Is There a Primary Role of Institutions on Explaining Cross Country Differences in Income Levels and Long-Run Economic Growth?

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Abstract
This work evaluates the role of institutions and other control variables on per capita income and growth models for a set of almost one hundred countries, using cross-section and dynamic panel data analysis to answer two questions. Institutions have a primary role on explaining huge cross-country differences on per capita income levels when compared to other control variables such as trade integration and geography? Does long-run growth performance relies mainly on institutional quality? The 2SLS and OGMM results for per capita income levels models suggest that there are some evidence regarding the role of institutions since all the estimated coefficients are positive and statistically significant but the instruments are not valid. Trade integration and geography do not seem to play a direct and significant role on explaining differences in per capita income levels. On the other hand, the results from the growth models suggest that there is scarce evidence for the role of institutions in fostering economic growth and the System-GMM is the one that is more likely to capture such role. In one word, there is no indication of an empirical consensus to claim that institutions have a *primary* role on growth and income models, but after all, the institutional environment seems to matter.

Key-Words: Per Capita Income Levels and Growth Models; Institutions; Cross-Section and Panel Data Analysis.
JEL Codes: C33, O47, O43

Resumo
O trabalho avalia o papel das instituições e outras variáveis de controle em modelos de renda per capita e de crescimento para um conjunto de quase cem países através de análises de painel e corte transversal para responder duas questões. Instituições têm um papel primordial na explicação das grandes diferenças nos níveis de renda per capita entre países quando comparado com variáveis tais como integração comercial e geografia? O desempenho em termos de crescimento de longo prazo depende de maneira crucial da qualidade institucional? Os resultados das estimações por 2SLS e OGMM para os modelos de renda per capita sugerem que há alguma evidência quanto ao papel das instituições dado que todos os coeficientes estimados são positivos e estatisticamente significativos, mas os instrumentos não são válidos. Integração comercial e geografia não têm um papel direto e significativo na explicação das diferenças de níveis de renda per capita. Por outro lado, os resultados dos modelos de crescimento sugerem evidências menos robustas para o papel das instituições em estimular o crescimento econômico sendo que as estimações por System GMM foram aquelas em que este papel é mais facilmente encontrado. Sumarizando, pode se argumentar que não há indicação de um consenso empírico a favor do argumento de que instituições têm um papel *primordial* nos modelos de crescimento e de renda per capita, porém, o ambiente institucional parece ser relevante.

Palavras-Chave: Modelos de Crescimento e Nível de Renda per Capita; Instituições: Análise de Painel e Corte Transversal
Códigos JEL: C33, O47, O43

Introduction

A wide variety of empirical studies on growth and per capita income levels using institutions as an explanatory variable have been developed during the last ten years and the empirical consensus is that the institutions matter but one can say that there is no consensus on what is called the institution rule hypothesis. In other words, once we incorporate institutions in our model, it is not clear if other factors such as geography will play only an indirect role on growth and differences in income levels.

The study has two main empirical goals. First, estimate growth models and evaluate the relevance of institutions and other macroeconomic variables by the estimation of a dynamic panel data model using the GMM (System and Difference) method. Second, estimate cross-section per capita income models using 2SLS and Optimal GMM (OGMM) to address whether or not institutions have a primary role when compared to other control variables (geographical and integration indicators). The variable used as proxy for institutional quality is the Law and Order (Law) index for both (growth and per capita income) models.

The paper is divided in four sections other than this introduction and final remarks. Section one is devoted to summarize the empirical and theoretical literature on economic growth and differences in per capita income levels among countries with the inclusion of institutions and other control variables. Section two develops a cross-section analysis based on a per capita income level and summarizes the results. Section three focuses on estimating a growth model using panel data analysis and the GMM estimation method. Section four compares the empirical results from the literature and the ones from the previous two sections.

1 – Institutions, Differences in Per Capita Income and Economic Growth: Theory and Evidence

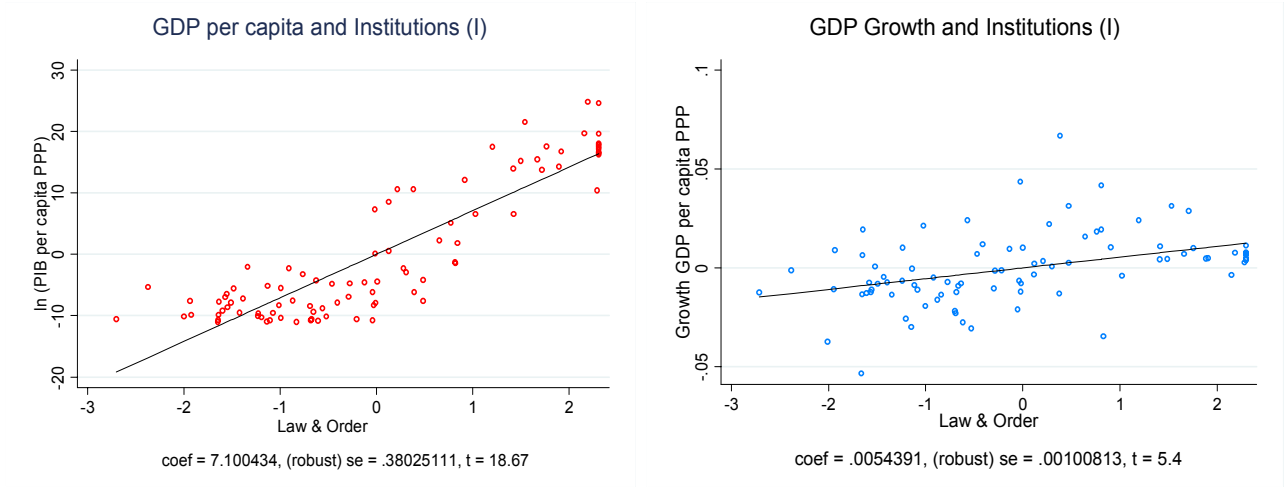
Economic growth and differences in countries per capita income levels have been the focus of several research studies in the field of macroeconomics and also a topic of interest for policymarkers, as well as in other areas of research, such as reduction of poverty and economic development. The literature of economic growth and differences on per capita income levels has been highlighted in recent past decades both on theoretical and empirical grounds. Most of this advance is due to new econometric techniches and longer database, incorporating lessons from the endogenous growth and human capital models, and empirically the advance is associated on how to deal with the endogeneity problem and how to use valid instruments. The use of econometric techniques based on GMM estimation for dynamic panel data analysis for growth models and cross-section analysis with two stage least squares (2SLS) and optimal GMM to test for differences in per capita income levels is part of this advance and both of them will be implemented in this paper.[1]

The empirical evidence from the growth and the cross country income levels difference literatures suggests a positive association with the quality of institutions meaning that better institutions foster long run economic growth and countries with better institutions are the ones with higher per capita income levels. Figure 1 below illustrates such evidence for our complete set of 91 countries where the proxy for institution (Law & Order) shows a positive and statistically ignificant coefficient when plotted against the

