INSTITUTIONS AND ECONOMIC PERFORMANCE

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Institutions and Economic Performance

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Abstract

This paper studies the effect of institutions on economic performance in a set of developed and developing countries. We apply a kernel density estimation procedure to appropriately weighted samples, and provide a clear visual representation of the impacts of interest. Results suggest that institutions explain a significant fraction of the change in income distribution over time, other things being equal. This wiev challenges a recent opinion emerged in the literature, which claims that only factors accumulation are able to describe convergence/divergence among countries.

`Very preliminary draft. Please do not quote.`

1 Introduction

In the last decades a consistent difference in income per capita and output per worker emerged across countries. It is well known that countries at the top of world income distributions are largely richer than those at the bottom.

A distributional plot about density of countries can account for those changes.

[Figure 1 about here]

From 1960 to 2000 the distribution of GDP per worker changed dramatically. The mean has increased from $13,571$ $US\$$ at constant price to $31,910$. However, it is interesting to note that compared to 1960, the spread in the income distribution grew considerably. Also, it clearly appears that the shape of the distribution has changed. After 40 years the distribution appears to be bimodal, which encompasses the existence of two different equilibria toward which countries tend.

The tradition approach (Barro, 1991, Mankiw, Romer and Weil, 1992 and Dougherty and Jorgenson, 1996) assumes that accumulation of physical and human capital as well as technological advancements should be indicated as the main determinats of economic growth. Those variables, therefore, should also embody an explanation on the convergence/divergence in output per worker, as well as, consequently, on the shape of the distribution.

However, as Knack and Keefer (1993) point out, when studying the determinants of economic performance the role of institutions should be taken into consideration, along with the other traditional variables affecting economic performance.

The reason for encompassing institutions into the determinats of economic performance is better explained in Hall and Jones (1998) and, more recently, Acemoglu, Johnson and Robinson (2006). While accumation of productive factors are simply proximate causes of growth, the institutional framework of a given country should be considered as the fundamental causes. This difference is quite important and stems from the consideration that, although it is well known that factors accumulation boosts economic performance, some countries failed to adopt policies, which favor such an accumulation.

In a remarkable example, Acemoglu (2009) analyzes the different development of South Korea and Nigeria. While the former has been characterized by a considerable development in the last 50 year, the latter did not. More interestingly, the Nigeria owns important natural resources, which could even boost economic growth. The

most important difference between those difference relies on the fact that South Korea introduced such policies, which shaped the incentives to accumulate both physical and human capital, as well as to improve productive technolgies, while Nigeria failed to do so.

While the role of institutions in sustaining economic development has been acknowledged under several points of view, you do not have a unified view on whether they, in fact, boost economic performance.

In a recent paper Beaudry et al. (2005) argue that the institutions critical to production do not play any specific role in determining economic growth and, consequently, they are not liable for changes in income distribution.

In this paper, we offer a different view on the importance of institutions in sustaining economic growth. More specifically, we challenge Beaudry et al. (2005) claims under several aspects. First, we choose more appropriate variable to proxy the quality and the extent of institutions in a country. Second, we choose to study how the entire distribution may be affected by institutions, while Beaudry et al. (2005) take into consideration simply the interquartile range in the distribution.

The paper is organized as follows. In the next Section, we present our empirical methodology. In Section 3 we review the data, which we use in our empirical analysis. In Section 4 we present and discuss our results. Finally, we conclude in Section 5.

2 Empirical Methodology

In order to take into consideration the role played by institutions on the process of converge/divergence in a set of countries, the distributional approach it is very attractive.

Using such an approach allows us to display the behavior of each country, without focussing on a *representative economy*, as we should do using a more orhodox approach.

Nonetheless, using a purely non-parametric approach to analyze income per worker distribution may show some problems, mainly due to the fact that this framework is assumed to be free from any constraint coming from economic theory. Therefore, we prefer to adopt a semi-parametric approach in order to link non-parametric approach to the insights coming from economic theory. Such an approach shares several characteristics with the one used by Beaudry et al. (2005) and is based on the one proposed by Di Nardo, Fortin and Lemieux (1996).

