Institutions, Geography, and Terms of Trade in Latin America: A Longitudinal Econometric Analysis*

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Abstract

Recent World Bank reports indicate that the world has seen a severe reduction in poverty, representing not just a cutback in the relative incidence of poverty but a significant decline in the total number of "poor" people. However in Latin America, the incidence of poverty has remained approximately constant, while the number of poor people has increased. Because of this it is important to understand why Latin America is not making the same strides that the rest of the world is in terms of poverty reduction. It is also necessary to understand how Latin American countries can achieve a long-term economic development to both reduce poverty and improve income inequality. Since long-term economic development is a complex phenomenon, the paper focuses on three "deep" determinants: geography, integration, and institutions. Traditionally, authors study the impact of institutions, integration and geography on per capita income using worldwide cross-section data. Conversely, this paper employs the Hausman and Taylor (1981) method to examine the influence of these three determinants on per capita income in Latin American countries. That longitudinal econometric method allows us to consider unobserved heterogeneity across countries and to obtain direct parameter estimates of the time invariant independent variables, like geography or some institutional measures. Our results demonstrate that not just the quality of institutions, as much of the previous literature has claimed, but also the terms of trade both have strong impacts on per capita income. Once institutions are controlled for, measures of geography have relatively weak direct effects on incomes. Similarly, once institutions are controlled for, we find that both openness to trade and appreciated real exchange rates are detrimental to growth.

Keywords: Institutions, Development, Openness, Geography, Panel Data
JEL: N1, O1, H1, F1

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1. INTRODUCTION

The central economic contradiction today is that “economic development” is working while “development policy” is not. On the one hand, the last quarter century has witnessed a tremendous and historically unprecedented improvement in the material conditions of hundreds of millions of people living in some of the poorest parts of the world. On the other hand, development policy as it is commonly understood and advocated by influential multilateral organizations, aid agencies, Northern academics, and Northern-trained technocrats has largely failed to live up to its promise. We are faced with the confluence of two seemingly contradictory trends. (Rodrik, 2007)

According to the latest World Bank estimates, there were roughly 400 million fewer “poor” people in the world in 2001 than two decades earlier, when poverty is measured in the world dollar-a-day standard. This is a striking improvement in the absolute number of poor, not just in the relative incidence of poverty. What has made these gains possible is the sharp increase in economic growth in some of the poorest and most populous countries of the world, China and India in particular. China’s growth rate since 1978 has been nothing short of spectacular, binging considerable poverty reduction in its wake. In fact, the reduction in poverty in China alone accounts for the full 400 million global reductions, with the gains and losses in the rest of the world canceling each other out. The number of people below the one-dollar-a-day line has fallen somewhat in South Asia, but increased sharply in sub-Saharan Africa. In Latin America, the incidence of poverty has remained roughly constant, while the number of poor people has increased. (Rodrik, 2007)

The perseverance of disparities in income levels between rich and poor countries is a matter of concern worldwide, and the issue of what determinants matter most for development has been at the core of a large number of studies in the growth and development literature. Although it remains an open question what exactly constitutes a "deeper" determinant of development, three broad categories have emerged in the literature: geography, institutions, and integration (Rodrik 2002). It is the goal of this paper to understand which of these determinants has the greatest impact on Latin American economic development.

2. INSTITUTIONS, TERMS OF TRADE, AND GEOGRAPHY

The importance of institutions was emphasized in the work of Douglas North (1993, 1994a, b, c). The motivation to consider institutions can be linked to the inability of the neoclassical theory to explain widespread differences in economic performances across counties. Institutions are the rules of game that a society lays down for itself and which determine the incentives people face and thus the choices they make. Another way of looking at institutions is through their impact on transaction costs. Well defined rules and their smooth enforcement, i.e. better institutional quality, greatly reduce transaction costs economic agents face and thus lead to outcomes that are more efficient (North, 1993, 1994b). Hall and Jones (1999) was one of the first empirical studies to examine the impact of institutions on economic development. Unlike geography however, there is a potential problem with institutions – endogeneity. Hall and Jones use a measure of language fractionalization as an instrumental variable for institutions, and find that

institutions play an important role in explaining economic growth. The search for appropriate instruments for institutions was pushed further by Acemoglu et al. (2001).

Acemoglu, Johnson, Robinson (2001) (AJR) use settler mortality as an instrumental variable for institutions, arguing that areas with high mortality rates are unable to create stable institutional structures. They find that differences in institutions explain three-quarters of the per capita income differences across colonies. AJR's approach uses a unique instrumental variable called settler mortality. This is used as an instrument for institutional measures or institutional quality, which each have major endogeneity issues. Settler mortality is now commonly used in regression analysis as an instrument for institutions, and will be used in this paper. This unique approach has led researchers such as Rodrik (2004) to question the use and accuracy of instrumental variables in explaining institutions. Despite some theoretical issues, instrumental variables are a viable option for overcoming the endogeneity problems that plague this literature.

Rodrik (2002), who has done significant work in this area of research, discusses the role of institutions in economic development, using a cross-sectional analysis he finds that institutions have the strongest and most significant impact on economic growth, while the effect of geography is small and openness to trade is insignificant. These results match much of the previous literature, including that of Easterly and Levine (2002).

Jacob and Osang (2007) use panel data to account for unobserved heterogeneity across countries. They employ the Hausman and Taylor estimator which allows them to obtain direct parameter estimates of the time invariant explanatory variables, eliminating

problem of time invariance variable omission in a fixed effects model. The Hausman-Taylor approach allows for comparisons to the cross-sectional literature. Jacob and Osang find that institutional measures have the strongest impact, followed by openness to trade. As in much of the previous literature, geography has a very small impact.