[1] A historical look on the growth literature reveals that during the 1950s and 1960s growth theory was linked primarily to the neoclassical model developed by Ramsey (1928), Solow (1956), Swan (1956), Cass (1965) and Koopmans (1965). These models were based on the so-called convergence property and the idea is that economies with low per capita GDP will face higher growth rates given the assumption of diminishing capital returns. Since the 1980s, the concept of capital in the neoclassical model has been expanded to incorporate not only physical capital but also human capital, as seen through the models developed by Lucas (1988) and Rebelo (1991), among others. Romer (1995) highlights the dilemma encountered by the theoretical and empirical growth literatures and the contribution of endogenous growth theory for understanding the long-term growth, arguing that the main contribution of this approach is to provide a theory of technological progress, one of the central elements absent from the neoclassical growth model, and the inclusion of a theory of technological change in the neoclassical framework is difficult, since the conventional assumptions of competitiveness can not be maintained. Knight, Loayza and Villanueva (1993) test the neoclassical model of growth for 98 countries, from 1960 to 1985 in order to establish the relative importance to economic growth of factors that are specific to the countries and which vary over time, as is the case of human capital investment and the degree of openness. The empirical results found indicate that such factors have an important and positive role for growth.

log of per capita GDP and the GDP growth rate. Regardless of such primary evidence it is necessary to investigate econometrically such relationship in both models using the adequate techniques such as GMM System and Difference for growth models and 2SLS and OGMM for models of per capita income levels. It is fair to say that the positive coefficients reported in both graphs does not imply a specific causality from institutions to GDP growth and per capita GDP levels since we might face reverse causality in the sense that countries with higher income levels and growth rates can create a better institutional environment, which is likely to happen in most cases.

Figure 1: Per Capita GDP and GDP Growth vs Institutions (Law)



Initially, it is necessary to address the role of institution and its definition. Douglas North (1990) definition of institutions is associated to the idea that institutions are the rules of the game in a society and it imposes constraints that shape human interaction. Acemoglu et. al (2004) highlights the relevance of institutions for improving economic growth and development, arguing that:

> "Economic institutions are important because they influence the structure of economic incentives in society, and without property rights, individuals will not have the incentive to invest in physical or human capital or adopt more efficient technologies. Economic institutions are also important because they help to allocate resources to their most efficient uses, they determine who gets profits, revenues and residual rights of control." (2004: p.1-2).

On the empirical evolution of the growth literature and the contribution of geography, integration and institutions, Rodrik et. al (2004) states clearly that:

> "Growth theory has traditionally focused on physical and human capital accumulation, and, in its endogenous growth variant, on technological change. But accumulation and technological change are at best proximate causes of economic growth. (....) But why did some societies manage to accumulate and innovate more rapidly than others? The three-fold classification offered above – geography, integration, and institutions – allow us to organize our thoughts on the "deeper" determinants of economic growth. These three are the factors that determine which societies will innovate and accumulate, and therefore develop, and which will not." (2004: p.132-33)

The following review of the literature will be devided into two sets. The first one deal with the empirical works where the per capita GDP growth rate is the dependent variable, while the second one has the per capita GDP level as the dependent variable since it is concerned with differences in such levels across countries and not with their growth rates as it is for the first set of studies.

The evolution of the empirical growth literature using panel data goes back to the work developed by Barro (1995) for a study using data for more than one hundred countries from 1960 to 1990. The empirical results suggest that, for a given level of real per capita income, the growth rate is positively affected by the level of education and life expectancy, low fertility, lower government

consumption, by maintaining the rule of law, lower inflation rate, improvement in the terms of trade, and negatively by the initial level of real per capita GDP. The inflation rate not only has a negative impact on real GDP growth in the long run, but also on the investment rate, but this result is statistically significant when the economies with a history of high inflation are included in the sample.[2]

Acemoglu et. al (2004) develops the empirical and theoretical case that differences in economic institutions are the fundamental cause of differences in economic development. According to the authors:

> "One of the crucial hypotheses is that differences in economic institutions are the fundamental cause of different patterns of economic growth is based on the notion that it is the way that humans themselves decide to organize their societies that determines whether or not they prosper. Some ways of organizing societies encourage people to innovate, to take risks, to save for the future, to find better ways of doing things, to learn and educate themselves, solve problems of collective action and provide public goods. Others do not." (2004: p.12)

Acemoglu et. al (2001) is a referential paper on addressing the endogeneity problem of institutions when examining and evaluating difference in economic performance among countries. The authors uses differences in mortality rates as an instrument to estimate the effect of institutions on economic growth using a two-stage least squares (2SLS) estimation, and the results are robust to different specifications, indicating the occurrence of significant effects of institutions on per capita income for a set of 64 countries. The main idea of the model is to estimate the coefficients associated to variables (indexes) of protection to the risk of expropriation as a proxy for institutions. The essential idea is that countries with better institutions, with more secure property rights, and policies with less distortion, tend to invest more in physical and human capital and usually have a more efficient use of such production factors in order to achieve a higher level of income. The authors make clear that when using the mortality rate as an instrument for institutions, this is valid only if other variables that are correlated with the mortality rate are not related to the per capita income. The idea is that the instrument for institutions (mortality rate) should be an important factor to capture the variation observed in the institutions, without having an effect on the growth rate.

Rodrik (1999) emphasizes the difference in growth rates between the periods 1960-75 and 1975-89, and the motivation of the study is to understand some issues and questions there are not a consensus in the growth literature. Among these one can list the following: what are the crucial factors responsible for instability in the economic performance of developing countries; why countries that have a good economic performance in the 1960s and 1970s have had problems in the following decades; why some countries were strongly but shortly affected by external volatility in the second half of 1970 while others took a lot of time to recover from such external shocks; what are the main reasons underlying the process of expansion of the adverse effects of external shocks on the growth rate of many economies.

The hypothesis investigated by Rodrik (1999) is that domestic social conflicts are crucial to understanding and answering the above questions as these conflicts have negative impact on productivity, besides being related to cases involving the postponement of policies associated to fiscal and relative prices (real exchange rate and wages) adjustments. Another key aspect is the effect that such conflicts have on the uncertainty (investment decision) of the economy and the diversion of activities out of the production sector. The empirical analysis uses indicators of inequality, ethnic fragmentation, quality of government institutions, rule of law, democratic rights and social protection network to test Rodrik´s hypothesis. The results indicate that countries that had the greatest reduction in the rate of GDP growth in 1975 were those where society is more fragmented and has fragile institutions. The degree of severity of external shocks can be considered secondary in explaining the differences in growth rates between countries, and once controlling for social conflicts and institutional quality, other factors (trade policies, government consumption, ratio of debt / exports) have little explanatory power over such differences in growth rates, or are secondary factors when

[2] See Bruno and Easterly (1995) for additional evidence on inflation and growth.

compared with the social conflict that ultimately is linked to the adoption of inadequate macroeconomic policies.

The second branch of the literature deals with empirical tests on the role of institutions and other factors in explaining why countries have such a huge difference in per capita income levels.

