Low Income Traps and Institutional Quality

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Abstract

The empirical growth literature has established that institutional quality is the most significant deep determinant of economic growth. This literature has also shown that countries tended to exhibit club convergence, and hence some of them are stuck in low income traps. These two sets of results lead us to ask, are countries stuck in low income traps because economic institutions in these countries are similarly stuck in low quality institutions traps? This paper looks into this issue by identifying convergence clubs in income and institutional quality using the *log t test* suggested by Phillips and Sul (2007). The results show that for both income and institutional quality, most countries converge to more than one club that emerge over time, while a handful of countries diverge from these clubs. We also find a very strong overlap between countries in low level 'income' traps and low level 'institutional' traps. Since the empirical growth literature has already established strong causality running from institutions to income, our results seem to imply that low income traps are caused by low level institutional traps.

Keywords: Absolute Convergence, Club Convergence, Low Income Traps, Institutional Quality, Cross-sectional Heterogeneity, log t test

Introduction

The empirical growth literature has focused mainly on two issues. The first is the identification of the determinants of long-run growth. The second is establishing the possibility of convergence of growth rates and income levels over time. The literature dealing with the determinants of growth initially focused on proximate determinants like investment, trade, etc., but has subsequently moved on to "deep" determinants. Some of the most influential contributions to this literature has established that institutional quality is perhaps the most important "deep" determinant of economic growth (Acemoglu et al. 2001, Rodrik et al. ,2004).

The literature that deals with the issue of convergence has also covered a lot of area, moving from beta to sigma convergence and then on to stochastic convergence (Quah, 1993; Sala-i-Martin, 1996; Pritchett, 1997; Barro, 2012; Rodrik, 2011 and 2013). The consensus in this area seems to be that rather than absolute convergence (or even conditional convergence), countries have tended to exhibit club convergence, i.e., converging towards multiple clusters over time (Quah 1995, Phillips and Sul 2007). These results seem to support the idea of multiple equilibria and low income traps.

Surprisingly, very few studies have tried to relate these two strands of the empirical growth literature, i.e., exploring whether deep determinants like economic institutions are responsible for the convergence clubs and low income traps exhibited by countries. In other words, are countries stuck in low income traps because economic institutions in these countries are similarly stuck in low quality institutions traps? The objective of this paper is to look into this issue.

There has been, from time to time, some isolated contributions to this literature. The literature on institutions stresses that they influence economic growth not only though increases in investment in physical and human capital but also through increases in productivity. Thus it is not surprising that some contributions (Knack (1996), Keefer and Knack (1995)) find that the difference in institutional quality is one important reason that the poor countries are unable to converge with the high income countries. If institutions are indeed the most important determinant of growth then clearly, the ability of poor countries to catch up with the developed will dependent on the capability of the institutions in these countries of catching up with those in the latter. A few recent studies have attempted to analyse this issue of convergence in institutional quality across

countries. Some have found that countries with lower institutional quality improve their institutional capabilities faster than countries with better institutional quality (Elert and Halvarsson, 2012). Others have shown evidence of conditional convergence of institutional quality among EU member states (Tamayo, Ramos and Surinach, 2014). Savoia and Sen (2015) found that countries with initially poor institutions tended to slowly catch up with those with high institutional quality, irrespective of the initial conditions of the institutions.

A salient feature of these contributions is that they are all based on sigma or β-convergence tests. Interestingly, these methodological approaches to convergence has been criticized by recent contributions to the empirical growth literature. The most serious criticism of β-convergence is that a negative β-coefficient which implies absolute β-convergence, may be consistent with a stable or rising variance in institutional quality across countries. Again, in the presence of multiple equilibria, β-convergence tend to reject the null hypothesis of no convergence very often. Another approach that has been used to study this issue is based on the idea of stochastic convergence. This approach however suffers from low power as a result of ignoring the possibility of the presence of structural breaks in time series and panel data (Perron (1989), Im et al. (2005) and Kim and Perron (2009), Ghosh et al. (2013)).

It may be noted that all the methods mentioned above are based on the idea of the presence of one single long run steady state. This ignores the possibility of the existence of multiple steady state (or club-convergence) in the economy for different groups of countries. In order to take this possibility into account, Phillips and Sul (2007) has suggested a regression based method for analyzing economic transition. This approach overcomes the deficiencies in the earlier approaches and accommodates a broader concept of convergence compared to the earlier studies of Quah (1997) and Chatterjee (1992). Most importantly, this econometric framework allows for the possibility of either absolute or sub-group (club) convergence under a variety of possible transition paths.

In this paper, we contribute to the literature on convergence clubs and low income traps. More specifically, we look at the possibility that members of particular convergence clubs in terms of (per capita) incomes (say, low income clubs) are also members of corresponding convergence clubs of institutional quality (say, poor institutions clubs). We do so by applying the Phillips and Sul (2007) method, and investigate the possibility of absolute or club convergence in both per

capita incomes and measures of institutional quality, for a large group of countries over a period of two and a half decades (1985 to 2010). Our study shows that over this time period, the group of countries do not exhibit absolute convergence, either in terms of per capita income or in terms of the measures of institutional quality. Instead, for both income and institutions, most countries converge to more than one club that emerge over time, while a handful of countries diverge from these clubs. Finally, we also find a very strong overlap between countries in low level 'income' traps and low level 'institutional' traps. Since the empirical growth literature has already established strong causality running from institutions to income, our results indicate that low income traps are caused by low level institutional traps.

The next section reviews the relevant literature. Section three provides a graphical exposition of clustering tendencies in measures of institutional quality. Section four describes the Phillips and Sul (2007) methodology used to identify convergence clubs. Section five presents the results. Section six concludes the paper.

Review of the Literature

There are two strands of the literature that is relevant for this paper. The first deals with methodological developments and results related to the issue of convergence of per capita output. The second strand deals specifically with the issue of convergence of institutional quality. The literature on convergence of output goes back to Baumol (1986). However, it was Barro and Sala-i-Martin (1992, 1995), who first introduced the concepts of β and σ convergences. β-convergence implies that poorer countries grow faster than the richer ones and catch up with them in the long run. σ convergence implies that the dispersion of income diminishes over time. Subsequently, these pure cross-sectional approaches were criticized on the grounds that they do not account for unobserved differences across countries (cross-sectional haterogeneity), and they are susceptible to measurement errors, endogeneity biases and spatial autocorrelation (Temple, 1999). As a result, many recent testing procedures for the convergence hypothesis have been developed using time series or panel data techniques. Bernard and Durlauf (1995) and Evans and Karras (1996) noted the importance of time-series and panel data methods instead of cross-sectional approach.

Conceptualizing convergence within a panel data framework, Phillips and Sul (2007) provide an important breakthrough in tests of convergence, as their methodology takes care of a number of shortcomings found in the previous tests described above. Firstly, they capture heterogeneous cross-sectional behaviour, by adopting a model involving one common factor (representing the long-term trend) and idiosyncratic effects (representing short-run cross-sectional heterogeneity). Previous studies having a similar structure focused on analyzing the asymptotic properties of the common factors in asset pricing models (Chamberlin and Rothschild, 1983; Connor and Korajczyk, 1986, 1988). Other studies have accommodated non-stationary common factors and idiosyncratic errors (Bai and Ng, 2002, 2004; Stock and Watson, 1999, Moon and Perron, 2004). Phillips and Sul (2007) extend these models to capture heterogeneous agent behaviour by allowing the systematic idiosyncratic element to evolve over time. The test of convergence then reduces to a regression based econometric test of whether these heterogeneous time varying idiosyncratic components converge over time to a constant. The Phillips and Sul (2007) approach also takes care of other shortcomings in the earlier methodology. As opposed to time-series based approaches, their test does not need to make any assumptions about the stationarity of the variable or the common factor. Moreover, this is the only approach that allows the researcher to differentiate between a wide range of convergence possibilities - absolute convergence, transitional divergence with long-run convergence, club convergence and finally, absolute divergence. Based on this technique, Phillips and Sul (2007) finds that across a large cross-section of nations, there is overwhelming evidence of convergence clubs and hence, low income traps.

