-linear OLS curve with $R^2 = 0.51$. GADP from Hall and Jones (1999), LATITUDE from Olsson and Hibbs (2003))

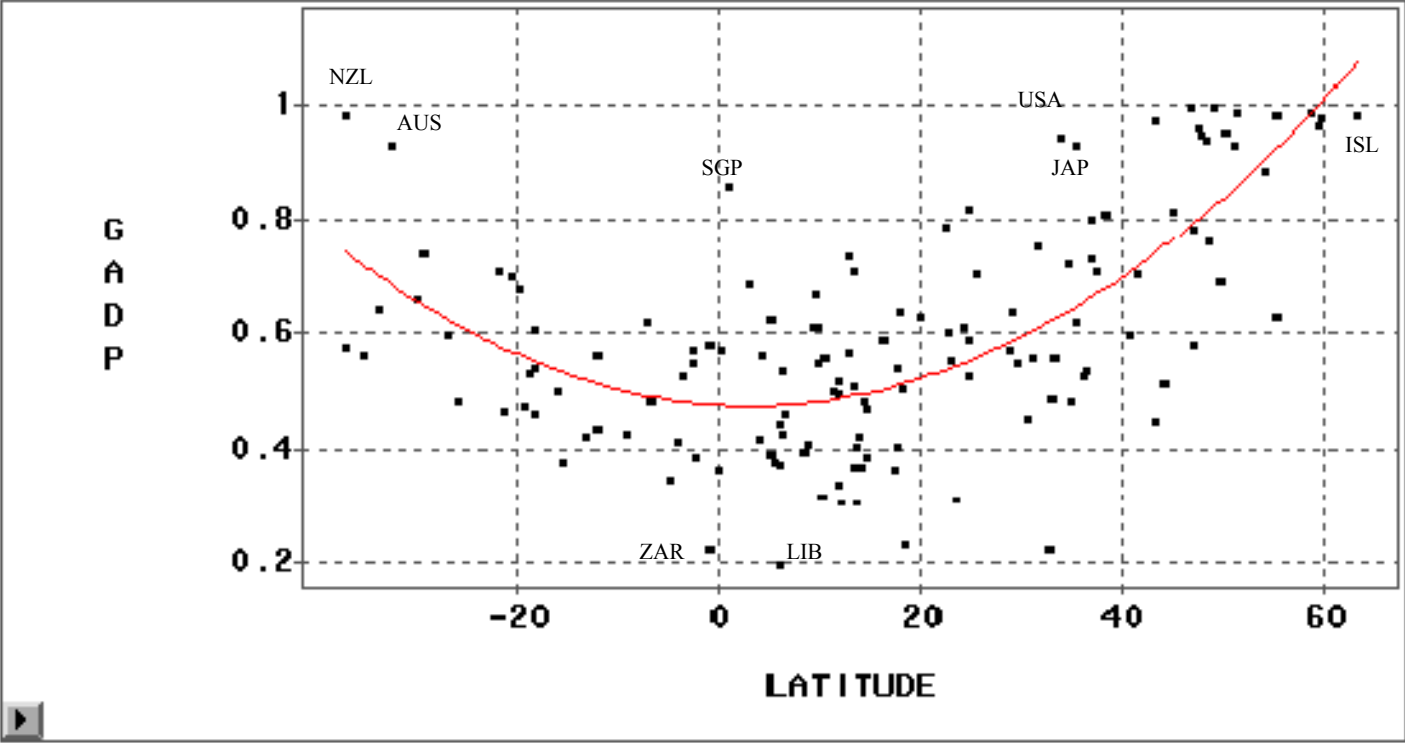


Table 1: Aspects of geography.

Non-biological aspects			Biological aspects
Climate	Topography	Geology	Biogeography
temperature	mountain	soil	flora
precipitation (floods, drought)	plateau	mineral	fauna
sunlight	river	gas	type of vegetation (jungle, steppe, desert)
humidity	lake	oil	(disease vectors)
winds (storms)	ocean	earthquakes	
ocean currents	island	volcanos	
	peninsula		

Table 2: Earlier empirical studies on geography and institutions.

Study	Geography variable	Institutions variable	Base sample
Hall and Jones (1999)	Distance from equator	Social infrastructure	127 countries
AJR (2001a)	Settler mortality	Risk of expropriation	64 ex-colonies
AJR (2002b)	Access to Atlantic	Constraint on executive	
Easterly and Levine (2003)	Dist., Settler mort., Crops/Minerals dummy	Kaufmann measure	72 countries
Rodrik et al (2002)	Dist., Settler mort., alt. measures	Kaufmann measure	80 countries
Olsson and Hibbs (2003)	Bio Conditions, Geo Conditions	GADP	112 countries