Hall and Jones (1999) is one of the pioneers in examining the issue of why output per capita is so different across countries using a large set of countries. The main goal is to explain changes in long-run economic performance focusing directly in the investigation of crosss-section in levels. One of the main empirical findings is that differences in capital accumulation, productivity and ultimately in per capita income is due to differences in institutions and government policies. The authors call this as social infrastructure and considered it as endogenous, which requires finding variables that are good instruments (location and language) in order to overcome problems such as coefficient bias in the presence of endogenous variables.[3] The authors emphasize that productivity is crucial to understand such differences in income levels. The idea is to answer two main questions: why there is a significant difference in investments in physical and human capital? And why there is an important difference across countries in terms of productivity?

In order to answer the questions listed above, Hall and Jones (1999) have a hypothesis based on the argument that long run economic performance of a country is primarily determined by social infrastructure, or in other words, differences in capital accumulation, productivity and ultimately in per capita output is due to differences in social infrastructure. Examining 127 countries the authors found a close and positive relation between output per capita and social infrastructure. After controlling for endogeneity of social infrastructure (institutions and government policies) they still find evidence that most of differences in long-run economic performance is due to differences in social infrastructure across countries. The estimated coefficient for output per capita and productivity is 0.60 and the correlation between the differences for the two series in log is 0.89. Most of the differences in output per capita is due to productivity by a factor of 8.3 against human capital with 2.2 and capital intensity with 1.8 when comparing the five highest and lowest countries in terms of output per capita, which are different by more than 30 times for this set of countries.

The estimation of the social infrastructure index (SI) by Hall and Jones (1999) uses a combination of two indexes to construct the proxy for SI. One is the index of government antidiversion policies (GADP) based on data from the Political Risk Service (130 countries and 24 categories) and the authors select five categories: law and order; bureaucracy quality; corruption; risk of expropriation and government repudiation of contracts, each of them as average for the period of 1986-95. The second index tries to capture the degree of openness to trade and it draws from the data developed by Sachs and Warner (1995) and it varies from 0 to 1 according to criteria such as: level of nontariff barriers; average tariff rates; black market premium; country classified as non-socialist; and absence of government as a monopolist for major exports. The final proxy for SI is given by the sum of GADP and the openness index and the instruments used captures greography characteristics (distance from the equator), the Western European influence (primary spoken language) and the (log) predicted trade share of the economy contructured by Frankel and Romer (1996). The estimated model for output per capita shows that the estimated coefficient for social infrastructure is positive (for the main specification $\hat{\beta}_{SI} = 5.14$ with four instruments) and statistically significant for all specifications. The authors conclude after some robustness tests that taking into account elements such as greography (distance from the equator) and Western influence (language), differences in social infrastructure determines (cause) large differences in per capita income across countries, the ultimate empirical goal of the paper.

Other works such as the one developed by Easterly and Levine (2003) is focused on understanding differences in per capita income across countries. They develop an analysis first reviewing the empirical literature / theories of how geography, institutions, and policy influence

[3] It is worth to mention that early studies such as Mankiw, Romer and Weiss (1992) was crucial in setting an empirical agenda to investigate differences in per capita income levels across countries based on differences in human and physical capital and productivity.

economic development and so the disparity in income levels. The geography / endowment hypothesis argues that environment has a direct impact on the quality of land, labor, and production technologies, while the institution view is based on the idea that the environment's main impact on economic development operates through institutions. The policy view tries to minimize the relevance of tropics, germs, and crops as a fundamental determinant of differences in economic development and income level by arguing that economic policies and institutions are a result of current knowledge and political forces. Within this perspective, to change income levels it is necessary to it is necessary to understand each country policies and institutions. Ultimately, Easterly and Levine (2003) wants to empirically address which of these three views / theories are more adequate to explain differences in income levels across countries. [4]

Easterly and Levine (2003) uses settler mortality as an indicator of endowments to test the greography and the institutions hypotheses and other control variables such as: latitude, dummies for crops / minerals, landlocked, a measure for openness (Frankel and Romer, 1999), real exchange rate overvaluation and inflation to address the policy view, and six institutions quality indexes from Kaufman et. al (1999) to capture the relevance of institutions in a per capita income model. The authors also use other control variables such as ethnolinguistic diversity, religion and French legal origin.

The initial step was to estimate a model for a sample of 72 countries by OLS with heteroskedasticity consistent standard errors for the log of the per capita GDP on the endowment variables and the results indicate that endowments explain cross-country variation in per capita income. The next step was to run an OLS model and check if endowments help to explain cross-country differences in institutional development and the results indicate that variables like settler mortality and natural resources (germs and crops) are the dominant forces to understand institutional development. Up to this point the Easterly and Levine (2003) have found evidence that endowments have an impact on economic and institutional development. Following this result, the authors estimate a 2SLS model for the log of per capita GDP using four instruments (settler mortality, latitude, landlocked and crops/minerals) in the first stage estimation, and institutions index, French legal origin, religion, ethnolinguistic diversity and oil as exogenous variables in the second stage estimation. The estimated coefficients for the institution index are all positive and statistically significant and the overidentification tests were not rejected indicating that the set of instruments are valid. The final estimated model treats macroeconomic policy variables (inflation, openness and real exchange rate overvaluation) as endogenous using 2SLS and the evidence suggests that such policies do not explain differences in per capita income after taking into account the impact of institutions on income levels. The estimated coefficients for the institution index are all positive and statistically significant.

The empirical evidence found by Easterly and Levine (2003) suggests that endowments (tropics, germs, and crops) have an impact on per capita income through institutions but not a direct effect, which is a support for the institution view but not for the greography one. The same is true for what they call policies variables which has no impact on development when controlling for

[4] The geography / endowment hypothesis is associated to different studies such as Sachs and Warner (1995, 1997), Bloom and Sachs (1998) and Sachs (2001), arguing for the presence of direct effects of tropics, germs, and crops on development. The Institutions hypothesis relates the effect of tropics, germs, and crops through institutions and can be associated to works such as Hall and Jones (1999) who uses institutional quality as one component of social infrastructure which is crucial to explain differences in productivity, allowing for the use of instruments such as distance from the equator and European language. Acemoglu et.al (2001) is another example of the institution view with a germs theory of institution by using setler´s mortality as an instrument for institutions. The policy view argues in favor of sound macroeconomic policies, openness to international trade, and the absence of capital account controls considered as important measures to foster economic growth and to increase per capita income. Tropics, germs, and crops may influence production technologies and institutions but to improve economic development it is necessary to change policies targeting low inflation, increase in trade and financial integration to the world. One example of this view is Frankel and Romer (1999) to whom geography matters for economic development through government policy (trade openness).

institutions, in other words, institutions rule differences in per capita income levels across countries.[5] Such empirical results are hand to hand with the work of Acemoglu et. al (2001).