The second strand of the literature that we review deals with studies that have focused on the convergence of institutional quality. Elert and Halvarsson (2012) used the 'Economic Freedom of the World' index, for 141 countries, to study this phenomenon over the period 1970-2009. This is a composite index reflecting a country's institutional quality with respect to size of government, legal structure and security of property rights, access to money, freedom to trade internationally, and regulation of credit, labour and business. The study found that countries with lower institutional quality improve faster than countries with higher institutional quality. Tamayo, Ramos and Surinach (2014) analysed the convergence in institutional, social and macroeconomic conditions between EU members states. For their analysis, they used a composite indicator and seven sub-indicators built from 51 variables directly related to the

external competitiveness of an economy, the capacity to attract foreign investors, and the quality of life and welfare of citizens. The data set comprised of 77 countries (including 28 European countries) for the period, 1995-2013. They estimated the standard deviation of this indicator (for sigma convergence) and performed the unconditional and conditional β-convergence analysis for all the indicators. The study obtained evidence of conditional convergence among EU member states. Evidence of unconditional convergence over the considered period was found to be limited.

Savoia and Sen (2015) is the most systematic study of the convergence of institutions, based on measures of legal, bureaucratic and administrative quality, for the period 1970-2010. The paper tests for both absolute and conditional convergence in institutional quality. For absolute convergence, average annual growth rate in institutional quality was regressed on the observed institutional quality at the beginning of the sample period. A negative estimated co-efficient confirmed the existence of absolute convergence. They repeated the same exercise for conditional convergence, where a set of explanatory variables (e.g., initial per capita GDP, initial level of education, political democracy, regional fixed effects, geographical effect, legal origin dummies, religion, ethnic fractionalization etc) accounting for long run determinants of institutional change were included in the regression. Both their convergence tests, i.e., absolute and conditional, clearly showed a significant negative correlation between the initial institutional quality measure and the average annual growth rate in institutional quality. Based on these findings, they concluded that countries with initially poor institutions tended to slowly catch up with countries with high institutional quality, irrespective of the initial conditions of the institutions.

Clusters in Institutional Quality: A Graphical Exposition

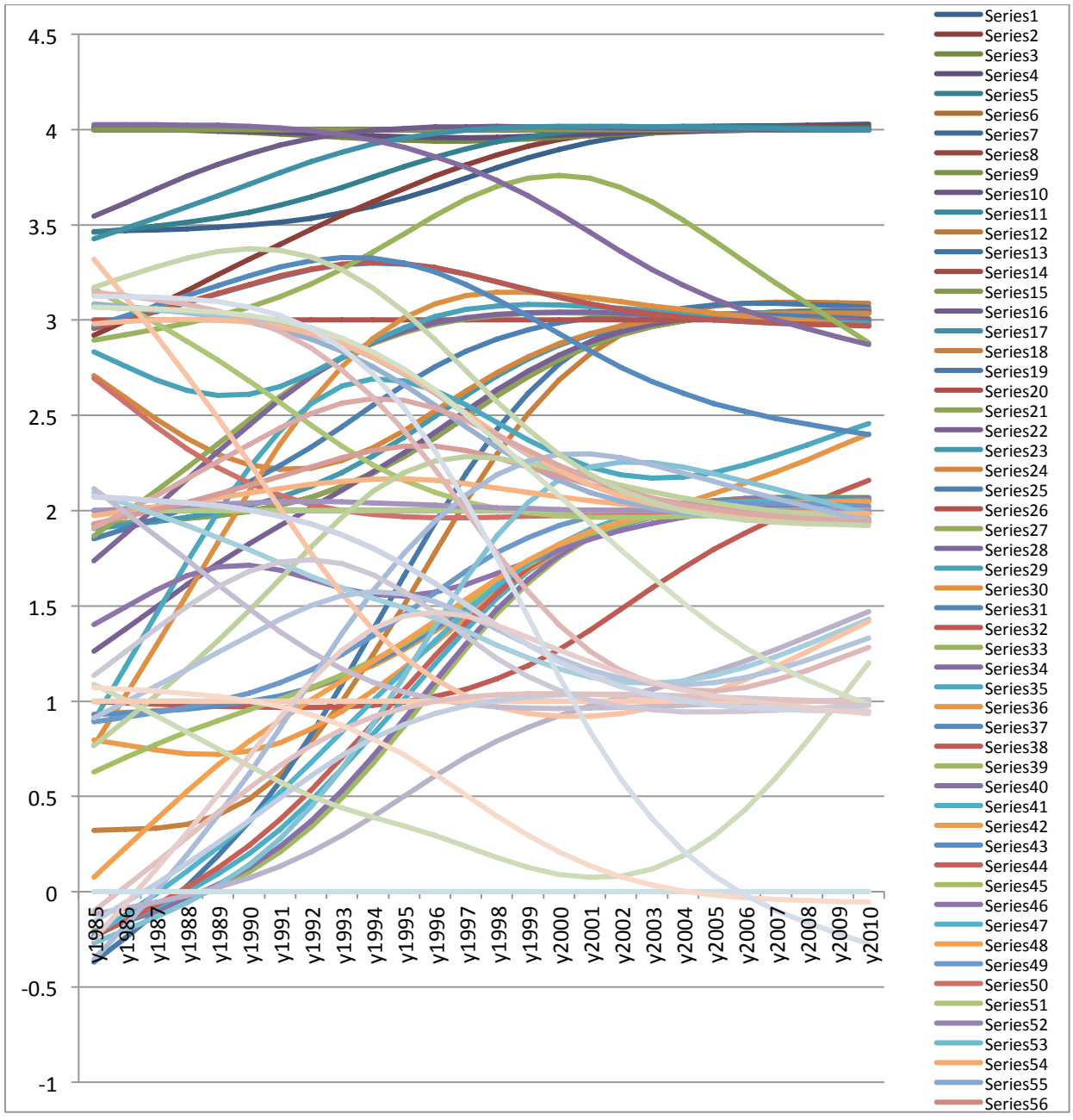
A number of studies have already established that per capita incomes across nations tend to form multiple clusters over time leading to conclusions that they exhibit club convergence. Since our objective is to relate such outcomes to underlying dynamics of institutional quality, the first question to ask is, do institutional measures also show such clustering tendencies? In this section we attempt a preliminary analysis of this issue by looking at time tends of cross sectional graphs of measures of institutional quality. In subsequent sections, we will analyze this issue using more rigorous techniques.

Greif (2006) defined institutions as a set of social factors, rules, beliefs,values and organisations that jointly motivate regularity in individual and social behavior.In other words, institutions are composed of interrelated though distinct components, particularly rules, beliefs, and norms, which sometimes manifest themselves as organizations.Therefore, good institutions are those that stimulate agents'activities with a high social return. On the contrary, poor institutions stimulate socially unproductive behaviors.

For our study, we choose measures of institutional quality that reflect property rights institutions, legal institutions and institutions capturing state capacity. We use data from the International Country Risk Guide database (ICRG, 2012), constructed by Political Risk Services, which covers the period 1985-2010. We use the variable Bureaucratic Quality (BQ) as a measure of state capacity, the variable Law & Order (LO) for legal institutions and Contract Viability (CV) as a proxy for property rights. BQ has been scaled between 0 and 4, LO has been scaled between 0 and 6 and CV has been scaled between 0.5 and 10.