The argument for economic integration as a fundamental determinant of development is based on the gains from trade literature. Next to the classic case of comparative advantage gains are more modern approaches that stress the importance of trade in the transfer of new technologies and ideas, which in turn enhance productivity. Moreover, supplying to a larger international market allows higher degrees of specialization and thus entails productivity gains. There are many empirical studies on the link between international trade or integration and economic development. One of the more influential ones is Sachs and Warner (1995) who constructed an index of openness and found that greater openness leads to higher growth. As with institutions, trade variables are likely to be endogenous with regard to income. Frankel and Romer (1999) examine this issue in detail. Their predicted trade share variable is derived from a gravity equation, thus effectively using distance between countries as an instrumental variable. The findings point to a positive link between integration and income. (Jacob and Osang, 2007)

Geographic factors in general characterize the natural location of a nation such as distance from equator, access to sea, agro-climatic zone, disease environment, soil type, and natural resources. Measures of geography may matter for development because of its impact on transaction costs (Jacob and Osang, 2007).

Using a cross-sectional approach, Jeffrey Sachs (2003) finds that geography rather than institutions has the strongest impact on economic growth. Sachs critiques Rodrik's use of the geography variable "distance from the equator," and does not include a control for trade openness in his regressions. The paper instead focuses on the role of a new malaria index called Malaria Ecology (ME), which he uses as an instrumental variable for geography. Using this index he finds that countries that have a high malaria ecology index have a lower rate of growth. Since malaria and climate are highly correlated, Sachs declares that geography has the most significant impact on economic growth.

All of these studies have used large world data sets consisting of individual country data. Using this type of data one can make conclusions about the generalities of institutions, geography, and trade. However, every continent and every country has a specific institutional and geographical story that is being overlooked by these studies. Latin America is an area that has been the subject of development economists work for decades, and has a very specific story to tell. For years the IMF and World Bank have offered incentives to become more open to trade. Some economists blame the era of "neo-liberalism" for the slow growth in Latin America the last 20 years. Some say that Latin American's political institutions have been too volatile to fully develop institutions that are necessary for economic growth. Some argue that the climate and proximity to the equator has been an obstacle that many Latin American countries have not been able to overcome. We will discuss these issues and develop a model to test what has had the biggest impact on Latin American Development, Institutions, Geography, or Openness to Trade?

3. A BRIEF COMMENT ABOUT REFORMS AND ECONOMIC PERFORMANCE IN LATIN AMERICA

Approximately two decades ago, countries in Latin America began a process of reforms oriented by the Washington Consensus. The term "Washington Consensus" served to exhibit the evidence of a paradigmatic shift in the economic policy for Latin America. The intellectual momentum behind the consensus view undoubtedly flowed from Washington, the locus of the U.S. Treasury, the International Monetary Fund, and the World Bank. Similarly important, the consensus encompassed key Latin American business elites and functionaries of the state apparatuses. Multinational corporations, particularly in the financial realm, used their extensive influence to consolidate a policy that promised to unlock all sectors of the Latin American economies to foreign investment and unrestrained financial flows across the borders, including fluid repatriation of profits. (Cypher, 1998)

Those earliest efforts were made at the start of the 1970s by Chile and were later followed by similar initiatives in Mexico, Argentina, Colombia, Costa Rica and Brazil in the late 1980s and early 1990s. The change in development paradigm, which resulted in the rejection of the inward oriented, state-led model of the postwar period, brought about great structural changes. The production structure and the institutional and regulatory regime of the countries of the region underwent important change as part of an overwhelming, long-term structural transformation. The combination of pro-competitive structural reforms, the historical features of each national economy and the impact of the world economy's increasing financial turbulence and volatility triggered a Schumpeterian

episode of “creative destruction” through which a new economic, institutional and technological regime was gradually emerging. (Katz 2001, pg. 15)

Latin American countries suffered with the impact of a change in the macroeconomic incentive regime created to stabilize the economy and to introduce structural reforms. Such a policy package involved a drastic change in the regulatory and incentive regimes (including tariff protection, patent legislation, property rights on natural resources, etc). The central objective of the policy package-which included monetary, fiscal and income policies, as well as changes in the regulatory and institutional ‘regime’ – was that of reducing aggregate demand and imports while simultaneously expanding exports, together with exposing local firms to more external ‘contestability’. (Cimoli and Katz, 2003)

New patterns of production specialization and trade emerged, with knowledge intensive industries loosing ground within Latin American countries while non-tradable activities and natural resource processing industries and ‘maquila’ - type assembly operations (catering mostly for US markets), have gained participation. A gradual change in the technical progress and productivity growth has occurred, with a rapidly increasing share of external players emerging at the expense of domestic ones. Side by side with the development of new forms of articulation of domestic firms and consumers with foreign companies ‘know how’ and with the rapid diffusion of information technologies, the pattern of accumulation of technological capabilities has been changing in structure and performance. As a result, the relative technological gap with the world’s ‘best practice’ frontiers has become smaller in highly ‘localized’ and specific areas of each economy (such as telecommunication services, internet access, or energy production and

distribution), but globally such gap remains still dramatically high, even after long years of trade liberalization and market deregulation efforts. (Cimoli and Katz, 2003)

Stiglitz (2003) points out that the experiment in so-called first-generation reforms failed in Latin America. In 2002, many of the countries of the region faced recessions, depressions and crises; a few of them had an almost unprecedented level, reminiscent of the Great Depression. Argentina, the A+ student of the first three quarters of the decade, has not only had a crisis but, at least in some quarters, it has become beyond measure. Brazil, too, a first-rate student of reform, faced a severe crisis. A reform strategy which promised to bring unprecedented prosperity has failed, in an almost unprecedented way. Its critics said that it might bring sustainable growth in the long run. The outcomes have been worse than many of its critics feared: it has not brought sustainable growth for the region but it has brought increased inequality and poverty.