Acemoglu et. al. (2004) review what is called the geography hypothesis as an alternative to explain difference in economic performance among countries and the main idea is to focus on the role of physical and geographical environment. This approach emphasizes differences in geography, climate and ecology as fundamental in understanding how preferences and the opportunity set of individual economic agents in different societies. The greography hypothesis can be devided into three versions. The first one highlights how climate may be an important factor of work effort, incentives, or productivity. The second one argues that geography may determine the technology available to a society, especially in agriculture, while the last one is based on the idea that infectious disease is costly and more likely to happen in the tropics than in the temperate zones, which can mitigate economic performance over time. (Sachs, 2000)

One can say that there is a clear disagreement among the role played by greography in explaining differences in per capita income levels. Sachs (2003) is an example of studies that do not agree with others such as Acemoglu et. al (2001), Easterly and Levine (2003) and Rodrik et. al (2004) on the proposition that the role of geography in explaining cross-country differences in per income is secondary and operates mainly through institutions. According to the author per capita income, economic growth, and other economic and demographic dimensions are strongly correlated with variables associated to geography and econology, including climate zone, disease ecology, and distance from the coast. The variable used to contradict the other studies is malaria transmission, which is strongly affected by ecological conditions and has a direct impact on per capita income once controlling for institutions quality.

Rodrik et. al (2004) empirically investigates the contribution of institutions, geography and trade in explaining differences in per capita income across countries and the evidence suggests the predominance of institutions over geography and trade using different instruments. There authors argue that that integration to the world economy and the quality of institutions should be treated as endogenous since they affect each other and are affected by geographical variables and by income levels. Dealing with this means to take into account endogeneity and reverse causality issues in estimating a cross country income model.

The main empirical evidence found by Rodrik et. al (2004) is that once institutions are part of the regression (2SLS), integration has no direct effect on per capita income, while geography measures have at best only weak direct effects even though they are important to understand the quality of institutions. Trade does not reveal to be statistically significant once institutions are controlled for and it seems to have an unexpected negative sign. The estimated coefficients for the measure of property rights and the rule of law are positive and statistically significant. The authors also found similar evidence to Easterly and Levine (2003) that geography has a significant impact on the quality of institutions and this is the channel through which it affects income levels. In the preferred model specification (settler mortality as instrument for institutions quality) developed by Rodrik et. al (2004) it was possible to account for half of the variance in cross country incomes and trade and distance from the equator are not statistically significant. Comparing the estimated coefficients (table 2 and OLS) for institutions (rule of law), geography (distance from the equator) and integration (log of trade to GDP) after they have been standardized in order to be comparable, the results for the log of GDP per capita reveals that the coefficient for institutions is positive and statistically significant and greater than the coefficient for geography (positive and significant), which is greater than the estimated coefficient for integration (positive but not significant). The 2SLS estimation reported on table 3 reveals on the preferred specification (column 6) that the coefficient for institutions is positive (1.98) and statistically significant, while the coefficients for geography (-0.72) and integration (-0.31) are not significant and the latter has an unexpected sign.

[5] Such empirical results are hand to hand with the work of Acemoglu et. al (2001).

The main criticism stated by Sachs (2003) with respect to the institutions rule argument is that there are specification problems in the model and how they test the primacy of institutions. The first specification problem is associated to the use of a static rather than a dynamic model for per capita income and the author argues that it is more likely that the quality of institutions in a given time period will affect the growth rate and not income level but the three mentioned studies are concerned in explaining differences in per capita income and not in growth rates across countries. Other than this Sachs (2003) argues that differences in income levels should not be explained by only a few variables excluding geography and the choice made by studies such as Rodrik et. al (2004) in using distance from the equator is not adequate. Sachs (2003) uses three instruments to estimate a 2SLS model of the log of GNP per capita adjusted to PPP in 1995: KGPTEMP is a measure of the share of a country population in temperate ecozones; LOGMORT is an estimate of mortality rates of British soldiers and other populations in the early 19th century; and ME is a measure of malaria risk. For all the regressions quality of institutions and malaria risk are statistically significant

Regarding the use of indexes of institutional quality based on surveys of foreign and domestic investors (Rule of Law, Corruption, Investment Profile and Bureaucracy) Rodrik (2004) states that such indexes are able to capture investor´s perceptions but not exactly which are the rules governing these institutions, which is a limitation and future research on growth disparities will have to deal with this. It is also necessary to distinguish between stimulating and sustaining economic growth and better and more reliable institutions are more important for the latter than to the former meaning that developing countries can boost initial growth with some minor changes in their institutional environment.

2 – Insitutions and *GDP* per capita Level: Empirical Evidences

This section summarizes methodological aspects of using two stage least square (2SLS) and optimal GMM methods for models of cross country income differences and reports the estimation results on tables 1 and 2.

2.1 – Methological Issues

This section of the paper has two goals. First, specify the two stage least square estimation (2SLS) procedure and the optimal GMM (OGMM) since they are widely used in the cross section models of differences in per capita income across countries. Second, compare these two estimates for different sets of countries using institutions, geography, integration and other control and instrumental variables.

The cross section studies on per capita income differences across countries are almost always based on the use of two-stage least square (2SLS) estimation since this is the core instrument when dealing with endogeneity problems as it happens with the inclusion of institutions in this kind of model.

Considering the following model for a dependent variable (y) on a single regressor (x):

$$y = \beta x + u \qquad (1)$$

Assuming that the regressor (x) is endogenous, the OLS estimation is not valid since it violates the assumption required for consistency that the error term (u) is not correlated to the regressors ($E(u / x) = 0$) and the instrumental variable (IV) approach deals with this by selecting new variables (z) that are highly correlated to the regressors ($E(z / x) \neq 0$) but not with the error term ($E(u / z) = 0$).

The 2SLS estimation is based on a two stage procedure when first it implements an OLS estimation of the endogenous variable (institutions in our example) as the dependent variable as a function of exogenous variables and the new set of instruments (z) and this is called the reduced form

equation.[6] The second stage is the OLS regression of the dependent variable of the original model (log of per capita GDP) on the exogenous variables and the replacement of endogenous regressors by predictions from the first stage. One advantage of the 2SLS estimation is that In the presence of independent and homocedastic errors it is the most efficient estimator but since this is not an easy assumption, we use the correction for heteroskedasticity in our estimates (tables 1 and 2).

Another possibility is to use the optimal GMM estimator (OGMM) with the heteroskedasticity correction, which is based on a weighting matrix that it different from the one used by the 2SLS estimation.[7] One of the problems associated to the 2SLS estimation is how to avoid the use of weak instruments since they will result in less precise coefficients due to high standard errors (lower t-statistics) and the occurrence of finite sample bias (the IV estimator is not centered on the true populational coefficient).[8]

2.2 – Empirical Results

First of all, it should be emphasized that the set of instruments used in the 2SLS and OGMM estimation when dealing with endogeneity of institutions (Law) are Latitude, SettlerMort, Legoruk, EnglishLang, and EuropeLang, where for integration (Trade) we use the index developed by FrankelRomer to capture perceived integration.[9]

The estimation of the cross-section models of per capita GDP levels for the complete sample (91 countries) using 2SLS and OGMM is reported on table 1. The 2SLS estimated models (columns 4, 5 and 6) shows that the coefficients for institutions (Law) are positive and statistically significant in all three models. It is necessary to interpret this result with some caution since models (4) and (5) that are over-identified have overidentification tests that reject the null and so the set of instruments are not valid. Geography (Latitude) is only statistically significant in model (6) using 2SLS but with unexpected negative sign meaning that countries far away from the equator have lower levels of per capita income. Trade (integration) is not statistically significant in the two 2SLS estimation (5 and 6) regardless if it is considered as exogenous (5) or treated as endogenous (6) and instrumented by FrankelRomer index of perceived trade openness. The GMM estimations are reported on columns 7 and 8 and we have the same empirical findings from the 2SLS. Institutions (Law) have positive and statistically significant coefficients, while Geography (Latitude) have negative but not statistically significant coefficients and Integration (Trade) is negatively associated to per capita GDP levels and not statistically significant. All the results should be interpreted with caution since the overidentification tests reject the null hypothesis and the set of instruments are not valid. [10]

[6] It is necessary to have at least the same number of instruments as the number of endogenous variables in order to avoid underidentification problems when there is no consistent IV estimator. Just-identified (Over-Identified) are the cases where the number of instruments are the same (greater than) the number of endogenous variables.