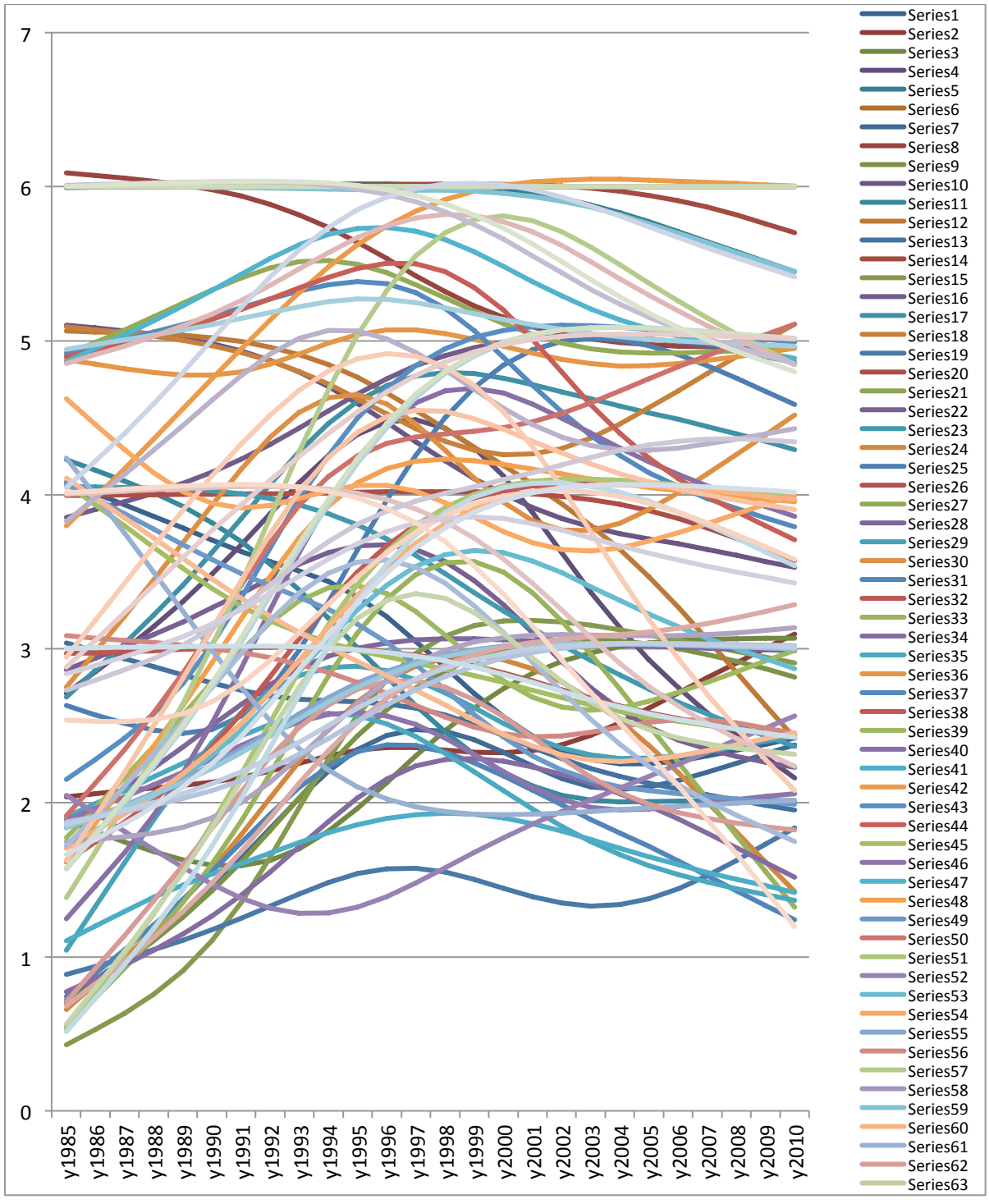
In Figures 1 to 3 we see how the institutional quality (filtered) of a large group of countries has changed over time. Different trends can be identified in these figures. Some countries, starting with a high institutional quality have dropped to a lower institutional quality. Conversely, other countries have started from low institutional quality but have risen to joined countries with high institutional quality. It is interesting to see that over time, the institutional quality indicators for a large number of countries have tended towards certain specific values. These trends seem to indicate that in terms of convergence of institutional quality, countries tend to form clubs(especially after the year 2000).

Figure 1: Trends of Bureaucratic Quality (BQ) across countries, over time



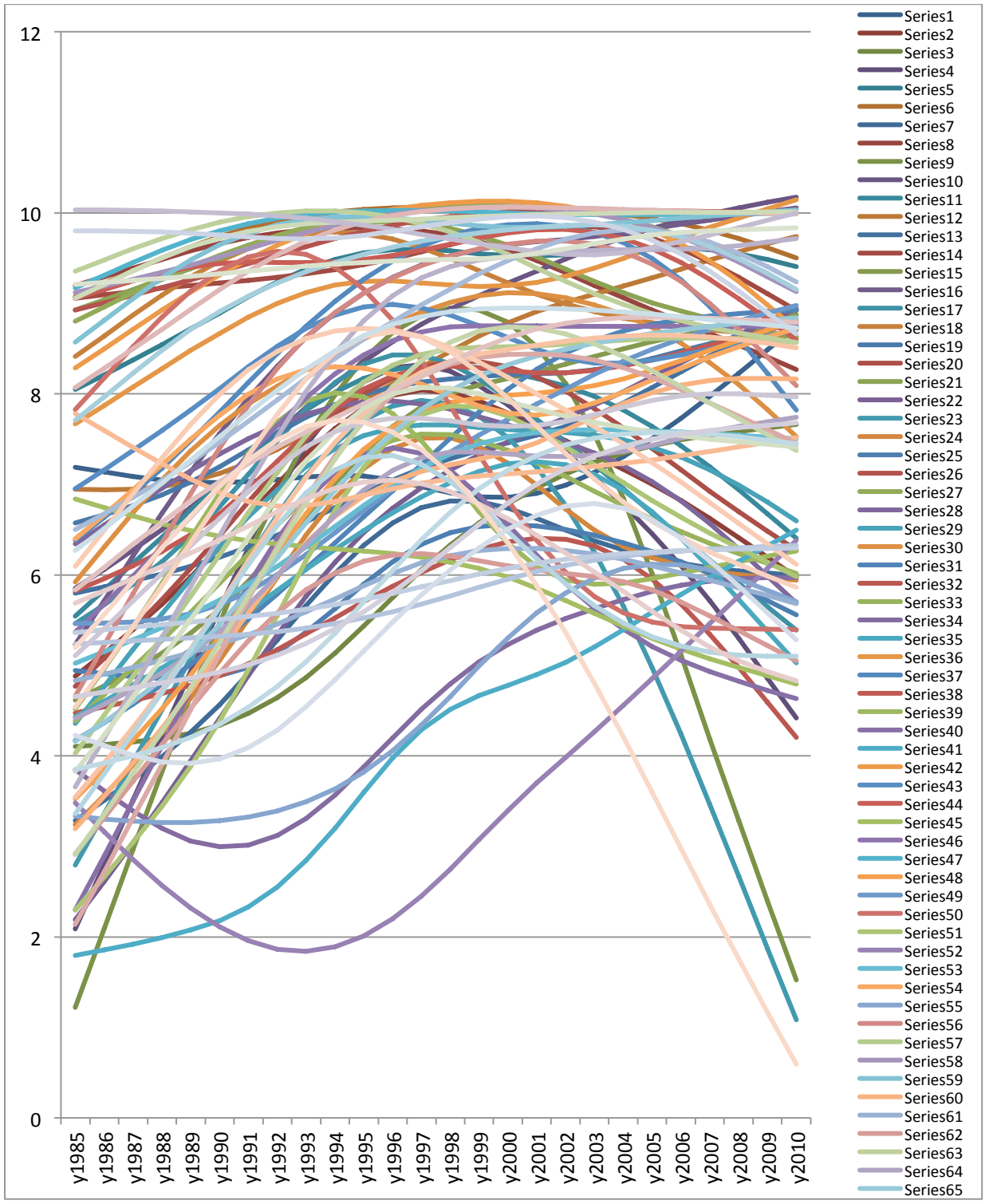
Source:International Country Risk Guide database (ICRG, 2012)

Figure 2: Trends of Law & Order (LO) across countries, over time



Source:International Country Risk Guide database (ICRG, 2012)

Figure 3: Trends of Contract Viability (CV) across countries, over time



Source: International Country Risk Guide database (ICRG, 2012

Next, we study the kernel density plots for all these institutional indicators for the period after 2000, when the clustering becomes more prominent in the figures above. Figures4 to 6 present the kernel density plots for BQ, LO and CV for the years, 2000, 2005 and 2010, respectively.