Standard neoclassical theory predicts convergence, that is, that less developed countries will grow faster (per worker) than developed countries. In reality, there was convergence during the pre-reform decades, but since 1980 there has been divergence. In the early part of the 1990s, in which the success was claimed for the reforms, per capita income in the United States grew more rapidly than in Latin America. The counter argument is that it takes time for the reforms to take effect, but even this argument has a flaw. It was the first half of the decade in which growth occurred. In the second half, especially since 1997, there has been stagnation, recession and depression. Recently, the growth rate in Latin America has recovered from the deep recession of the early 2000s. Silva and Vernengo (2007) point out that in 2005 the region grew by 4.5%, but they bring a serious doubt about the long-run stability of the high-level growth rate because of the

predicted slowdown of the US economy, the largest destination of the exports from Latin American countries, and the remained low level of investment in infra-structure that would result in a ‘crowding-in’ effect.

Rodrik (2007) points out that an important reason why the Washington Consensus, and its subsequent variant, second-generation reforms, have failed to produce the desired outcome is that they were never targeted on what may have been the most important constraints blocking economic growth. The fact that poor economies are poor indicates that they could potentially suffer from a variety of afflictions: they are poorly endowed with human capital, make ineffective use of capital and other resources, have poor institutions, have unstable fiscal and monetary policies, provide inadequate private incentives for investment and technology adoption, have poor access to credit, are cut off from world markets, and so on.

In fact, Latin American countries were looking for a way to restore growth and overcome the debt crisis that had enveloped the region. However, macroeconomic policies were focusing on the immediate and unique priority of stabilization. Eager to restore its medium-term growth prospects, Latin America made deeper changes in its development strategy, including proceeding with financial liberalization, opening up to foreign investment and trade, privatizating state-owned enterprises, and deregulating markets. The aim was to promote more open, competitive economies by expanding the role of markets and reassessing the role of the state. These structural reforms became another element of strategy that – with financing support from the international financial institutions- would help over-indebted economies regain access to international capital markets.

A traditional import substituting industrialization (ISI) model was quite effective in stimulating growth in a large number of Latin American countries. East Asian-style outward orientation combined heavy-handed interventionism at home with single-minded focus on exports (South Korea, Taiwan). Chile's post-1983 strategy was based on quite a different style of outward orientation, relying on large real exchange rate depreciation, absence of explicit industrial policies (but quite a bit of support for nontraditional exports in agro-industry), saving mobilization through pension privatization, and discouragement of short-term capital inflows. The experience of countries such as China is best described as two-track reform. India comes as close to genuine gradualism as one can imagine. Hong Kong represents probably the only case where growth has taken place without an active policy of crowding in private investment and entrepreneurship, but with special and favorable preconditions. (Rodrik, 2007)

In the long run, the main factor that ensures convergence with the living standards of advanced countries, as supported by our empirical results, is the acquisition of high-quality institutions, and safeguarding a competitive exchange rate. The growth-spurring strategies described above have to be complemented over time with a cumulative process of institution building to ensure that growth does not run out of steam and that the economy remains resilient to shocks. (Rodrik, 2007)

4. THE DATA, THE MODEL AND THE HAUSMAN-TAYLOR METHOD

As discussed above, Latin America has faced various institutional and trade challenges that have resulted in a continent that is ripe for study and policy recipe. In the development literature that focuses on "deep determinants," perhaps the most pressing

issue is the problem of endogeneity. This is true for the world and true for Latin America. It is possible that income per capita is affected by institutions, with political stability, rule of law, and property rights all instigating growth in income per capita. But it is also possible that per capita income affects institutions, or that growth per capita may cause a demand for institutions such as property rights, political stability, and rule of law to be created and enforced.

Trade/openness is also difficult to determine. Trade can affect income and institutions, while institutions and income can be argued to effect trade. At the same time, income per capita may be both the cause and the result of an increase in trade. The potential reverse causality makes this literature difficult.

Geography may have an impact on institutions, as early settlers may have chosen not to settle in areas with harsh climates. As discussed in Diamond (1997), and Acemoglu et al. (2001), early settlers may not have been able to grow certain crops or raise specific animals, which caused European settlers to "extract" resources from these harsher climates instead of settle and create institutions. Geography may be the most exogenous variable since it is difficult to argue that institutions affect geography. One could make the argument that in regards to malaria risk, which is commonly used as a measure of geography, institutions could affect the variable, as has certainly been the case in South Korea where malaria used to be a major economic burden. However, as institutions changed (or even as income growth caused institutions to change), the Koreans were able to eliminate the risk of malaria. This is a compelling argument, which is why the instrumental variable Malaria Ecology was developed, taking into account "the fact that causation may run not only from malaria to income but also from income to

malaria" (Sachs 2003). Generally, geography is considered exogenous, and is considered exogenous in Rodrik (2002), and will be considered such in this paper. The dataset covers the period 1996-2006 and it is based on in many sources (see table 8).

4.1 HAUSMAN AND TAYLOR (1981)

An important purpose in combining time-series and cross-section data is to control for individual-specific unobservable effects which may be correlated with other explanatory variables. An important benefit from pooling time-series and cross-section data is the ability to control for individual-specific effects-possibly unobservable-which may be correlated with other included variables in the specification of an economic relationship. Analysis of cross-section data alone can neither identify nor control for such individual effects. The following equations illustrate:

$$Y_{it} = X_{it}\beta + Z_i\gamma + \alpha_i + \eta_{it} \quad (1) \qquad (i = 1,\ldots, N;\ t = 1,\ldots, T)$$

where β and γ are k and g vectors of coefficients associated with time-varying and time-invariant observable variables respectively. The disturbance η_{it} is assumed uncorrelated with the columns of (X, Z, α) and has zero mean and constant variance σ_η^2 conditional on X_{it} and Z_i. The latent individual effect α_i is assumed to be a time-invariant random variable, distributed independently across individuals, with variance σ_α^2.