[7] For the just-identified case there is no difference between the 2SLS and the OGMM. In other words, there is no meaning in estimating an equivalent model of the 2SLS column (6) on tables 1 and 2 using OGMM since the estimated coefficients and statistical significance would be the same given that this model is just-identified.

[8] See Cameron and Trivedi (2008) cap.6 for further details on 2SLM and OGMM. The paper will use overidentification tests through the use of the *estat overid* command for Stata 10.0 and the *estat firststage* command to evaluate the presence of weak instruments (F-stat of first stage).

[9] Table 3A of the appendix reports the endogeneity tests for institutions (Law) and integration (Trade) for the restricted sample (includes settler mortality), and we were able to reject the null hypothesis meaning that Law and Trade can be considered as endogenous variables. See also table 1A of the appendix for the description of each variable used in the two model estimation and tables 4A and 5A for the sample descriptive statistics for cross-section and panel data.

[10] Tables 1 and 2 report the F-stat First Stage which is a joint test for the significance of the instruments used to instrument the endogenous variable. In all model specifications for the 2SLS and the OGMM and in both samples (restricted and complete) we were able to reject the null hypothesis meaning that the set of instruments are statistically significant. It should be mentioned that this is not a direct test for weak instruments.

Table 1- Cross-Section Real Per Capita GDP Models (Complete Sample): OLS, 2SLS and OGMM

Variables / Method	OLS	OLS	OLS	2SLS	2SLS	2SLS	OGMM	OGMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Latitude	4.2889	1.2449	1.4616	-0.9083	-1.9802	1.3004	-0.7986	-1.8955
	*(0.000)***	*(0.019)***	*(0.006)***	*(0.537)*	*(0.273)*	*(0.007)***	*(0.577)*	*(0.298)*
Law		0.5561	0.5201	0.9348	1.1261	0.5364	0.9385	1.1331
		*(0.000)***	*(0.000)***	*(0.000)***	*(0.000)***	*(0.000)***	*(0.000)***	*(0.000)***
Trade			0.1750		-0.1723	0.1348		-0.1425
			(0.172)		*(0.458)*	*(0.384)*		*(0.543)*
First Stage (OLS)								
Instruments								
Legoruk				0.3582	0.3162		0.3582	0.3162
				(0.244)	*(0.216)*		*(0.244)*	*(0.216)*
EnglishLang				0.3260	0.2356		0.3260	0.2356
				(0.603)	*(0.732)*		*(0.603)*	*(0.732)*
EuropeLang				0.2832	0.4426		0.2832	0.4426
				(0.238)	*(0.082)**		*(0.238)*	*(0.082)**
FrankelRomer						*0.5434*		
						*(0.000)****		
R2	0.497	0.683	0.688	0.601	0.499	0.690	0.599	0.493
F-stat First Stage (prob)				(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Overid (prob)				(0.042)**	(0.093)*		(0.042)*	(0.093)*

Overid = test of overidentification restrictions
*, ** and *** = significant at 10%, 5% and 1%

The next step was to estimate the same models from table 1 but now for a restricted sample which includes countries in our sample with data for Settler Mortality, which is the instrumental variable used by Acemoglu et. al (2001). The only difference is that on table 2, settler mortality was used as an instrument while in table 1 it was not.

Table 2- Cross-Section Real Per Capita GDP Models (Restricted Sample): OLS, 2SLS and OGMM

Variables / Method	OLS	OLS	OLS	2SLS	2SLS	2SLS	OGMM	OGMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Latitude	3.3758	0.8588	1.3301	-1.1194	-1.8112	0.9088	-0.3032	-0.9775
	*(0.000)***	*(0.239)*	*(0.091)**	*(0.356)*	*(0.252)*	*(0.211)*	*(0.778)*	*(0.512)*
Law		0.5598	0.5089	0.9677	1.0929	0.5464	0.8767	1.0420
		*(0.000)****	*(0.000)***	*(0.000)****	*(0.000)****	*(0.000)****	*(0.000)****	*(0.000)****
Trade			0.2465		-0.1251	0.1129		-0.0549
			(0.125)		*(0.591)*	(0.531)		*(0.802)*
First Stage (OLS)								
Instruments								
SettlerMort				-0.0005	-0.0004		-0.0005	-0.0004
				*(0.087)**	*(0.030)***		*(0.087)**	*(0.030)***
Legoruk				0.2408	0.2652		0.2408	0.2652
				(0.568)	*(0.425)*		*(0.568)*	*(0.425)*
EnglishLang				1.4165	1.1257		1.4165	1.1257
				(0.125)	*(0.257)*		*(0.125)*	*(0.257)*
EuropeLang				0.0514	0.2931		0.0514	0.2931
				(0.881)	*(0.422)*		*(0.881)*	*(0.422)*
FrankelRomer						*0.6022*		
						*(0.000)****		
R2	0.2068	0.5363	0.5339	0.377	0.2586	0.5596	0.443	0.305
F-stat First Stage (prob)				(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Overid (prob)				(0.0237)**	(0.0297)**		(0.0237)**	(0.0297)**

Overid = test of overidentification restrictions
*, ** and *** = significant at 10%, 5% and 1%
Restricted Sample = all countries with data for Settler Mortality (Index used by Acemoglu, 2001)

The 2SLS estimated models from table 2 (columns 4, 5 and 6) shows that the coefficients for institutions (Law) are positive and statistically significant in all three models. In the same way when we present the results from table 1, it is necessary to interpret this result with some caution since models (4) and (5) that are over-identified have overidentification tests that reject the null and so the set of instruments are not valid. Geography (Latitude) is not statistically significant in any of the three models using 2SLS and it has an unexpected negative sign in model 6. Trade (integration) is not statistically significant in the two 2SLS estimation (5 and 6) regardless if it is considered as exogenous (5) or treated as endogenous (6) and instrumented by the index constructed by FrankelRomer. The GMM estimations are reported on columns 7 and 8 of table 2 and we have the same empirical findings from the 2SLS. Institutions (Law) have positive and statistically significant coefficients, while Geography (Latitude) have negative but not statistically significant coefficients and Integration (Trade) is negatively associated to per capita GDP levels and not statistically significant, and the two OGMM estimation have problems in terms of validity of the set of instruments.