Figure 4. Kernel density plots for BQ

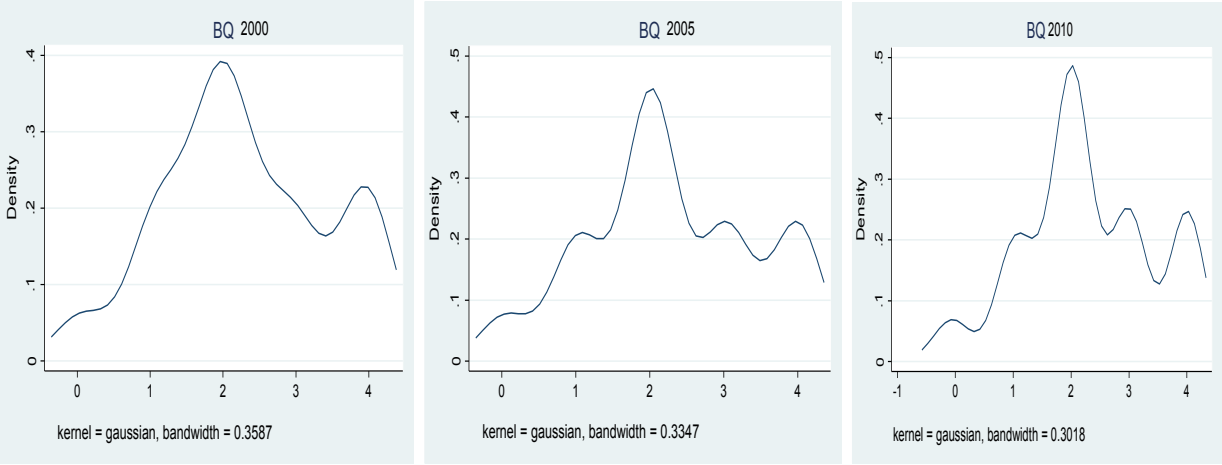


Figure 5. Kernel density plots for LO

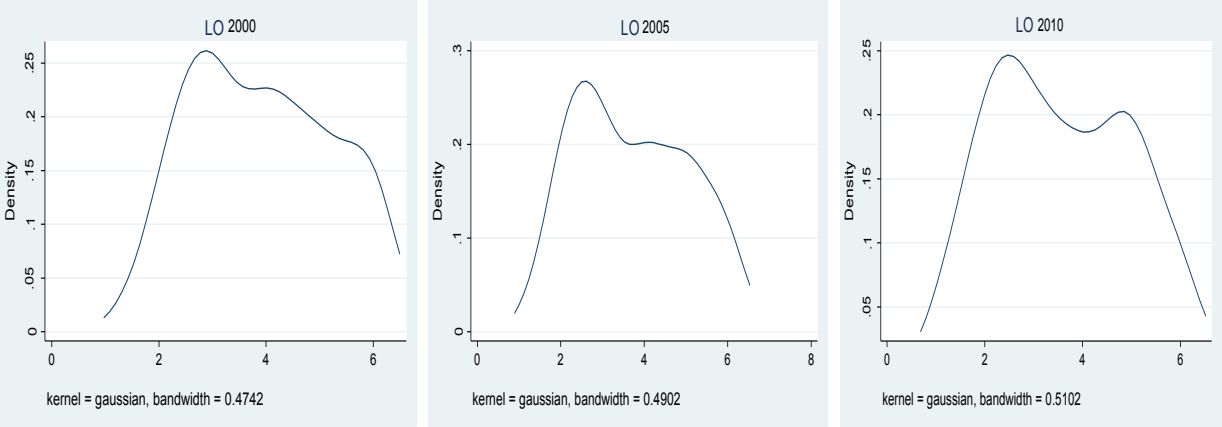
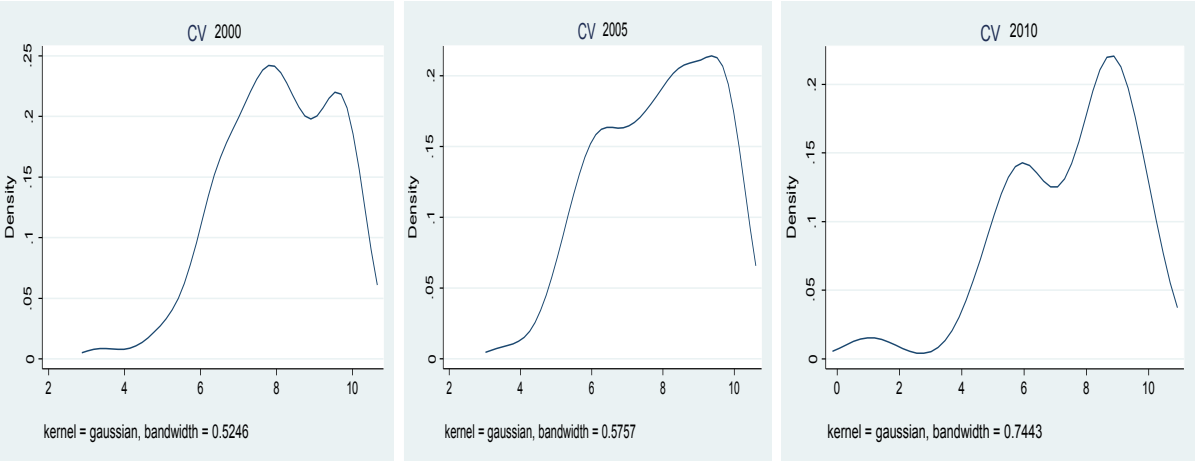


Figure 6. Kernel density plots for CV



Here we clearly see that the kernel density plots are not unimodal and over time, the number of modes have increased which again strongly suggests the formation of convergence clubs over time. This motivates us to undertake a more rigorous empirical exercise in the next section that can establish the existence of convergence clubs in institutional quality.

Methodological Approach

In this section, we describe the Phillips and Sul (2007) methodology which has been used in subsequent sections in order to identify convergence clubs. This approach consists of a regression based convergence test, also known as the '*log t test*', and is similar to other recent econometric studies that have given significant importance to modelling cross-sectional heterogeneity while studying panel data. As explained earlier, this methodology captures heterogeneous cross-sectional behaviour, by adopting a model involving a common factor (representing the long-term trend) and idiosyncratic (i.e., unit specific) effects (representing short-run cross-sectional heterogeneity). Such a model may be represented as

$$X_{it}=\alpha_i\mu_t+\varepsilon_{it} \qquad (1)$$

Here, α_i represents the unit specific element, μ_t represents the factor which is common for all the units and ε_{it} is the error term. It may be noted that model (1) seeks to capture the evolution of the elements of X_{it} in relation to the common factor μ_t, using two idiosyncratic (i.e., unit specific)

elements, α_i and ε_{it}. Alternatively, equation (1) can be written in terms of time varying factor representation as:

$$X_{it}=(\alpha_i+\frac{\varepsilon_{it}}{\mu_t})\mu_t =b_{it}\mu_t \qquad (2)$$

Here, b_{it} measures the distance of an individual unit X_{it} from the common trend component μ_t. This time-varying component b_{it} (which includes all idiosyncratic movements in X_{it}) thus represents the country-specific transition path of country i to the common trend μ_t. Clearly, the extent to which individual characteristics differ across economies will be reflected in the diverse shapes of economic transition defined by b_{it}.