Hausman and Taylor (1981) explain that the OLS coefficient estimates from the transformed data (known as "within-groups" or "fixed effects" estimators) have two important defects: (1) all time-invariant variables are eliminated by the transformation, so

that y cannot be estimated; and (2) under certain circumstances, the within-groups estimator is not fully efficient since it ignores variation across individuals in the sample. The first problem is generally the more serious since in some applications, primary interest is attached to the unknown coefficients of the time-invariant variables.

The Hausman-Taylor method uses assumptions about the correlations between the columns of (X, Z) and α_i. If we are willing to assume that certain variables among the X and Z are uncorrelated with α_i, then conditions may hold such that all of the $\beta's$ and $\gamma's$ may be consistently and efficiently estimated. Intuitively, the columns of X_{it} which are uncorrelated with α_i can serve two functions because of their variation across both individuals and time: (i) using deviations from individual means, they produce unbiased estimates of the $\beta's$, and (ii) using the individual means, they provide valid instruments for the columns of Z_i, that are correlated with α_i.

Hausman and Taylor (1981) point out from the equation (1) the properties of conventional estimators in the absence and presence of specification errors of the form $E(\alpha_i \mid X_{it}, Z_i) \neq 0$. Thus

$$Y_{it} = X_{it}\beta + Z_i\gamma + \varepsilon_{it} \quad (2)$$

$$\varepsilon_{it} = \alpha_i + \eta_{it}$$

where they believe that $E(\varepsilon_{it} \mid X_{it}, Z_i) = E(\alpha_i \mid X_{it}, Z_i) \neq 0$. Note that, somewhat unconventionally, X_{it} and Z_i denote TN x k and TN x g matrices respectively, whose subscripts indicate variation over individuals (i = 1,…, N) and time (t = 1,…, T).

Observations are ordered first by individual and then by time, so that α_i and each column of Z_i are *TN* vectors having blocks of *T* identical entries within each *i* = 1,..., *N*.

The prior information the Hausman-Taylor procedure uses the ability to distinguish columns of *X* and *Z* which are asymptotically uncorrelated with α_i from those which are not. For fixed *T*, let

$$\operatorname*{plim}_{N\to\infty}\frac{1}{N}X_{1it}^{'}\alpha_i = 0 \qquad \operatorname*{plim}_{N\to\infty}\frac{1}{N}Z_{1i}^{'}\alpha_i = 0 \quad (3)$$

$$\operatorname*{plim}_{N\to\infty}\frac{1}{N}X_{2it}^{'}\alpha_i = h_x \qquad \operatorname*{plim}_{N\to\infty}\frac{1}{N}Z_{2i}^{'}\alpha_i = h_z$$

where $X_{it} = [X_{1it} \vdots X_{2it}]$ of dimensions $[TN \times k_1 \vdots TN \times k_2]$, $Z_{it} = [Z_{1i} \vdots Z_{2i}]$ of dimensions $[TN \times g_1 \vdots TN \times g_2]$, and the k_2, g_2 vectors h_x, h_z are assumed unequal to zero.

5. RESULTS

In tables 4, 5, 6 and 7, we see that real exchange rate, trade openness, and rule of law are highly statistically significant. The geography variables in all cases come up statistically insignificant at the 5% level, with only Malaria Ecology statistically significant within the 10% level. This is contrary to Sachs (2003). The institutional measure (rule of law) result is not surprising, however based on previous literature the openness to trade and real exchange rate significance are surprising. The importance of the real exchange rate and openness to trade reflect the central debate that is taking place over the reforms in Latin America. Moreover, Rodrik (2008b) provides evidence that

undervaluation of the currency stimulates economic growth. Thus, the high level of significance and the positive coefficient of the real exchange rate imply that an overvalued exchange rate is detrimental to Latin American growth. This has important policy implications in terms of foreign capital flows, floating exchange rates, and controlling domestic interest rates. Similarly, trade openness is statistically significant with a negative coefficient, which implies that the more open to trade a country is, the lower the growth they will have. This is contrary to the reforms outlined in the Washington Consensus where it was argued that trade openness would result in a long-term and sustainable economic growth. This is contradictory to the results of Rodrik (2002), Jacob and Osang (2007), and Frankel and Romer (1999). It is possible that in a world dataset, the specifics of the Latin American growth experience were lost in each of these studies.

In agreement with Rodrik (2002), North (1994), and Jacob and Osang (2007), institutions are still a dominant determinant of growth. Rule of Law is both significant and has a positive coefficient. In Latin America, we can say not just that "Institutions Rule," but that both institutions and foreign trade rule.

It is clear to the authors that there is a very specific and important relationship between the real exchange rate, openness to trade, and per capita growth. In countries with overvalued real exchange rates, it is likely that trade openness will be detrimental to growth. Conversely, in countries with a depreciated real exchange rate, openness to trade is likely to spur economic growth through export driven growth.

6. CONCLUSION

Using panel data for Latin America, and applying the Hausman-Taylor estimator, we have found that both institutions and terms of trade matter in Latin America. Many studies use cross sectional world datasets, which fail to capture both the time effects and the continent specific effects. As Rodrik (2007) claims, there are "many recipes" for economic growth and economic development. From these results, it is clear that a new paradigm, a paradigm different from the "Washington Consensus," is necessary and should account for the area specific effects that are unique to the developing area. In this case, it is clear that in Latin America, not only does the "classic" result of the importance of institutions hold, but terms of trade are equally as important. The implications of the importance of terms of trade are that Latin American countries should have devalued exchange rate, and capital controls that prevent foreign capital from appreciating the exchange rate beyond what policy makers deem acceptable. In terms of trade openness, our results imply that neo-liberal policies may be misguided for Latin America.