Summarizing the results for the cross-country differences in per capita income levels it is fair to say that there are some mixed evidences regarding the role of institutions (Law) since all the estimated coefficients are positive and statistically significant but the instruments are not valid. Integration (Trade) and Geography (Latitude) do not seem to play a direct and significant role on explaining differences in per capita income levels across countries.

3 – Institutions and GDP per capita Growth: Emprical Evidences

This section of the paper presents some methodological issues on panel data estimation for long run growth models and the use of the GMM method and it reports on table 3 the estimated coefficients for the complete sample and for developing countries.

3.1 – Methological Issues

This section of the study aims to specify the methodology of panel data analysis using GMM estimation to be used in the econometric analysis, specifying the growth models to be estimated, the number of countries in the sample and the explanatory variables.

The study uses a dynamic model of panel data and the estimation method is the Generalized Method of Moments (GMM). The motivation for the use of this methodology is the possibility to take into account the following: i) the time series dimension of the data, ii) non observable country specific effects; iii) inclusion of lagged dependent variable among the explanatory variables, and iv) the possibility that all explanatory variables are endogenous. The standard approach on panel data starts with the assumption that the growth rate path is consistent with the following procedure:

$$y_{it} - y_{i,t-1} = (\alpha - 1)\, y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (2)$$

Where y is the natural log of per capita real GDP, X represents the set of explanatory variables, η is a non-observable and country specific term, ε is a random term and the subscripts i and t refers to country and time, respectively. [11]

[11] The specification of the model includes a term that varies over time and is constant across countries, and such term is not reported in the following equations just to simplify the presentation. This time-specific term was included in all regressions estimated by including the time Dummies variables for each period (five year average) of the sample.

It should be noted that the time specific effect allows to control the international conditions that change over time and ultimately affect the growth performance of countries in the sample, while the non observable country specific effect (η_i) incorporates factors that influence the growth of per capita GDP and are potentially correlated with the explanatory variables.

What characterizes the dynamic relationship is the presence of lagged dependent variable as one of the explanatory variables, which is evident once we rewrite equation (2) as:

$$y_{it} = \alpha y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (3)$$

The elimination of the country specific and the non observable term (η) is obtained once we apply the first difference to equation (3):

$$y_{it} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (4)$$

The use of instruments is required to deal with the possible endogeneity of the explanatory variables and the correlation between the new term of error, $\varepsilon_{i,t} - \varepsilon_{i,t-1}$, and the lagged dependent variable, $y_{i,t-1} - y_{i,t-2}$. Under the assumptions that the error term (ε) is not serially correlated and the explanatory variables (X) are weakly exogenous, lagged values of the explanatory variables can be used as instruments, as specified under the following moment conditions:

$$E\left[y_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})\right] = 0 \text{ for all } s \geq 2;\ t = 3, \ldots, T \quad (5)$$

$$E\left[X_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})\right] = 0 \text{ for all } s \geq 2;\ t = 3, \ldots, T \quad (6)$$

The GMM estimator based on the moment conditions (5) and (6) is called GMM-DIFF. There are statistical problems associated with the use of GMM-DIFF: statistically, when the regressors in equation (4) are persistent, lagged levels of X and y are weak instruments. The use of weak instruments asymptotically implies that the variance of the coefficient increases and in small samples the coefficients can be bias. To reduce the potential bias and inaccuracy associated with the use of DIFF-GMM estimator, Arellano and Bover (1995) and Blundell and Bond (1997) develop a system of regressions in differences and levels. The instruments for the regression in differences are the lagged levels of the explanatory variables, moment conditions (5) and (6). The instruments for the regression in levels are the lagged differences of explanatory variables. These are appropriate instruments under an additional assumption, that is, although there may be correlation between the levels of explanatory variables and the country specific effect (η) in equation (3), there is no correlation between those variables in differences and the country specific effect (η. This can be represented as:

$$E\left[y_{i,t+p} \cdot \eta_i\right] = E\left[y_{i,t+q} \cdot \eta_i\right] \text{ and } \quad E\left[X_{i,t+p} \cdot \eta_i\right] = E\left[X_{i,t+q} \cdot \eta_i\right] \text{ for all p and q} \quad (7)$$

The moment conditions for the regression in level, the second part of the system, are:

$$E\left[(y_{i,t-s} - y_{i,t-s-1}) \cdot (\eta_i + \varepsilon_{i,t})\right] = 0 \text{ for } s = 1 \quad (8)$$

$$E\left[(X_{i,t-s} - X_{i,t-s-1}) \cdot (\eta_i + \varepsilon_{i,t})\right] = 0 \text{ for } s = 1 \quad (9)$$

The GMM estimator based on the moment conditions (5), (6), (8) and (9) is called GMM-SYST. The consistency of the GMM estimator depends on the validity of the moment conditions. To such extent it will be considered two specification tests based on Arellano and Bond (1991), Arellano

and Bover (1995) and Blundell and Bond (1997): i) Hansen test is a test of overidentifying restrictions and the joint null hypothesis is that the instruments are valid instruments, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation; ii) and the Arellano-Bond test which tests the hypothesis of no second order serial correlation in the error term.[12]

The justification for estimating both the Difference and the System GMM is associated to the debate on the problems of too many instruments. Roodman (2008) develops a detailed analysis on the issue of two many instruments when using GMM Difference and GMM System. The System GMM uses lagged variables in levels to instrument the differenced equation and lagged differences to instrument levels, which might end up with too many instruments. The author discuss the symptoms of instrument proliferation showing that as T increase the number of instruments can be too large compared to the sample size and the outcome is to invalidade some asymptotic results and specification tests. Too many instruments can overfit endogenous variables and fail to expunge their endogenous components, resulting in biased coefficients. Another argument is that the Hansen and Difference-in-Hansen tests can be weak when using the System GMM in the presence of overidentification. Among the procedures to reduce the number of instruments one possibility is to use only a few lags instead of all the available ones as instruments, and a second one is based on the idea of combining instruments through addition into smaller sets.

The panel data model is estimated for the complete sample (91 countries) and for developing countries over the period 1980-2004. The data used are transformed and are based on averages for non-overlapping periods of five years (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004), so that there are five data entries for each country for each variable in the sample. There is no data for all countries, time and variables, so the estimated panel is an unbalanced one. The variables used in the econometric estimation are reported on table 1A of the appendix, where the variables were in the logarithmic form except for the time dummies and the indexes of institution quality.[13]

3.2 – Empirical Results

The analysis of table 3 reveals that the coefficient for institution (Law) is statistically significant only when using the System GMM for the complete sample in a more parcimonious specification (without Credit, Pop and TermsTrade) and this result is also true in three out of four (5, 6 and 8) estimation for developing countries but only at the 10% significance level. The results also suggest that Gov (government consumption) has a negative and statistically significant coefficient in seven out of eight estimates, suggesting a robust role played by such policy variable, meaning that countries with more fiscal discipline benefit over time in terms of economic growth.[14] Some minor evidence of significance was found for Educ only for model (2) using System-GMM, for Credit in models (4) and (8) using Difference-GMM but only at 10% and for Pop in model (2) using the System-GMM. The estimated coefficients for the integration to the world economy (Trade), macroeconomic stability (Inf) and Terms of Trade were not statistically significant in any model specification.