In the model described above, the difference between any two time series variables is given by $X_{it} - X_{jt} = (b_{it} - b_{jt})\ \mu_t$. Here, if b_{it} and b_{jt} converge to some common b as $t \rightarrow \infty$, X_{it} and X_{jt} are asymptotically convergent. However, if the speed of divergence of μ_t is faster than the speed of the convergence of b_{it}, the residual $(b_{it} - b_{it})\mu_t$ may retain non-stationary characteristics. In other words, if the rate of convergence of b_{it} to b is very slow and data is limited, then the standard cointegration tests typically have low power in detecting asymptotic convergence. In order to take care of this problem that arises due to individual heterogeneity and evolution of that heterogeneity over time and across groups, Phillips and Sul (2007) propose an alternative way to define relative long run equilibrium or convergence between such series by defining them in terms of their ratios rather than their differences.

In equation (2), testing for convergence requires estimating b_{it} as well as μ_t. In this general case however, the number of observations in the panel is less than the number of unknowns in the model, making it impossible to estimate b_{it}. In order to solve this problem, Phillips and Sul (2007) defines convergence in terms of a relative transition coefficient given by

$$h_{it}=\frac{X_{it}}{1/N\sum_{i=1}^{n}X_{it}}=\frac{b_{it}}{1/N\sum_{i=1}^{n}b_{it}} \qquad (3)$$

The last part of equation (3) shows that like b_{it} , h_{it} also traces out the transition element for economy i, but does so relative to the cross-section average. It may be noted that, by focusing on

h_{it}, the framework eliminates the common growth path μ_t, and is defined completely in terms of the idiosyncratic part of the variable. For convergence, this framework needs a common transition behavior across all economies, with $h_{it} \rightarrow 1$, for all cross sectional units i, as $t \rightarrow \infty$. In this relative transition framework, the curves traced out by h_{it} may differ across the cross sections in the short run, while allowing for ultimate convergence (when $h_{it} \rightarrow 1$, for all i, as $t \rightarrow \infty$) in the long run. Next, the methodology defines the cross-sectional variance of h_{it}, by

$$H_t = \frac{1}{N} \sum_{i=1}^{N} (h_{it} - 1)^2 \qquad (4)$$

and the statistical convergence property $H_t \rightarrow 0$ translates into the null hypothesis of economic convergence between countries in the panel.

To formulate a null hypothesis of convergence, the method needs to impose some more structure on b_{it}. Phillips and Sul (2007) assume that b_{it} follows a decay model which has the following semi-parametric form

$$b_{it} = b_i + \frac{\sigma_i \xi_{it}}{L(t) t^{\beta}} \qquad (5)$$

where b_i is a fixed value that b_{it} may reach in the long run, σ_i is an idiosyncratic scale parameter, and ξ_{it} is a random variable that is iid (0,1) across i , but may be a weakly dependent time series. $L(t)$ is a slowly varying function (like log t) for which $L(t) \rightarrow \infty$ as $t \rightarrow \infty$ and β is the decay rate. β governs the rate at which the cross section variation over the transitions decays to zero over time.

In terms of the semi-parametric form assumed above, the null hypothesis of overall convergence may be written as

H_0: $b_i = b$ for all i and $\beta \geq 0$

This implies that all the idiosyncratic effects have a common long-run value and that they all converge toward this value.

The alternative hypothesis is given as

H_A: Either (i) $b_i=b$ for all i and $\beta<0$ (Absolute Divergence)

Or (ii) $b_i\neq b$ for some i and $\beta \geq 0$ (Club Convergence)

In either of the two cases, the null hypothesis of absolute convergence breaks down. It may be noted that in case (i) this is due to the fact that the cross-sections exhibit absolute divergence (i.e., they do not all converge towards the common value) while in case (ii) this is due to the fact that the cross-sections exhibit club convergence (i.e., although there is convergence towards long-run values, there are, in fact, more than one long-run value). Therefore, the alternative hypothesis also includes the possibility of club convergence.

Finally, to test for convergence, the methodology proposes a regression model that tests whether H_t , the cross sectional variance of the relative transition coefficient h_{it} , tends to zero in the long run. Phillips and Sul (2007) prove rigorously that using equations (3), (4)and (5), the above condition can be reduced to the regression equation

$$\log (H_1/H_t) - 2\log L(t) = p + q \log t + u_t \text{ , for } t = [rT], [rT]+1, \ldots T \quad (6)$$

with $\hat{q} = 2\hat{\beta}$, where β is the decay rate in equation (5)

Equation (6) is the *log t test* regression[1], where H_1 represents the variance of the relative transition coefficient at the beginning of the sample (i.e., t = 1), and H_t represents the same at any point in time t (i.e., t = 1,2,…, T). Since any convergence of the relative transition coefficients would require H_t to fall continuously as a proportion of H_1 , the term $\log (H_1/H_t)$ is a measure of this convergence. L(t) is assumed to be a slowly varying function of time and Phillips and Sul (2007) suggest using the log function for this variable (i.e., L(t) = log(t)). Note that the equation is estimated on a truncated sample which is defined by the size of the total sample T, and a parameter r, such that the truncated sample goes from r*T (or the closest integer to r*T) to T. Although r can lie anywhere between zero and one, the limit distribution and power properties of the test depend on the value of r and hence, r has to be chosen to balance between the two. Phillips and Sul (2007) run simulation experiments that suggest r = 0.3 is a satisfactory choice in

[1] For detailed derivation of log t regression equation refer Phillips and Sul (2007), appendix, pp. 44-48.

terms of both size and power, and they suggest using this for all *log t tests*. Based on this truncated sample, equation (6) is estimated using a heteroscedasticity and autocorrelation consistent, one sided t-test. It is then applied to test the inequality of the null hypothesis i.e., $\beta \geq 0$. The null hypothesis of convergence is rejected if $t_{\hat{q}}$< -1.65 (5% significance level).

As discussed above, this methodology embeds the possibility of club convergence in the absence of absolute convergence. In the actual application of this methodology, the researcher confirms the outcome - absolute convergence, club convergence or absolute divergence - through a two-step approach. The first step involves testing for absolute convergence for the entire sample using the *log t test*. If the null hypothesis of convergence cannot be rejected, we accept that the cross sections exhibit absolute convergence over the period. If the null is rejected, it could either be a case of club convergence or absolute divergence. The second step tests for club convergence. This involves identifying sub-groups of the whole sample for which the *log t test* shows convergence. If such sub-group or clusters can be identified, we conclude that the data exhibits club convergence. Otherwise we conclude that the data exhibits absolute divergence.

The identification of clubs or subgroups (if absolute convergence has been rejected) is itself a multi-step process involving a clustering mechanism procedure. First, the cross-sectional units are sorted in descending order of the value of the variable of interest (say, per capita income) in the last period for which data is available (Phillips and Sul (2007) argue that convergence is usually most apparent in the final time periods of the sample). Next, the method tries to identify the first convergence club. For this, first the core group of the club has to be identified. This is done by selecting the *k* highest units in the panel of size N, where N > k ≥ 2. The value of k is chosen such that it maximizes the t-statistic (from the *log t test*), amongst all those subgroups that do not reject the null of convergence. Once this core is selected, more units are added until an additional unit shows a rejection of the null of convergence for that group. The core and the additional units thus identified make up the first convergence club. After the first convergence club is identified, there may be many more units left in the sample. The approach then attempts to identify a second and a third and a fourth convergence club and so forth - using the same steps that had identified the first convergence club - until the sample is exhausted or there are some units left that do not converge to any club. These units exhibit absolute divergence.