Table 1: Classification of Variables for HT Model Estimation

Time Varying			
Institutions		**Trade**	
Name	Category	Name	Category
Ln CMI	X1	Ln Fuel Export	X1
Rule of Law	X2	Ln Tariff	X2
Ln Infant Mortality	X2	Ln Trade Share	X2
		Ln Real Exchange Rate	X2
Time Invariant			
Institutions		**Trade**	
Ln Settler Mortality	Z1	Frankel-Romer Index	Z2
Ln % Protestant (80s)	Z1		
Ln % Catholic (80s)	Z1		
Ln % Muslim (80s)	Z1		
Ln European Fractionalization	Z1		
No Corrupt	Z2		
Political Risk	Z2		
Geography			
Ln Airdist (km to closest major port)	Z1		
Ln Land Area	Z1		
Dist. Equator	Z1		
Landlocked	Z1		
Malaria Index (1994)	Z1		
Falciparam Malaria Index (1994)	Z1		
Malaria Ecology	Z1		
Kgptemp (%Pop in temperate zones)	Z1		

Note: X1 and Z1 (X2 and Z2) denote variables uncorrelated with (correlated with) the country-specific Time-invariant unobservables

Table 2: Descriptive Statistics					
Variable	Obs	Mean	Std. Dev.	Min	Max
Ln GDP per capita	162	7.81	0.64	6.55	9.02
Measures of Institutions					
Rule of Law	162	-0.40	0.60	-1.39	1.24
No Corrupt	162	3.48	1.30	2.10	7.30
Political Risk	162	65.17	7.64	53.00	82.00
Ln CMI	162	4.24	0.19	3.61	4.53
Ln Infant Mortality	162	3.05	0.42	2.08	3.95
Ln Settler Mortality	162	4.41	0.28	4.23	5.10
Ln % Protestant (80s)	162	0.89	0.93	-1.61	3.05
Ln % Catholic (80s)	162	4.30	0.73	1.36	4.57
Ln % Muslim (80s)	162	-0.90	1.34	-2.30	1.50
Ln European Fractionalization	162	4.21	0.73	1.39	4.61
Measures of Geography					
Ln Airdist (km to closest major port)	162	8.45	0.41	7.79	9.05
Ln Land Area	162	12.70	1.60	9.95	15.95
Dist. Equator	162	0.19	0.11	0.02	0.41
Landlocked	162	0.11	0.32	0.00	1.00
Malaria Index (1994)	162	0.22	0.32	0.00	1.00
Falciparam Malaria Index (1994)	162	0.05	0.07	0.00	0.26
Malaria Ecology	162	0.69	0.65	0.00	2.33
Kgptemp (%Pop in temperate zones)	162	0.14	0.28	0.00	1.00
Measures of Openness					
Ln Fuel Export	162	1.01	2.28	-4.61	4.49
Ln Tariff	162	2.05	0.10	1.61	2.25
Ln Trade Share	162	4.04	0.46	2.77	5.19
Frankel-Romer Index	153	2.43	0.67	1.11	3.36
Ln Real Exchange Rate	161	2.61	2.79	-3.24	10.47

Table 3: Correlation Coefficients

	Ln GDP per capita	Ln Airdist (km to closest major port)	Ln Land Area	Dist. Equator	Landlocked	Malaria Index (1994)	Falciparam Malaria Index (1994)	Malaria Ecology	Kgptemp (%Pop in temperate zones)
Ln GDP per capita	1								
Ln Airdist (km to closest major port)	0.27	1							
Ln Land Area	0.33	0.55	1						
Dist. Equator	0.37	0.67	0.21	1					
Landlocked	-0.40	0.35	0.05	0.13	1				
Malaria Index (1994)	-0.53	-0.41	-0.10	-0.40	-0.21	1			
Falciparam Malaria Index (1994)	-0.32	-0.21	0.10	-0.57	-0.20	0.63	1		
Malaria Ecology	-0.47	0.17	0.18	-0.10	0.59	0.10	0.10	1	
Kgptemp (%Pop in temperate zones)	0.49	0.69	0.20	0.84	-0.13	-0.32	-0.28	-0.35	1

	Ln GDP per capita	Ln Settler Mortality	Ln % Protestant (80s)	Ln % Catholic (80s)	Ln % Muslim (80s)	Ln European Fractionalization	No Corrupt	Political Risk
Ln GDP per capita	1							
Ln Settler Mortality	-0.52	1						
Ln % Protestant (80s)	-0.14	0.35	1					
Ln % Catholic (80s)	-0.24	0.23	0.65	1				
Ln % Muslim (80s)	0.33	-0.40	0.10	-0.34	1			
Ln European Fractionalization	0.04	0.16	-0.35	-0.35	-0.33	1		
No Corrupt	-0.03	0.08	0.60	0.53	0.09	0.27	1	
Political Risk	0.30	-0.04	0.67	0.60	0.30	-0.73	0.21	1

	Ln GDP per capita	Ln Fuel Export	Ln Tariff	Ln Trade Share	Ln Real Exchange Rate
Ln GDP per capita	1				
Ln Fuel Export	0.1919	1			
Ln Tariff	-0.0544	0.1427	1		
Ln Trade Share	-0.2087	-0.3335	0.2425	1	
Ln Real Exchange Rate	0.0363	0.0901	0.1537	0.1825	1

	Ln GDP per capita	Ln CMI	Rule of Law	Ln Infant Mortality
Ln GDP per capita	1			
Ln CMI	0.053	1		
Rule of Law	-0.0415	-0.0725	1	
Ln Infant Mortality	-0.6552	0.0108	-0.0121	1