After all one can say that the results for the long-run per capita GDP growth models suggest that there are mixed evidence for the role of institutions (Law) in fostering economic growth and the System-GMM is the one that is more likely to capture such role. Another lesson to be draw from the estimated growth models is that fiscal discipline, measured by government consumption / GDP, plays a crucial role in stimulating long-run growth.

[12] See the AR(2) results and the Overid tests on table 3.

[13] The index for Law was constructed so that the higher the value, the better the environment regarding law enforcement and property rights.

[14] The results for the AR(2), Hansen and Hansen Diff tests indicate that we are able to reject the null hypothesis meaning that there is no second order autocorrelation and the set of instruments are valid, with only one exception for the Hansen Diff test in model specification (1) using System-GMM.

Table 3- Real GDP Growth Models: GMM System and Difference

	Complete Sample				Developing Countries			
Variables / Method	System	System	Diff	Diff	System	System	Diff	Diff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growthppp -1	0.1007	0.1574	-0.099	-0.1476	0.1463	0.0757	-0.0084	-0.1345
	(0.251)	*(0.053)**	*(0.106)*	*(0.060)*	*(0.059)**	*(0.438)*	*(0.907)*	*(0.140)*
Yinitial	-0.0800	-0.5590	-0.2933	-0.2461	0.0132	-0.0578	-0.2180	-0.2322
	(0.748)	*(0.005)****	*(0.000)****	*(0.004)****	*(0.687)*	*(0.098)**	*(0.015)***	*(0.005)****
Educ	0.0148	0.1087	-0.0079	-0.2302	0.0429	0.0987	0.1783	-0.1828
	(0.736)	*(0.018)***	*(0.943)*	*(0.100)**	*(0.465)*	*(0.127)*	*(0.380)*	*(0.393)*
Law	0.0351	0.0233	0.0165	0.0232	0.0259	0.0325	0.0126	0.0446
	*(0.002)****	*(0.108)*	*(0.205)*	*(0.167)*	*(0.051)**	*(0.064)**	*(0.374)*	*(0.058)**
Trade	0.0047	-0.2111	0.0592	0.0245	-0.0111	-0.0467	0.1240	0.0655
	(0.832)	*(0.306)*	*(0.317)*	*(0.798)*	*(0.641)*	*(0.246)*	*(0.104)*	*(0.396)*
Gov	-0.1042	-0.1277	-0.1235	-0.1688	-0.0935	-0.0783	-0.1477	-0.1458
	*(0.010)****	*(0.002)****	*(0.023)***	*(0.001)****	*(0.027)***	*(0.103)*	*(0.017)***	*(0.045)***
Inf	0.0007	-0.0123	-0.0074	-0.0107	0.0008	-0.0171	-0.0065	-0.0098
	(0.944)	*(0.196)*	*(0.198)*	*(0.341)*	*(0.934)*	*(0.156)*	*(0.520)*	*(0.358)*
Credit		-0.0256		-0.0504		-0.0041		-0.0868
		(0.160)		*(0.069)**		*(0.925)*		*(0.070)**
Pop		-0.0555		-0.0198		-0.0520		-0.0093
		*(0.003)***		*(0.184)*		*(0.169)*		*(0.715)*
TermsTrade		*0.0265*		*0.0055*		*0.0483*		*0.0036*
		(0.450)		*(0.887)*		*(0.256)*		*(0.883)*
AR(2)	0.160	0.411	0.887	0.648	0.663	0.873	0.802	0.490
Hansen	0.209	0.884	0.325	0.282	0.964	0.999	0.362	0.811
Hansen Diff	0.025	1.000			0.998	1.000		
No. Obs.	306	264	224	191	220	190	160	137

Estimation includes time dummies and a dummy for Africa

*, ** and *** = signifficant at 10%, 5% and 1%

4 – Empirical Results and the Literature

It is clear that there is an extensive list of empirical studies on per capita income levels and growth models trying to address the discussion of endogeneity, reverse causality and their pitfalls, together with an attempt to separate the interpretation of what is really important in explaining differences in income levels and growth rates across countries and what roles the set of instruments play in this interpretation. One of the studies to address these issues is Rodrik et. al (2004):

> "We now want to clarify a point regarding the interpretation of results. In particular, we want to stress the distinction between using an instrument to identify an exogenous source of variation in the independent variable of interest and laying out a full theory of cause and effect. In our view, this distinction is not made adequately clear in Acemoglu et al. and is arguably blurred by Easterly and Levine (2003). (…) While colonial history does not quite provide a satisfactory account of income differences around the world, it can still provide a valid instrument. And that, in our view, is where Acemoglu et al. paper is successful. An instrument is something that simply has some desirable statistical properties. It need not be a large part of the causal story. (…) Easterly and Levine (2003) also assigns a causal role to the settler mortality instrument and interpret it as a geographical determinant of institutions such as 'crops and germs' rather than viewing it as a device to capture the exogenous source of variation in institutions. (…) Our view is that we should not elevate settler mortality beyond its status as an instrument, and avoid favoring either a

> colonial view of development (as some readings of Acemoglu et al. would have it) or a geography-based theory of development (as some readings of Easterly and Levine would have it)." (2004: p.154-55)

Rodrik (2004,2008) argue in favor of the necessity to implement institutional reforms to foster economic development but there is no clear perception of what kind of institutions each country should have. There are some crucial aspects such as providing security of property rights, the enforcement of contracts, increase integration to the international market, macroeconomic stability and a process of building better voice and accountability, but the pace and paths to achieve such elements are different for each country, especially when comparing developing and developed countries. That is what the author call "appropriate" institutions since each country has distinct economic and social constraints when they implement institutions reforms. Within this line of argument there is a criticism to the type of institutions reforms promoted by multilateral organizations (IMF, WTO and World Bank) and dealing with such reforms in developing countries may require a second best strategy which is more grounded to the economic and social reality of these countries. The author also examines the costs over time associated to the institutional arrangement based on the combination of flexible exchange rates, inflation targeting and increasing central bank independence for developing countries arguing that such arrangement might have unfavorable consequences when there is a trend towards real exchange rate appreciation and its perverse impact on economic growth. In a few words Rodrik argues that "The lesson here is that institutional rigidity pays off when lack of credibility and time inconsistency are the main problems of the day, but that it can eventually become a drag on growth. No single set of best practices will serve the needs of all countries at all times." (2008: p.10)

Based on our estimates of the two models (tables 1 to 3) and from Figure 1 on one side institutional quality (Law) seems to has a positive relation to GDP growth rates and to GDP per capita income levels, but the results should be interpreted with caution since for the income levels model there are problems with valid set of instruments (2SLS and OGMM), and for the growth model institution (Law) is statistically significant only when using the System GMM for the complete sample in a more parcimonious specification (without Credit, Pop and TermsTrade) and for three out of four estimation for developing countries but only at the 10% significance level. Such results should not be taken as an empirical support for the argument that *institutions rule* and institutions should not be seen as causing cross country differences in per capita income levels, even though it seems to matter.