A key issue in this approach is related to the fact that the growth rate of income

per worker is characterized by three different elements:

1. the position of each country in the income distribution at time t;
2. its growth rate in the period $t+s$;
3. the length of the transitional period s.

From the above elements, it follows:

$$y_{i,t+s} = y_{i,t} e^{s(g_i - \bar{g})}, \tag{1}$$

where $y_{i,t+s}$ and $y_{i,t}$ are the income per worker at time $t+s$ and t respectively, g_i is the growth rate experienced by country i between t and $t+s$, s is the length between the temporal points taken into consideration and, finally, $\bar{g}$ is the average growth rate of the entire sample between t and $t+s$.

We make use of the stochastic kernel proposed by Quah (1997), which allows us to estimate the *ex-post* probability of having an income per worker equal to y_{t+s} conditional on the income level at time t. More specifically, by Bayes' law, we can define the stochastic kernel as:

$$f\left(y_{i,t+s}|y_{i,t}\right) = \frac{f\left(y_{i,t}, y_{i,t+s}\right)}{f\left(y_{i,t}\right)}. \tag{2}$$

By substituting equation 1 into equation 2 yields:

$$f\left(y_{i,t+s}|y_{i,t}\right) = \frac{f\left(y_{i,t}, y_{i,t} e^{s(g_i - \bar{g})}\right)}{f\left(y_{i,t}\right)}. \tag{3}$$

The above equation account for different issues, which can be addressed. For our purposes, the most important implication emerging from equation 3 is that it allows us to asses the effect of some specific variables on the ditribution of income per worker in the sample under investigation and, consequently, it account for the weight of this variable in explaining the process of convergence/divergence.

Let us clarify this point. Before proceding in the estimation of the *ex-post* probability of having $y_{i,t+s}$ conditional to $y_{i,t}$, we may estimate the impact of a specific set of variables $\mathbf{x}$ on g, as suggested by economic theory. More specifically, we have:

$$E\left(g|\mathbf{x}\right) = h\left(\mathbf{x}\right). \tag{4}$$

It is important to note that the above equation can be estimated by using a standard growth model. However, it is crucial in building up our model, since it offers a critical

link between non-parametric framework and economic theory. This point should be clear if we consider the following development of our empirical model.

While $\mathbf{x}$ is a vector encompassing the traditional variables, which economic theory indicates as the determinats of growth, such as human and physical accumulation, we also include a proxy for the quality of institutions in a given country, i.e. $x^I \in \mathbf{x}$. As long as the impact of this variable is consistently estimated ($\hat{\beta}^I$), we may use the results coming from the auxiliary regression (4) in order to estimate the following stochastic kernel:

$$f^{x^I}\left(y_{i,t+s}|y_{i,t}\right) = \frac{f\left(y_{i,t}, y_{i,t}e^{s\left[(g_i-\bar{g})-\hat{\beta}^I\left(x_i^I-\bar{x}^I\right)\right]}\right)}{f\left(y_{i,t}\right)}. \tag{5}$$

The estimation of the above stochastic kernel defines the path of convergence of the entire sample from which the effect of the variable x^I has been subtracted. More specifically, assuming that $\hat{\beta}_i^I = \hat{\beta}^I \ \forall i$, the term $\hat{\beta}^I\left(x_i^I - \bar{x}^I\right)$ removes the effect of the variable x^I from the growth rate of each country.

Embodying economic theory into a non-parametric framework allows us to answer some important questions. For instance, the above stochastic kernel allows us to give an answer to our main research question, namely which is the role played by institutions on the convergence process. More specifically, we can understand whether and how much institutions are able to explain the convergence process and how much that process is explained by the factors accumulation. From this result, further interesting analysis emerges. Since we can disentangle and weight the effect of institutions on the convergence process, we can also "simulate" how income per worker distribution could change for a country, had it the institutional endowment of another. Such attempts reveal once again the importance of institutions in determining the process of convergence in a set of countries.