Table 4: Panel Regression Results

	Panel Regressions						
	Dependent Variable:						
	Log Real GDP per capita	1	2	3	4	5	6
Time Variant							
Exogenous	**Log Real Exchange Rate**	0.0815107		0.0783606		0.0815107	
		(5.73)***		(5.62)***		(5.74)***	
	Log CIM		0.1765273		0.062245		0.1765273
			(0.91)		(0.32)		(0.91)
Time Variant							
Endogenous	**Log Openness**	-0.3864973	-0.2903818		-0.1911713	-0.3864973	-0.2903818
		(4.49)***	(3.07)***		(1.91)*	(4.50)***	(3.07)***
	Rule of Law			0.4371438	0.2917661		
				(4.82)***	(2.66)***		
Time Invariant							
Exogenous	**Distance from Equator**	5.799779	2.265162	6.408788	2.312097		
		(0.80)	(1.07)	(0.82)	(1.10)		
	Malaria Ecology					-1.563397	-0.4929842
						(0.56)	(2.00)**
Time Invariant							
Endogenous	**NoCorruption**	-0.6640636	-0.0804595	-0.9197327	-0.2045728	-1.400357	-0.0137965
		(0.55)	(0.27)	(0.71)	(0.68)	(1.07)	(0.07)
	Political Risk						
Constant		10.38695	8.095540	9.781708	8.717610	15.10643	8.626100
		(3.49)***	(7.34)***	(3.07)***	(7.82)***	(1.07)	(7.75)***
Observations		161	162	161	162	161	162
Countries		18	18	18	18	18	18
Test 1	validity of RE†	0.2838	0.4132	0.2307	0.2835	0.2198	0.5616
Test 2	validity of HT‡	0.7124	0.2968	0.6526	0.7178	0.6135	0.8807
	Selected Estimation	RE	RE	RE	RE	RE	RE

Absolute value of z statistics in parentheses

*/**/*** significant at 10%/ 5%/ 1% respectively

†: p values of Hausman test between RE and FE

‡: p values of Hausman test between HT and FE (RE and HT) if RE rejected (not rejected) in Test 1

	Panel Regressions						
	Dependent Variable:						
	Log Real GDP per capita	7	8	9	10	11	12
Time Variant							
Exogenous	**Log Real Exchange Rate**	0.0783606		0.0815107		0.0783606	
		(5.63)***		(5.71)***		(5.60)***	
	Log CIM		0.062245		0.1765273		0.062245
			(0.32)		(0.91)		(0.32)
Time Variant							
Endogenous	**Log Openness**		-0.1911713	-0.3864973	-0.2903818		-0.1911713
			(1.91)*	(4.48)***	(3.07)***		(1.91)*
	Rule of Law	0.4371438	0.2917661			0.4371438	0.2917661
		(4.83)***	(2.66)***			(4.80)***	(2.66)***
Time Invariant							
Exogenous	**Distance from Equator**						
	Malaria Ecology	-1.573731	-0.442566	0.2047055	-0.4965415	0.6039110	-0.4767746
		(0.50)	(1.76)	(0.38)	(1.78)*	(0.74)	(1.68)*
Time Invariant							
Endogenous	**NoCorruption**	-1.724701	-0.132674				
		(0.44)	(0.61)				
	Political Risk			0.1043975	-0.0021326	0.1285829	-0.0205079
				(1.38)	(0.07)	(1.14)	(0.62)
Constant		14.86109	9.20411	2.21894	8.719530	-1.011695	10.10263
		(0.94)	(8.10)***	(0.42)	(3.95)***	(0.13)	(4.45)***
Observations		161	162	161	162	161	162
Countries		18	18	18	18	18	18
Test 1	validity of RE†	0.1475	0.4766	0.5870	0.1735	0.2926	0.1549
Test 2	validity of HT‡	0.5076	0.8321	0.9181	0.5865	0.7351	0.5290
	Selected Estimation	RE	RE	RE	RE	RE	RE

Absolute value of z statistics in parentheses

*/**/*** significant at 10%/ 5%/ 1% respectively

†: p values of Hausman test between RE and FE

Table 5: Panel Regression Results: Addition Measures of Geography

	Panel Regressions					
Dependent Variable:	**Log Real GDP per capita**	13	14	15	16	17
Time Variant	**Log Real Exchange Rate**	0.0843592	0.0826056	0.0839310	0.0834347	0.0842919
Exogenous		(6.22)***	(6.12)***	(6.16)***	(6.15)***	(6.22)***
	Log CIM	0.2003447	0.2039498	0.2015266	0.197727	0.1981438
		(1.16)	(1.18)	(1.16)	(1.14)	(1.15)
Time Variant	**Log Openness**	-0.2632374	-0.2641067	-0.2618940	-0.2672388	-0.2641629
Endogenous		(2.95)***	(2.95)***	(2.91)***	(2.99)***	(2.97)***
	Rule of Law	0.3060437	0.3038106	0.3083485	0.3039869	0.3060603
		(3.17)***	(3.13)***	(3.16)***	(3.14)***	(3.17)***
Time Invariant	**Malaria Ecology**	-0.491855	-0.524126	-0.295456	-0.615869	-0.4024948
Exogenous		(1.88)*	(2.14)**	(1.07)	(1.80)*	(1.47)
	Dist. Equator	2.4521610				
		(1.43)				
	Ln Land Area		.1347537			
			(1.57)			
	Landlocked			-.7145931		
				(1.32)		
	Ln Airdist				.6045312	
					(1.05)	
	Kgptemp					1.198152
						(1.19)
Time Invariant	**NoCorruption**	-0.2582666	-0.1698161	-0.2156048	-0.2834029	-0.331027
Endogenous		(1.23)	(0.95)	(1.15)	(1.05)	(1.19)
Constant		8.70708	7.16109	8.95367	4.258993	9.20779
		(8.58)***	(4.92)***	(8.70)***	(0.99)	(7.85)***
Observations		161	161	161	161	161
Countries		18	18	18	18	18
Test 1	validity of RE†	0.0277	0.0007	0.0296	0.0012	0.0083
Test 2	validity of HT‡	0.8514	0.6064	0.7067	0.6384	0.8387
	Selected Estimation	HT	HT	HT	HT	HT