Finally, in case the above process identifies more than one convergence club, tests are conducted to determine whether some of these clubs can be merged to form larger convergence clubs. To test for the merging of clubs, the procedure starts with the two highest clubs. Taking all units from these two convergence clubs, the *log t test* is run, and if the t-statistic does not reject convergence, both clubs are merged to form one larger club. Then the test is repeated after adding the next highest club etc., and the process is continued until the t-statistic indicates that the convergence hypothesis is rejected. Once the first merger is complete the process attempts to identify more mergers from the rest of the convergence clubs. The process is concluded when all possible mergers have been completed.

Results

We start by looking for evidence of absolute convergence in both per capita income and measures of institutional quality. Per capita income is taken from Penn World Tables and the three measures of institutional quality - Bureaucratic Quality, Law & Order and Contract Viability - are taken from the ICRG database. The sample covers the period 1985 to 2010. Test results for absolute convergence for the four variables using the *log t test* has is reported in Table 1.

Table 1: Log-t test for absolute convergence

Variable	Per Capita Income	Bureaucratic Quality	Law & Order	Contract Viability
Sample Size	85	91	91	91
t-statistic	-12.894	-14.55	-8.26	-3.26

Note: t-statistic smaller than -1.65 indicates divergence.

In the table, we find that the value of t-statistic is less than -1.65 for all the variables, so the null hypothesis of overall convergence is rejected at the 5% level of significance for both per capita income and measures of institutional quality. Next, we proceed to explore the presence of convergence clubs for all these variables.

Convergence Clubs in Per Capita Income

Using the clustering mechanism discussed in the methodology section, we find that there exist nine clubs and two diverging units. Next we test for mergers among these nine clubs. The results after applying the test procedure for all possible mergers are presented in table 2.

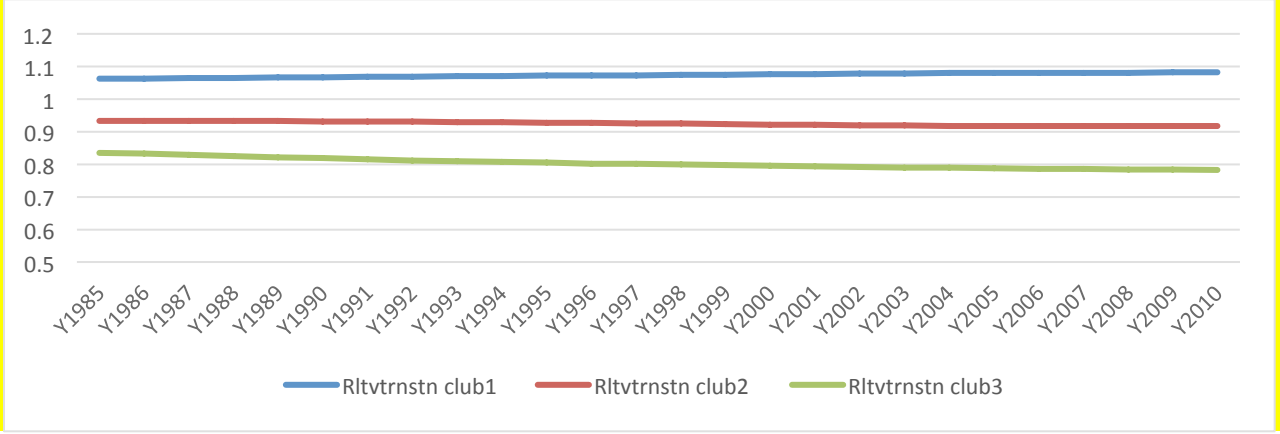
Table 2: Merging of clubs in per capita income

Club/Divergent Units	**Club 1 (merging initial clubs 1,2,3,4 and 5)**	**Club 2 (merging initial clubs 6,7 and 8)**	**Club 3 (initial club 9)**	**Divergent Units**
Club Size	53	15	15	2
t-statistic	-0.4088	-0.3652	-1.4538	

Note: t-statistic larger than -1.65 indicates convergence.

In table 2, we find that the t-statistics for the three clubs are greater than -1.65 indicating that there is convergence within each of them. Our attempts at further merging of clubs were not supported by the corresponding tests. This lack of any further possibilities of merger is also indicated by the relative transition paths for each of these three clubs. The relative transition curves are the time paths of the cross sectional means of the members of the convergence clubs as a ratio of the cross sectional means of the whole sample. In figure 7, we show the relative transition paths for the three clubs identified in table 2. The figure shows clear evidence of divergence among the clubs i.e., the gaps among the relative transition paths of the clubs do not show any tendency towards declining over time, since they are moving away from each other.

Figure 7: Relative transition path for income clubs



A list of the countries forming different clubs have been reported in the appendix, Tables, A.3. If we look at the countries representing different clubs (converging to the same steady state), we see that over time, many of the low income countries converge to the steady state income level of the high income group of countries while some of them seem to be stuck in the low income trap represented by club 3.

Convergence Clubs in Institutional Quality

The clustering mechanism generates five clubs and five divergent units for the variable Bureaucratic Quality. For the variable Law & Order, five clubs are found and there are no divergent units. Finally, for the variable Contract Viability, we find five clubs and three divergent units. The statistical results for these clubs are reported in the appendix (Table A.2).

Finally, we test whether some of these clubs can be merged among themselves to form larger clubs. Using the merging procedure, we find that the variables, Bureaucratic Quality, Law & Order and Contract Viability, finally get two clubs each. The convergence results after applying the merging test procedure are presented in table 3.

Table3: Merging of clubs for Institutional Quality

Bureaucratic Quality	Clubs/Divergent Units	**Club 1 (merging initial clubs 1,2 and 3)**	**Club 2 (merging initial clubs 4 and 5)**	**Divergent Units**
	Club Size	72	14	5
	t-statistic	0.62	4.67	
Law & Order	Clubs/Divergent Units	**Club 1 (merging initial clubs 1,2,3 and 4)**	**Club 2 (initial club 5)**	**Divergent Units**
	Club Size	60	31	0
	t-statistic	0.05	0.06	
Contract Viability	Clubs/Divergent Units	**Club 1 (merging initial clubs 1,2,3 and 4)**	**Club 2 (initial club 5)**	**Divergent Units**
	Club Size	81	7	3
	t-statistic	-0.88	1.80	

Note: t-statistic larger than -1.65 indicates convergence.

In table 3, we find that the t-statistics for the two merged clubs for all the variables are greater than -1.65 indicating convergence within them. Our attempts at further merging of clubs were not supported by the corresponding tests. This is also indicated by the relative transition paths for the two clubs for each of the three measures of institutional quality depicted in figures 8, 9 and 10. The relative transition curves of the two clubs in each of these figures show a clear evidence of divergence i.e., over time, they are moving away from each other.

The list of countries for each of the two clubs are reported in the appendix, Tables, A.4 to A.6. If we look at the countries converging to the higher steady state, we see that many of the low income countries manage to improve their institutional quality over time and ultimately converge to this cluster. It is evident that, it is not necessary that a country with poor institutional quality will be stuck in a low quality trap. However, the tables show that there are a significant number of such countries, which have remained in such a trap.