We can summarize our methodological approach in the following steps:

- We estimate equation (4) using a standard growth model;
- We incorporate the estimated parameters in equation (5);
- We use the estimated stochastic kernel in order to evaluate how the process of convergence may be affected by the quality of institutions.

3 Data

We collect information for 75 countries over a period ranging from 1960 to 2000. Following Beaudry et al. (2005), we excluded from our sample all sub-Saharan countries. This choice is based on the fact that civil wars and continuous political instability generated very poor conditions in those countries.

In selecting our variables, we tried to be consistent with the choice operated in Beaudry et al. (2005) in order to make comparision between our results and the findings in the latter paper.

The variable under investigation is per worker GDP. We drow it from the Penn World Tables ver. 7.0. As we mentioned in the methodology section, we estimate a standard growth model (equation 4) in order to derive the paramenters to be included in the estimation of the stochastic kernel (equation 5).

According to standard growth literature, we include in our analysis data for the accumulation of physical capital. Following Beaudry et al. (2005), we construct the stock of capital (K) using the investment ratio (KI) reported in the PWT, namely:

$$K = \log\left[\frac{KI}{(1+\gamma)(1+n)-(1-\delta)}\right],$$

where n is the population growth rate, $\delta = 0.03$ and $\gamma = 0.02$ (Mankiw et al. 1992).

Another important factor, which should be taken into account is human capital accumulation. Our primary source of data is Barro and Lee (2010). Educational investment (E) is calculated assigning a different weight to the enrollment rates in primary (E^P), secondary (E^S) and tertiary (E^T) schools according to the following formula:

$$E = \frac{6E^P + 6E^S + 4E^T}{16}.$$

A more specific discussion deserves the choices of the variables, which proxy the quality of institutions. As we mentioned above, the concept can have a very broad meaning and may encompass different aspect of a society. We consider two of them, namely the degree of democratization ($Polity$) and the extent of market liberalization ($EcFr$). As far as the first aspect is concerned, we believe that the degree of democratization could play a crucial role in affecting the economic performance of countries. It offers an important variable, which is able to explain how the policy maker behave and how the decisional process develops.

We proxy the extent of democratization in a country by using a variable ($Polity2$) taken from the Polity IV database. It is a ten-point scale with low/high values indicating the absence/presence of democratic institutions within a country.

However, not only political but also economic institutions matter. We refer to the rules which shape incentives toward economic activities. Enforcement of property rights, low regulation, flexible labor market are only few aspects, which may enhance economic development. They are closely related to the well functioning of economic institutions and need to be taken into consideration in our analysis. We proxy the quality of economic institutions by using the index of economic freedom ($EcFr$) regularly compile by the Fraser institute. It is a 10-point index with low/high values indicating a poor/high quality of economic institutions.

4 Empirical Results

In this section, we review the main results, which obtained in our empirical analysis. We present the analysis related to the estimation of the stochastic kernel.

Let us consider first Figure 2. It displays the estimation of stochastic kernel for the entire sample from 1960 to 2000. While it shows a double pick in the distribution (panel A), it is more interesting to analyse the contours plot in panel B.

It can be noted that income per worker clusterizes around two different basin of attraction, one for rich countries and one for the poor ones. Moreover, it is interesting to stress that the estimated mass lies almost perfectly on the 45 degree line. The meaning of this findings is that there is a large persistency in the distribution. In other words, the clusterization process is likely to remain unchanged for a long time (Quah, 1997).

[Figure 2 about here]

Following Beaudry et al. (2005), it is likely that the twin-peaks characterization in the distribution emerged from the 1978 onwards. Therefore, in panel C and D of Figure 2, we show the contours plot for the sub-periods 1960-1978 and 1979-2000. As expeceted, the divergence process appears to be more evident after the 1978. In the first period the two masses representing rich and poor countries were quite closed, while in the second period the valley between them is more pronunced.

This result may be a consequence of an erroneous choice of the value of s. In the previous figure we set $s = 5$. However, using a different time lag could bring different

information. With this aim, we repeat the previous analysis in Figure 3, where we set s equal to 10 and 20 respectively in Panels A and B.