Absolute value of z statistics in parentheses */**/*** significant at 10%/ 5%/ 1% respectively

†: p values of Hausman test between RE and FE

‡: p value of Hausman test between HT and FE (RE and HT) if RE rejected (not rejected) in Test 1

Panel 5: Regression Results: Addition Measures of Geography

Dependent Variable:	**Log Real GDP per capita**	18	19	20	21	22	23
Time Variant	**Log Real Exchange Rate**	0.0835990	0.0821253	0.0816221	0.0856739	0.0879638	0.0857635
Exogenous		(6.14)***	(6.07)***	(6.14)***	(6.25)***	(6.48)***	(6.24)***
	Log CIM	0.2023263	0.2041369	0.2148261	0.1957511	0.1787533	0.1956305
		(1.17)	(1.17)	(1.24)	(1.13)	(1.04)	(1.12)
Time Variant	**Log Openness**	-0.2638980	-0.2646397	-0.2618166	-0.2670277	-0.2667567	-0.2683811
Endogenous		(2.94)***	(2.95)***	(2.92)***	(2.97)***	(2.97)***	(2.98)***
	Rule of Law	0.3051405	0.3033549	0.3039309	0.3045402	0.3107585	0.3039124
		(3.14)***	(3.12)***	(3.13)***	(3.13)***	(3.20)***	(3.12)***
Time Invariant	**Malaria Index (1994)**	-.7640728	-.8558619	-1.148736			
Exogenous		(1.56)	(1.92)*	(3.21)***			
	Falciparam Malaria Index (1994)				-2.738561	-4.572508	-3.774414
					(1.11)	(3.15)***	(1.90)*
	Dist. Equator	1.4952600			1.3430710		
		(0.87)			(0.63)		
	Ln Land Area		.0718349				
			(0.86)				
	Landlocked			-1.214913		-1.133179	
				(3.27)***		(3.15)***	
	Ln Airdist						.0399887
							(0.09)
Time Invariant	**NoCorruption**	-0.2072144	-0.1386647	-0.1299226	-0.2028715	-.0980539	-.1853377
Endogenous		(1.04)	(0.81)	(1.04)	(0.95)	(0.81)	(0.85)
Constant		8.53736	7.68543	8.71250	8.53974	8.70342	8.44485
		(8.81)***	(5.15)***	(10.05)***	(8.79)***	(10.04)***	(2.41)***
Observations		161	161	161	161	161	161
Countries		18	18	18	18	18	18
Test 1	validity of RE†	0.0017	0.0000	0.5393	0.1451	0.9750	0.1363
Test 2	validity of HT‡	0.6412	0.4562	0.5013	0.8401	0.8455	0.8764
	Selected Estimation	HT	HT	RE	RE	RE	RE

Absolute value of z statistics in parentheses */**/*** significant at 10%/ 5%/ 1% respectively

†: p values of Hausman test between RE and FE

‡: p value of Hausman test between HT and FE (RE and HT) if RE rejected (not rejected) in Test 1

Table 6: Panel Regression Results: Addition Measures of Institutions

Dependent Variable:	**Log Real GDP per capita**	24	25	26	27	28
Time Variant	**Log Real Exchange Rate**	0.8739160	0.8739160	0.8739160	0.8739160	0.8739160
Exogenous		(6.28)***	(6.26)***	(6.24)***	(6.26)***	(6.24)***
	Log CIM	0.1846400	0.1846400	0.1846400	0.1846400	0.1846400
		(1.06)	(1.06)	(1.05)	(1.06)	(1.05)
Time Variant	**Log Openness**	-0.2662128	-0.2662128	-0.2662128	-0.2662128	-0.2662128
Endogenous		(2.97)***	(2.96)***	(2.95)***	(2.96)***	(2.95)***
	Rule of Law	0.3094180	0.3094180	0.3094180	0.3094180	0.3094180
		(3.19)***	(3.17)***	(3.17)***	(3.18)***	(3.17)***
Time Invariant	**Malaria Ecology**	-.1192506	-.2991351	.0020716	-.2288179	-.0432057
Exogenous		(0.33)	(0.78)	(0.01)	(0.61)	(0.14)
	Ln Settler Mortality	-1.034569				
		(1.50)				
	Ln % Protestant (80s)		0.0190049			
			(0.53)			
	Ln % Catholic (80s)			-.0162675		
				(2.53)**		
	Ln % Muslim (80s)				.0757047	
					(0.43)	
	Ln European Fractionalization					1.753914
						(2.58)***
Time Invariant	**NoCorruption**	-0.5795053	-0.4962623	-0.4468927	-0.5258296	-.4208712
Endogenous		(1.71)*	(1.54)	(1.99)*	(1.48)	(1.80)*
	Political Risk	0.1088461	0.0644900	0.0911817	0.0734023	0.0429366
		(1.55)	(1.02)	(1.82)*	(1.03)	(0.96)
Constant		7.57038	5.65990	4.97737	5.17465	5.34393
		(2.09)**	(1.58)	(1.90)*	(1.31)	(1.95)*
Observations		161	161	161	161	161
Countries		18	18	18	18	18
Test 1	validity of RE†	0.3592	0.1606	0.5505	0.0169	0.4601
Test 2	validity of HT‡	0.9183	0.8619	0.9237	1.0000	0.9068
	Selected Estimation	RE	RE	RE	HT	RE

Absolute value of z statistics in parentheses */**/*** significant at 10%/ 5%/ 1% respectively