Figure 8: Relative transition path of convergence clubs (Bureaucratic Quality)

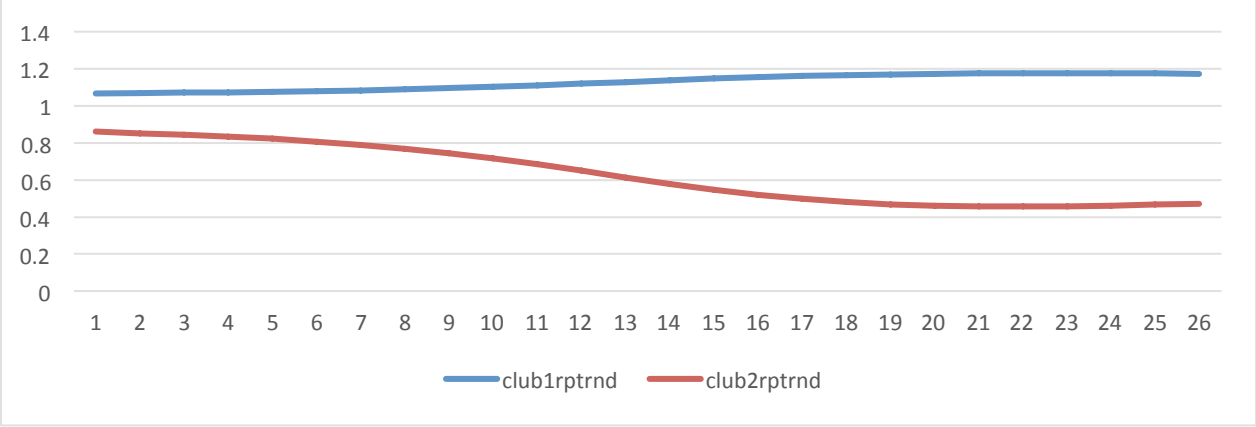


Figure 9: Relative transition path of convergence clubs (Law & Order)

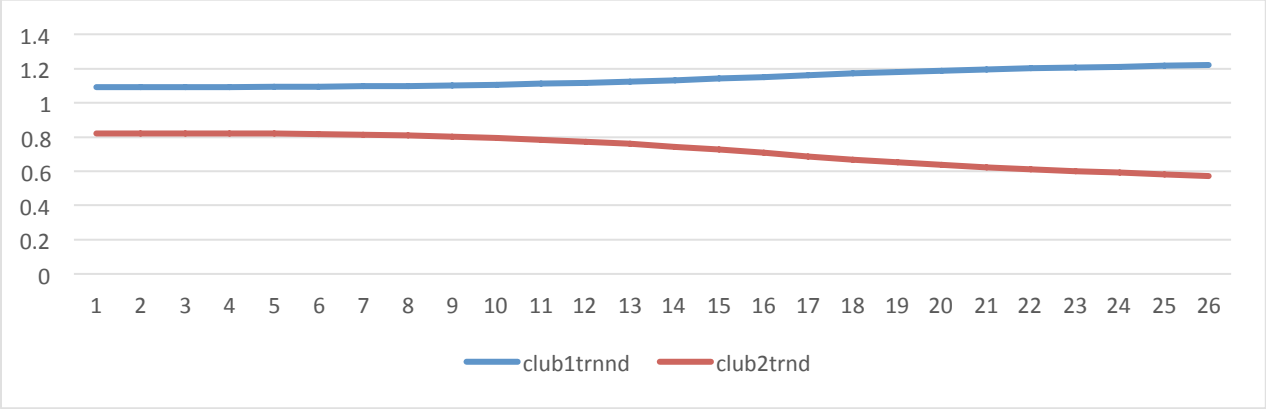
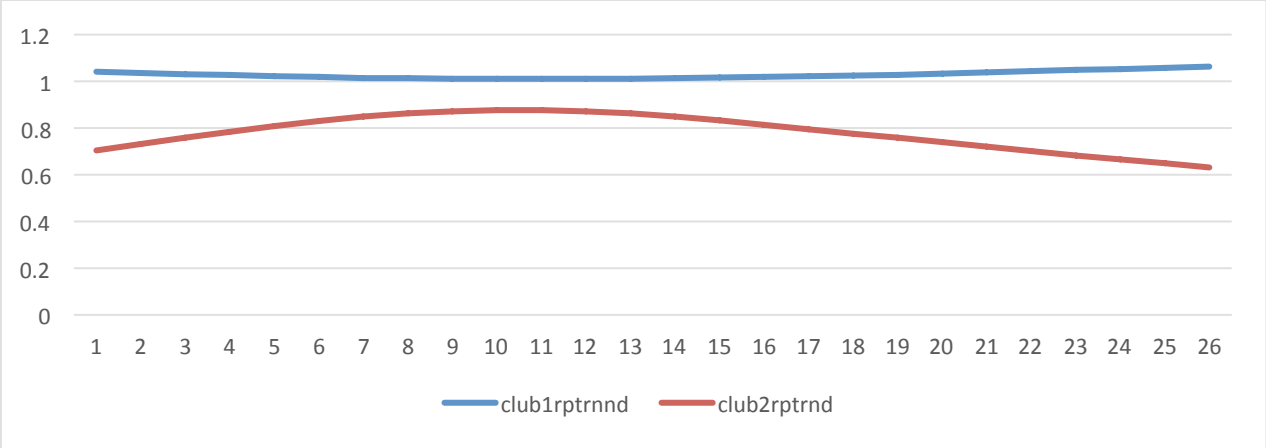


Figure10: Relative transition path of convergence clubs (Contract Viability)



Correlation Between Low Income Traps and Low Institutional Quality Traps

Figures 7, 8, 9 and 10 show that the lowest convergence club in each case not only diverges from the other club/s, they also show a distinctly declining trend for most or all the years that we study. We interpret this lowest club in figure 7 as a low income trap and those in figure 8, 9 and 10 as low institutional quality traps. In table 5 we list the members of this lowest convergence

club and the divergent units for the three measures of institutional quality and per capita income[2]. The members in bold font are those common to both per capita income and one of the three institutional measures.

Table 5: Members of the lowest Convergence Club and Divergent Units

Bureaucratic Quality	Law & Order	Contract Viability	Per Capita Income
Angola	Albania	Argentina	**Bangladesh**
Burkina Faso	Argentina	Bolivia	**Brazil**
Cameroon	**Bangladesh**	**Cote d`Ivoire**	**Burkina Faso**
Cote d`Ivoire	**Brazil**	Ecuador	**Cameroon**
Dominican Republic	Bulgaria	Guinea	**Côte d'Ivoire**
Gabon	Cameroon	Iran	**El Salvador**
Haiti	Colombia	Nigeria	Ethiopia
Liberia	Cote d`Ivoire	Syria	France
Mali	Dominican Republic	Venezuela	**Guinea**
Niger	Ecuador		**Kenya**
Nigeria	**El Salvador**		**Liberia**
Paraguay	Ghana		Malawi
Romania	Guatemala		**Mali**
Senegal	**Guinea**		**Niger**
Syria	Haiti		**Senegal**
Togo	Honduras		**Togo**
Venezuela	Indonesia		Uganda
Zambia	Iraq		
	Jamaica		
	Kenya		
	Mexico		
	Niger		
	Nigeria		
	Paraguay		
	Philippines		
	Thailand		
	Trinidad &Tobago		
	Uruguay		
	Venezuela		

[2] Countries which were not included to test for convergence of per capita income have been excluded from the lower clubs of measures of institutional quality so that we can compare them.

From this table, we find that among the 17 countries which either belong to the lowest club or is a divergent unit based on per capita income data, 13 countries (excluding Ethiopia, France, Malawi and Uganda) also belong to at least one of the lowest clubs based on data for institutional quality. Seven of these thirteen countries that can be said to be in a low income trap are also in a low bureaucratic quality trap, five are in a low quality of law & order trap and one of them in a low quality contract viability trap. Therefore, we can say with some confidence that many countries are stuck in low income traps because they are really stuck in low institutional quality traps.