[Figure 3 about here]

As it appears to be clear from the first panel, although we consider a time gap of 10 years, countries distribute around two clusters, which seems to be quite distant each other. The same pattern emerges if we look at Panel B ($s = 20$). What is interesting to note, is that whenever the time gap increases, the mass distributes slightly above the 45-degree line. This implies that if we consider income per worker distribution in a larger time period, the probability that the distribution itself remains unchanged decreases. Say it differently, the distribution of income shows a smaller persistency in the Panels presented in Figure 3.

The above analys shows that economic systems clusterize around two basin of attraction. The next step in our analysis is to understand what determines this behavior.

Let us consider the graphs reported in Figure 4. We conduct a counterfactual analysis in order to study how the distribution would look like, all determinats of economic growth were removed. In Panel A we show the estimated stochastic kernel, where all the variables traditionally indicated by economic growth theory are removed. The distribution still shows the existence of two clusters, around which countries distribute. In Panel B, we present the counterfactual contours plot where the dashed plot represent the actual distribution, while the solid line plot indicates the counterfactual distribution. It can be noted that if we remove all the traditional factors, which determine economic development according to standard growth theory, the distance between the two clusters increases. This implies that if we remove physical and human capital accumulation from our analysis, the distance between rich and poor countries tend to enlarge. This result is not surprisingly and confirm the importance of such factors.

[Figure 4 about here]

While Panel C shows the transitional dynamics of the income per worker distribution, it is more important to look at Panel D. The contours plot shows the estimated mass, when the traditional growth factors have been included in the analysis, but the effect of political and economic institutions has been removed. The interesting result, which emerges from our analysis, is that when we remove institutions, the two clusters appears to be closer. The meaning of this findings is that institutions boost economic

development and, *other things being equal*, show to characterize the basin of attractions to which rich and poor countries tend. Say it differently, institutions matter in determining the good performance of rich countries and the poor behavior of less developed ones.

We repeat the same analysis in FIgure 5, where we split the sample using the 1978 as the year when changes should occur.

[Figure 5 about here]

Results largerly conferm the importance of institutions for economic growth, while the effect seems to be larger after 1978.

5 Concluding Remark

This paper investigates the impact of institution on income per worker distribution. We employ a semi-parametric approach in order to link the non-parametric estimation framework to the growth theory. A similar approach has been adopted by Beaudry et al. (2005). While the latter claim that insitutions do not play any specific role in determining the distribution of income per worker, our findings reverse this results.

Institutions matter and according to our counterfactual analysis, they affect the distance between rich and poor countries. This results seem to be robust to different time length in our analysis and are controlled for the traditional factors affecting growth.

Moreover, our results appear to be consistent with the distinction, which emerged in economic theory, about fondamental anf proximate causes of growth.

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Figure 1 - Estimates of distribution of countries according to Log GDP per worker in 1960, 1980, 2000