When examining most of the reported econometric estimation results from the literature such as Rodrik et. al (2004) table 3 when they present the 2SLS estimation there is no overidentification test statistics for any of the first seven model specification (preferred specification is model 6) and when they report such tests (models 8 and 9) the p-values indicate rejection of the null hypothesis and the instruments are not valid.[15] Easterly and Levine (2003) when estimating the 2SLS (table 4) reports the F test for the first stage estimation using four instrumental variables (Settler Mortality, Latitude, Landlocked and Crops/Minerals) but there is no overidentification tests, even though they mention that they do not reject the null in any of the overidentification tests. The authors do report the overidentification tests (table 5 and 6) when policy variables (inflation, openness and real exchange rate overvaluation) are included in the model.

Concluding Remarks

The present paper aims to answer two theoretical and empirical questions. First, institutions have a primary role on explaining the huge cross-country differences on per capita income levels

[15] The same pattern (lack of overidentification tests) holds for tables 6 and 7 when checking for robustness of the results obtained in table 3.

when compared to other control variables such as integration and geography? Second, does long-run growth performance relies mainly on institutions quality?

Considering the results for the cross-country differences in per capita income levels it is fair to say that there are some mixed evidences regarding the role of institutions (Law) since all the estimated coefficients are positive and statistically significant but the instruments are not valid. Integration (Trade) and Geography (Latitude) do not seem to play a direct and significant role on explaining differences in per capita income levels across countries. The results from the per capita GDP growth models suggests that there are mixed evidence for the role of institutions (Law) in fostering long run economic growth and the System-GMM is the one that is more likely to capture such role.

Even though good institutions are associated to high levels of per capita GDP and higher long run per capita GDP growth rates the empirical evidence presented here do not allow one to state that there is conclusive evidence that institutions have a primary role on the explanation of cross-country per capita income differences nor we can say that long-run per capita growth relies mainly on institutions quality.

Regarding the role of institutions, it is fair to say that more frequently than not, they are somehow specific to each economy and society and the ones that perform well in one setting may not be adequate in a different environment depending on complementary institutions and norms. One good example of this is the comparison of institutions for Russia and China as pointed out by Rodrik (2004, 2008) where the later does not have a *western type* of institution regarded as more adequate to foster economic growth and increase income levels but it has found specific ways to stimulate and attract an enormous amount of investments and the establishment of domestic contracts that ultimately seems to be quite effective in improving growth and income.

Our empirical results have not been able to corroborate the idea that institutional quality can be considered as cause of differences in per capita income among countries since our overidentification tests do not allow one distinguish between such institutions been a result of economic prosperity or their cause. Future empirical research on cross country income levels and growth models should be focused on the choice of instruments and the construction of better indexes for institutions that are able to capture some specificities of each country in terms of different chains / environment through which institutions might work in terms of stimulating income and growth.

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Appendix

Table 1A: Classification and Variable Description

Variables	Description
Growthppp	Real per capita GDP growth rate measured by PPP
GDPpercapita	Per capita income level based on PPP 2004
Yinitial	Per capita income level of the year's initial period
Educ	Years of schooling of the population aged above 15 years
Inf	Average inflation rate – CPI : [log (1+inflation)*100)]
Gov	Government consumption / GDP (in log)
Trade	(Exports + Imports) / GDP (in log)
Credit	Credit / GDP (in log)
Pop	Population
Law	Law and Order index
Latitude	Latitude (degrees)
EnglishLang	Origin of Spoken Language (English)
EuropeLang	Origin of Spoken Language (European)
SettlerMort	Settler´s mortality
Legoruk	Origin of judicial system (United Kingdom)
FrankelRomer	Frankel and Romer index of perceived trade
TermsTrade	Terms of trade
Asia	Dummy for Asian Countries
yr8084,yr8589,	Time Dummies

Table 2A: Sample of Countries

Countries	Countries	Countries	Countries
Algeria	Ethiopia	Malawi	Sri Lanka
Argentina	Finland	Malaysia	Sudan
Australia	France	Mali	Sweden
Austria	Gabon	Malta	Switzerland
Bahrein	Germany	Mexico	Syrian Arab Rep.
Bangladesh	Ghana	Morocco	Thailand
Belgium	Greece	Netherlands	Togo
Bolivia	Guatemala	New Zealand	Trinidad and Tobago
Botswana	Haiti	Nicarágua	Tunisia
Brazil	Honduras	Niger	Turkey
Burkina Faso	Hong Kong	Nigeria	Uganda
Cameroon	Iceland	Norway	United Kingdom
Canada	India	Omã	United States
Chile	Indonesia	Pakistan	Uruguay
China	Iran	Panama	Venezuela
Colombia	Ireland	Papua New guinea	Zambia
Congo	Israel	Paraguay	
Costa Rica	Italy	Peru	
Cote d'ivoire	Jamaica	Philippines	
Dem. Rep. do Congo	Japan	Portugal	
Denmark	Jordan	Saudi Arabia	
Dominican Republic	Kenya	Senegal	
Ecuador	Korea	Singapore	
Egypt	Kuwait	South Africa	
El Salvador	Madagascar	Spain	

Table 3A - Endogeneity Tests (Restricted Sample With Settler Mortality

Variables and Instruments		
Dependent Variable	Lngdppercapita	Lngdppercapita
Endogenous Variable	Law	Trade
Instruments	Settler Mortality and Latitude	Frankel Romer
Robust Score - Chi-squared (prob	4.4815 (0.0343) **	6.6008 (0.0102) **
Robust Regression - F-stat (prob)	4.6375 (0.0364) **	8.11673 (0.0063) **

*, ** and *** = significant at 10%, 5% and 1%

Table 4A: Descriptive Statistics – Cross Section

Variable	Obs	Mean	Std. Dev.	Min	Max
Growthppp	89	.29099	.45633	-1.0476	1.959
GDPpercapita	91	11.632	11.036	.59133	36.450
Law	91	3.6889	1.3711	.98809	6
Frankelromer	89	20.278	16.280	2.3	98.14
Latitude	82	.28872	.1945	.01111	.7222
Legoruk	82	.32926	.47283	0	1
Englishlang	89	.08214	.25127	0	.974
Europelang	89	.30764	.41690	0	1
SetlerMort	55	225.09	478.10	8.55	2940
Trade	91	71.284	51.161	19.874	391.95

Table 5A: Descriptive Statistics – Panel Data

Variable	Obs	Mean	Std. Dev.	Min	Max
Growthppp	452	.04656	.12102	-.529	.4262
Yinitial	452	1.6586	1.1305	-.6813	3.5438
Educ	399	5.9616	2.6916	.54	12.05
Law	449	3.6089	1.5629	.7333	6
Credit	451	48.384	40.161	.9533	218.23
Gov	451	15.493	5.9792	4.013	48.06
TermsTrade	381	-.05442	.30859	-4.6052	.6686
Pop	454	1.8665	1.10137	-.5535	5.925
Trade	450	68.529	43.038	12.876	391.95
Inf	444	61.110	394.97	-3.01	6424.98