Concluding Remarks

The empirical growth literature has two very distinct and significant strands. One of these strands has established that institutional quality is the most significant determinant of economic growth. The other strand shows that countries tended to exhibit club convergence, and hence some of them are stuck in low income traps. In this paper, we bring these two strands together to ask, are countries stuck in low income traps because economic institutions in these countries are similarly stuck in low quality institutions traps? This paper looks into this issue by identifying convergence clubs in income and institutional quality using the *log t test* suggested by Phillips and Sul (2007). The results show that not only do countries get stuck in both low income and low institutional quality traps, but that there is a very strong overlap between countries in the low level income traps and those in low level institutional traps. It may be noted here that our methodology only establishes a strong correlation between the two types of traps and there is no robust causal link established from one kind of trap to the other. However, the empirical growth literature has already established strong causality running from institutions to income, our hence our result seem to imply that low income traps are caused by low level institutional traps.

If it is indeed true that countries are stuck in low income traps because they are primarily in poor institutions traps, then policies for growth will have to focus on getting them out of these traps rather than push up levels of investment, trade or infrastructure. Such policies will, of course, have to be based on identifying factors that are responsible for the formation of these poor institutions traps. This is an important agenda for future research.

Appendix

Table A. 1: Initial Convergence clubs for Per Capita Income

CLUBS/ DIVERGENT UNITS	CLUB SIZE	t-statistic
Club 1	8	1.7701
Club 2	9	0.2336
Club 3	10	1.5641
Club 4	10	1.3857
Club 5	16	1.7885
Club 6	7	0.6677
Club 7	6	0.1309
Club 8	2	4.0144
Club 9	15	-1.4538
Divergent Units	2	

Note: t-statistic larger than -1.65 indicates convergence.

Table A. 2: Initial Convergence clubs for Institutional Quality

Clubs/ Divergent Units	Bureaucratic Quality		Law & Order		Contract Viability	
	Club Size	t-statistics	Club Size	t- statistics	Club Size	t- statistics
Club 1	37	10.99	20	3.65	40	11.68
Club 2	13	14.49	11	13.26	16	3.06
Club 3	22	1.59	18	25.78	8	0.31
Club 4	9	5.02	11	3.09	17	10.59
Club 5	5	5.96	31	0.06	7	1.80
Divergent Units	5		0		3	

Note: t-statistic larger than -1.65 indicates convergence.

Table A.3: List of countries in merged clubs for Per Capita Income

CLUB 1	CLUB 2	CLUB 3	Divergent Units
Albania	Angola	Bangladesh	Brazil
Argentina	Bolivia	Burkina Faso	France
Australia	Colombia	Cameroon	
Austria	Ghana	Côte d'Ivoire	
Belgium	Guatemala	El Salvador	
Botswana	Honduras	Ethiopia	
Canada	Indonesia	Guinea	
Chile	Iraq	Kenya	
China	Jamaica	Liberia	
Costa Rica	Morocco	Malawi	
Denmark	Pakistan	Mali	
Dominican Republic	Paraguay	Niger	
Ecuador	Philippines	Senegal	
Egypt	Sri Lanka	Togo	
Finland	Zambia	Uganda	
Gabon			
Greece			
Hungary			
India			
Iran			
Ireland			
Israel			
Italy			
Japan			
Jordan			
Lebanon			
Malaysia			
Mexico			
Netherlands			
New Zealand			
Nigeria			
Norway			
Panama			
Peru			
Poland			
Portugal			
Romania			
Singapore			
Sweden			
Switzerland			

Syria Taiwan Thailand Trinidad and Tobago Tunisia Turkey United Kingdom United States Uruguay Venezuela Hong Kong Republic of Korea			

Table A.4.List of countries in merged clubs for Bureaucratic Quality

MERGED CLUB 1			MERGED CLUB 2		Divergent Units
Initial Club 1	Initial Club 2	Initial Club 3	Initial Club 4	Initial Club 5	
Singapore	Jamaica	Ghana	Angola	Nigeria	Coted`Ivoire
Israel	India	Italy	Niger	Dominican Rep	Haiti
Finland	Greece	Morocco	Syria	Senegal	Liberia
Japan	Portugal	Botswana	Cameroon	Venezuela	Mali
Norway	Hong Kong	Bulgaria	Burkina Faso	Paraguay	Togo
Australia	Poland	Sri Lanka	Nicaragua		
Belgium	Taiwan	Ecuador	Zambia		
Canada	Korea, Rep	Pakistan	Romania		
Denmark	Hungary	Tunisia	Gabon		
Netherlands	France	Egypt			
New Zealand	Algeria	Costa Rica			
Sweden	Uruguay	China			
Switzerland	Indonesia	Colombia			
United Kingdom		Jordan			
United States		Iran			
Austria		Brazil			
Ireland		Papua New Guinea			
Philippines		Kenya			
Guyana		Turkey			
Argentina		Thailand			
Trinidad &Tobago		Iraq			
Mexico		Tanzania			
Chile					
Malaysia					
Malawi					
Albania					
El Salvador					
Guatemala					
Bolivia					
Lebanon					
Peru					
Bangladesh					
Guinea					
Uganda					
Honduras					
Panama					
Ethiopia					

Table A.5. List of countries in merged clubs for Law & Order

MERGED CLUB 1				MERGED CLUB 2
Initial Club 1	Initial Club 2	Initial Club 3	Initial Club 4	Initial Club 5
Ireland	New Zealand	Portugal	Greece	Indonesia
Austria	Australia	Belgium	Poland	Papua New Guinea
Denmark	United Kingdom	France	Malaysia	Mexico
Finland	Taiwan	Hong Kong	Romania	Cote d`Ivoire
Netherlands	Chile	Japan	Hungary	Ghana
Norway	Turkey	Switzerland	Italy	Uruguay
Sweden	Egypt	Singapore	Costa Rica	Guinea
Canada	Uganda	United States	Botswana	Albania
Korea Republic	Peru	China	Burkina Faso	Bulgaria
Syria	Sri Lanka	Jordan	Gabon	Bangladesh
Tunisia	Liberia	Iran	Malawi	Ecuador
Tanzania		Pakistan		Philippines
Israel		Algeria		Trinidad &Tobago
Morocco		Senegal		Dominican Republic
Ethiopia		Togo		Argentina
Zambia		Panama		Thailand
India		Mali		Jamaica
Lebanon		Bolivia		Brazil
Nicaragua				Niger
Angola				Kenya
				Cameroon
				Colombia
				Nigeria
				Paraguay
				Haiti
				El Salvador
				Iraq
				Honduras
				Guyana
				Guatemala
				Venezuela

Table A.6. List of countries in merged clubs for Contract Viability

MERGED CLUB 1				MERGED CLUB 2	Divergent Units
Initial Club 1	Initial Club 2	Initial Club 3	Initial Club 4	Initial Club 5	
Botswana	Colombia	Turkey	Ghana	Syria	Venezuela
Hong Kong	India	Pakistan	Senegal	Nigeria	Bolivia
Chile	Jamaica	Papua New Guinea	Togo	Tanzania	Ecuador
New Zealand	Albania	Peru	Costa Rica	Cote d`Ivoire	
Sweden	Uruguay	Tunisia	Indonesia	Iran	
Finland	Malaysia	Philippines	Guyana	Argentina	
Switzerland	Israel	Brazil	Bangladesh	Guinea	
Japan	Taiwan	Thailand	Lebanon		
Singapore	Morocco		Algeria		
United States	Romania		El Salvador		
Bulgaria	Belgium		Egypt		
Poland	Mexico		Gabon		
Austria	Hungary		Niger		
Australia	Greece		Ethiopia		
Paraguay	Malawi		Korea, Republic of		
Portugal	Zambia		China		
France			Honduras		
Netherlands					
Kenya					
Dominican Republic					
Guatemala					
Cameroon					
Canada					
Sri Lanka					
Panama					
Jordan					
Trinidad &Tobago					
Ireland					
United Kingdom					
Denmark					
Italy					
Norway					
Nicaragua					
Burkina Faso					
Angola					
Uganda					

Iraq Liberia Haiti Mali					

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