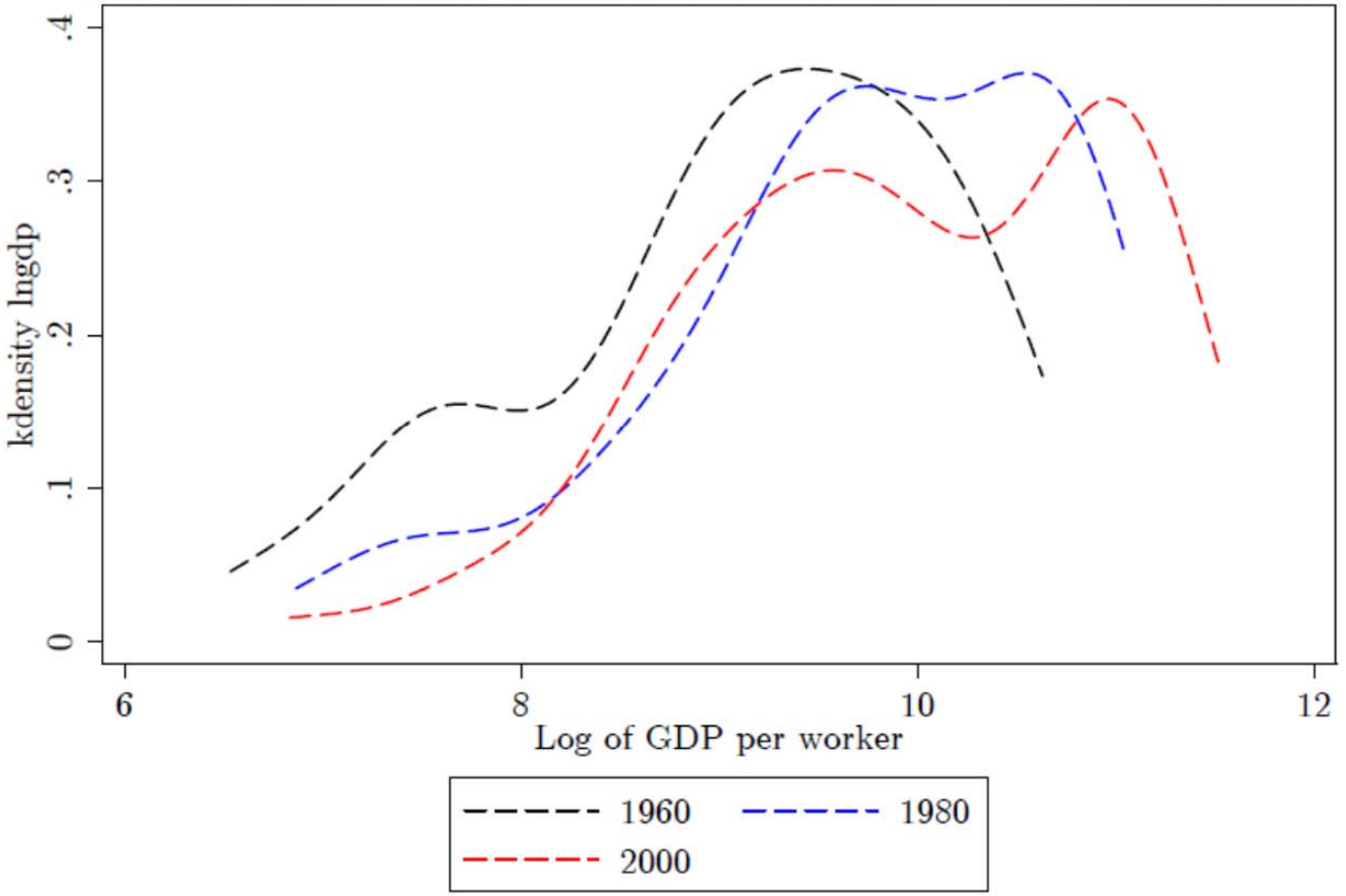
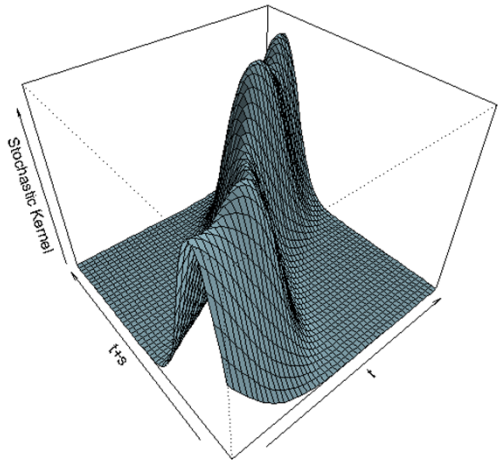


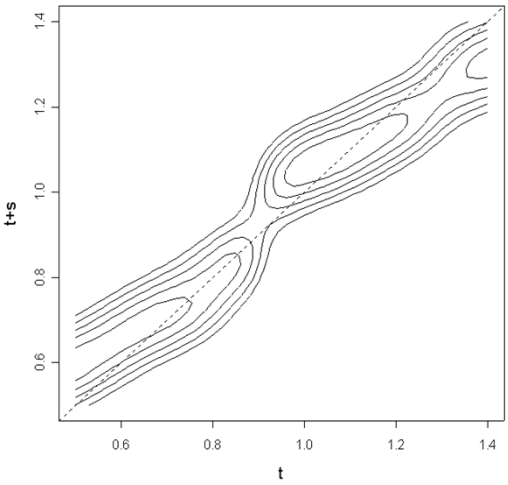
Figure 2
Stochastic Kernel Analysis (1960-2000)