†: p values of Hausman test between RE and FE, ‡: p value of Hausman test between HT and FE (RE and HT) if RE rejected (not rejected) in Test 1

Table 7: Panel Regression Results: Addition Measures of Openness

	Dependent Variable:		
	Log Real GDP per capita	29	30
Time Variant	**Log Real Exchange Rate**	0.0815818	0.0817126
Exogenous		(5.45)***	(6.07)***
	Log CIM	0.2057912	0.0181122
		(1.18)	(0.10)
Time Variant	**Log Openness**	-0.2780314	-0.7877170
Endogenous		(3.07)***	(3.58)***
	Rule of Law	0.3251566	0.2923168
		(3.18)***	(3.13)***
	Ln Fuel Export	.0021816	
		(0.67)	
	Ln Tariff		.787717
			(3.47)***
Time Invariant	**Malaria Ecology**	-.3379969	-.2263013
Exogenous		(0.98)	(0.60)
Time Invariant	**NoCorruption**	-0.4085629	-0.5459781
Endogenous		(1.40)	(1.65)*
	Political Risk	0.0448850	0.0834844
		(0.98)	(1.27)
Constant		6.67981	3.90004
		(2.56)	(1.06)
Observations		161	161
Countries		18	18
Test 1	validity of RE†	0.0125	0.0000
Test 2	validity of HT‡	0.9555	0.9999
	Selected Estimation	HT	HT

Absolute value of z statistics in parentheses */**/*** significant at 10%/ 5%/ 1% respectively

†: p values of Hausman test between RE and FE

‡: p value of Hausman test between HT and FE (RE and HT) if RE rejected (not rejected) in Test 1

Table 8: Definition and Sources of the Variables

Institutions	
Variable	Definition and Source
Rule of Law	Rule of law is a common institutional measure used by the World Bank. It **"**measures the extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence." Source: World Bank
No Corruption	Index of government corruption: Low ratings indicate "high government officials are likely to demand special payments" and "illegal payments are generally expected through lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans." Scale from 0 to 10. Average of the months of April and October in the monthly index between 1982 and 1995. Source: International Country Risk Guide (ICRG). From La Porta et al. (1999)
Political Risk	The aim of the political risk rating is to provide a means of assessing the political stability of the countries covered by International Contry Risk Guide (ICRG) on a comparable basis.
Contract Intensive Money (CIM)	Initially proposed by Clague (1999), it is based on a citizens decision regarding the form in which they chose to hold their financial assets. It is a measure of the enforceability of contracts and the security of property rights. Source: WDI (World Development Indicators, World Bank)
Infant mortality	Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year. Source: World Development Indicators, World Bank.
Settler Mortality	An instrument developed by AJR which measures early settler mortality. This instrument is based on the premise that early European colonies came in two forms, "extractive states (such as the Congo)" and "neo-Europes (such as Australia and the United States)" which directly affects the types of institutions that developed thereafter. Settler mortality would explain early settlements, which would explain early institutions, which would then explain current institutions and current economic performance (AJR, pg. 2). This data is mortality rates of soldiers, bishops, and sailors stationed between the 17th century and the 19th centuries.
Religious Fraction	Fraction of the population in the 1980s that is Catholic, Muslim, Protestant, or other religion. From La Porta et al. (1999)
European Language Fraction	Fraction of the population speaking one of the four major Western European languages (English, French, German, Spanish and Portuguese) at birth. From Hall and Jones (1999)
Geography	
Ln Airdist	Number of Kilometers of the capital city to the closest major port. Source: Frankel and Romer (1999).

Ln Land Area	Total square kilometers of total land area for a given country. Source: Frankel and Romer (1999).
Distance from Equator	Measured by calculated the distance from the equator and dividing by 90. Source World Bank 2002, also Gallup et al. (1998) and Hall and Jones (1999).
Landlocked	Dummy variable for non-Western and non-Central European landlocked countries. From Gallup et al. (1999)
Malaria Index (1994)	A calculation of the proportion of each country's population that lives with risk of malaria transmission. Based on the 1994 WHO world map of malaria risk (1994). Source: Sachs (2003)
Falciparam Malaria Index (1994)	An alternative measure to malaria risk, introduced in Gallup and Sachs (1998) which multiplies the Malaria Index (1994) by an estimate of the proportion of national malaria cases that involve the fatal species, Plasmodium falciparum, as opposed to three largely non-fatal species of the malaria pathogen (P. vivax, P.malariae, and P. ovale). Source: Sachs (2003)
Malaria Ecology	An ecologically based variable that is predictive of malaria risk. It combines temperature, mosquito abundance, and vector specificity into a single measure. The underlying index is measured on a highly disaggregated sub-national level, and then averaged for the entire country.
Population Percentage in Temperate Ecozones (KGPTEMP)	This variable measures the share of a country's population in temperate ecozones, based on the Koeppen-Geiger ecozone classification system. Source: Mellinger, Gallup, and Sachs, (2000)
Terms of Trade	
Ln Fuel Exports	Fuel exports as a percentage of total merchandise exports. Source: World Development Indicators, World Bank.
Ln Tariff	Customs and other import duties (% of tax revenue). Source: World Development Indicators, World Bank.
Frankel and Romer Predicted Trade Shares	Predicted trade shares calculated from bilateral gravity equations which control for geography. Source: Frankel and Romer (1999)
Ln Real Exchange Rate	Controls for terms of trade. The real exchange rate can be defined in the long run as the nominal exchange rate (e) that is adjusted by the ratio of the foreign price level (Pf) to the domestic price level (P_d). $R_{ppp}=e(P_f/P_d)$ This data was taken from the WDI and calculated manually.
Log Openness	Openness index which was originally created by Sachs and Warner (1995) but has been updated by the World Bank. (Exports + Imports)/GDP. Source: World Development Indicators, World Bank.

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