Panel A reports the stochastic kernel estimated for transitions of five years (i.e. s between 1960 and 2000 for 75 countries. Panel B reports the contours plot of the estimate for fixed levels of probability. Vectors t and $t+s$ consist of 3000 observations of per worker GDP (75 countries for 40 years). Panel C reports the contours plot for the sub-period 1960-78. Panel D reports the contours plot for the sub-period 1979-2000. Vector dimensions consist of 1350 and 1650 observations respectively. All estimates are performed by means of the Gaussian Kernal under the hypothesis that the data are normally distributed.

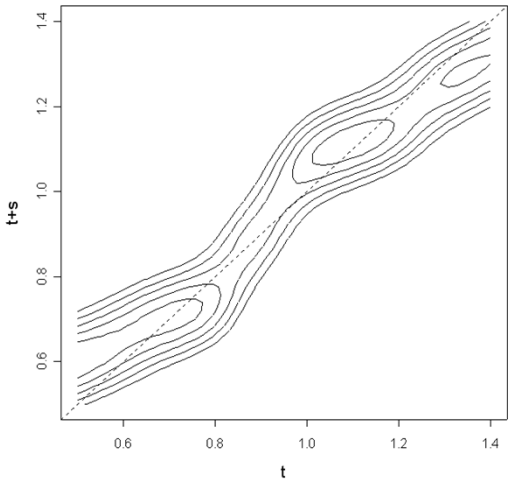
Panel A. Stochastic Kernel (1960-2000)



Panel C. Contours Plot (1960-78)



Panel B. Contours Plot (1960-2000)



Panel D. Contours Plot (1979-2000)

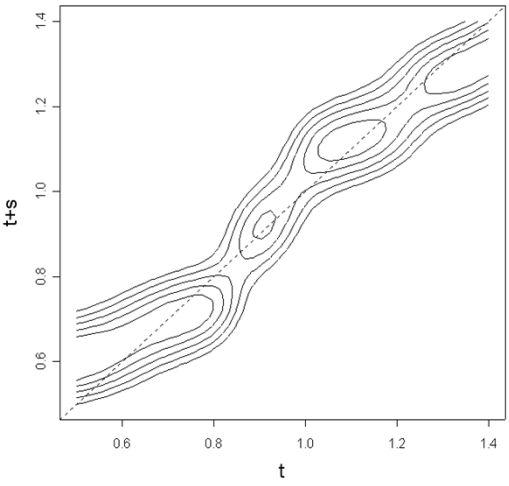


Figure 3
Alternative Transitional Periods

Panel A reports the contours plot of the stochastic kernel for transitions of 10 years (i.e. s=10) between 1960 and 2000. Panel B reports the contours plot of the stochastic kernel for transitions of 20 years (i.e. s=20) between 1960 and 2000.

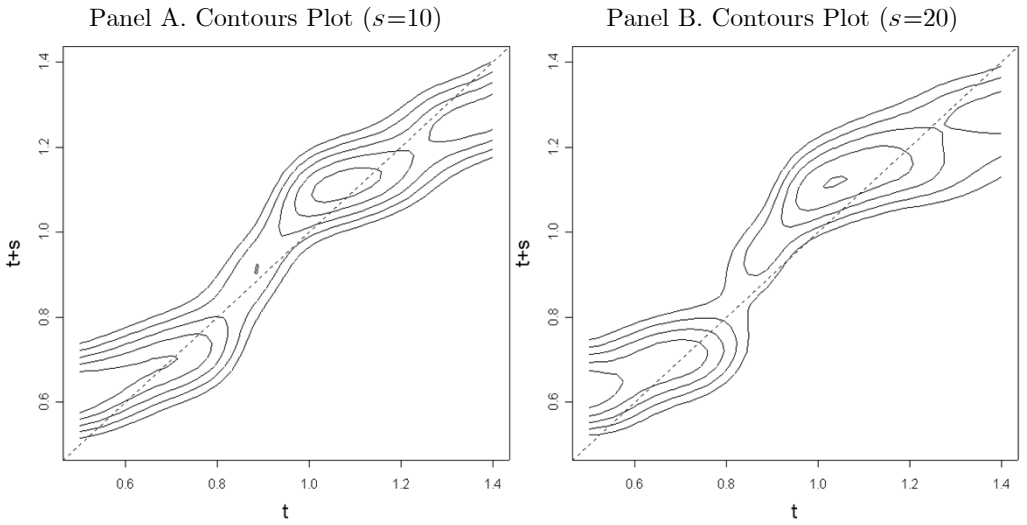
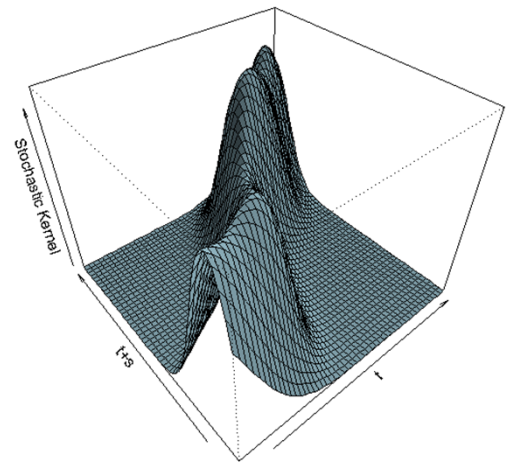


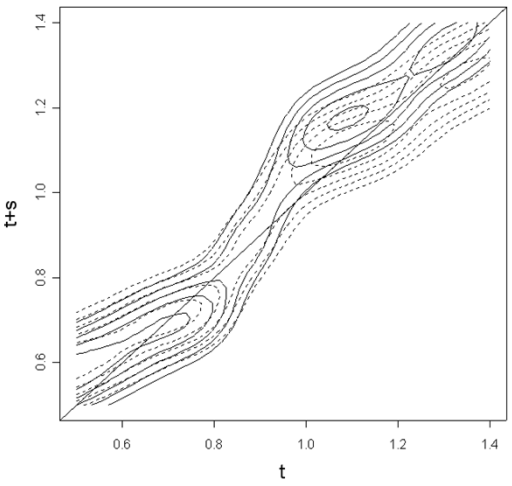
Figure 4
Counterfactual Dynamics

Panel A reports the stochastic kernel estimated for transitions of five years (i.e. s between 1960 and 2000 where the effect of all variables from the steady state convergence process has been removed. Panel B reports the contours plot of the estimate for fixed levels of probability, when steady state convergence is removed from the transitional paths. Panel C reports the contours plot of the stochastic kernel estimated for transitions of five years between 1960 and 2000 after conditioning countries economic growth rates using the effects of political and economic institutions.

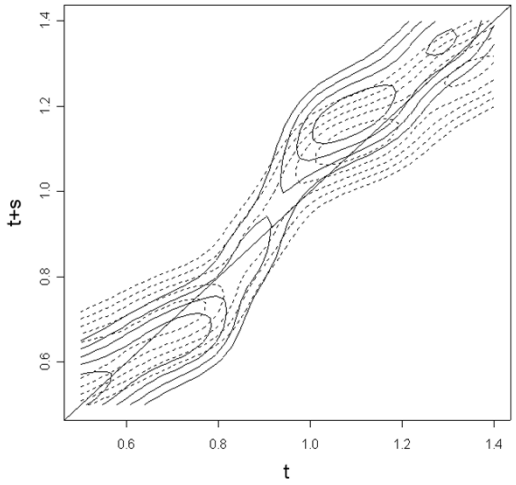
Panel A. Counterfactual Stochastic Kernel



Panel B. Counterfactual Contours Plot



Panel C. Counterfactual Contours Plot (Transitional Dynamics)



Panel D. Counterfactual Contours Plot (Institutions Effect)

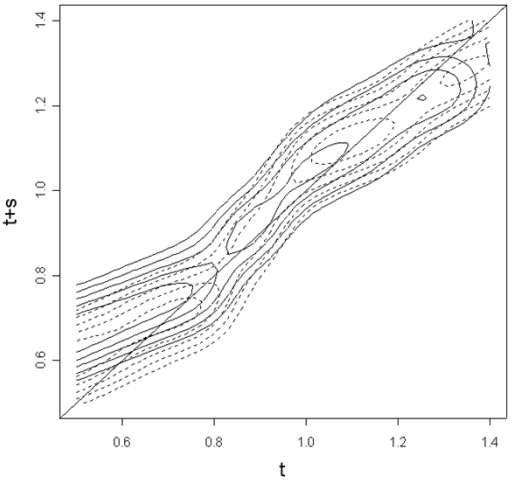
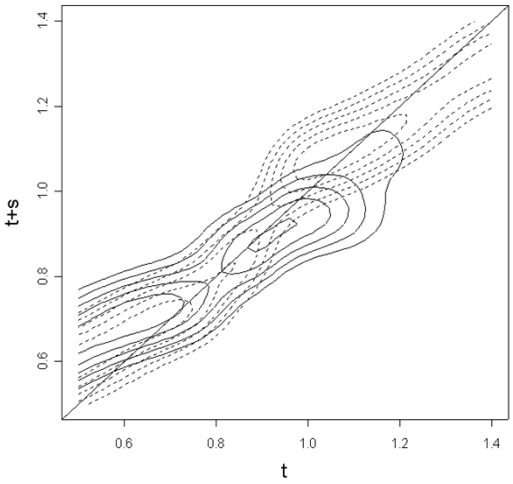


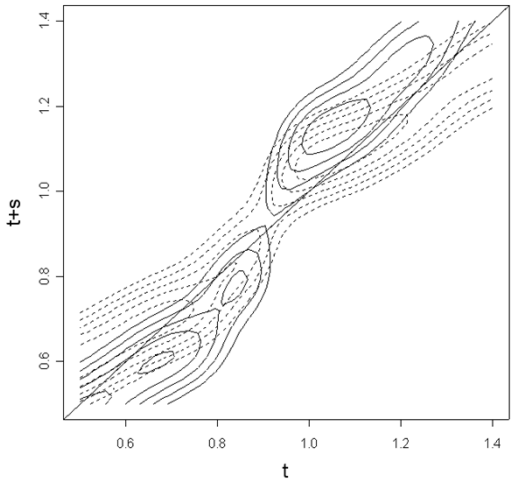
Figure 5
Counterfacual Dynamics for Sub-Periods

Panel A reports the contours plot of the stochastic kernel estimated for transitions of five years between 1960 and 1978 after conditioning countries growth rates using the effects of institutions only. In Panel B the estimates are obtained removing the effect of the steady state convergence from transition paths. Panel C reports the contours plot of the stochastic kernel estimated for transitions of five years between 1979 and 2000 after conditioning countries growth rates using the effects of institutions only. In Panel D the estimates are obtained removing the effect of the stady state convergence from transition paths. In all panels the dotted lines represent the actual dynamics.

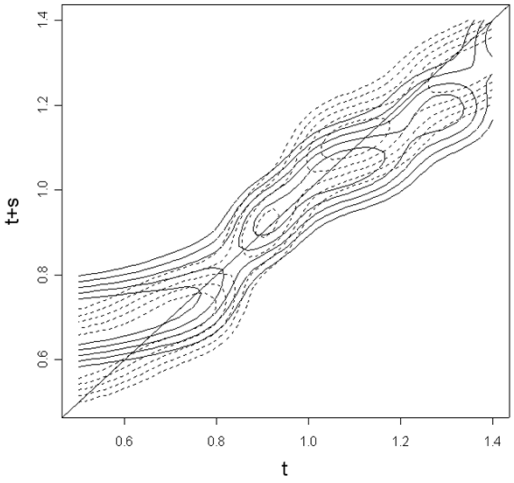
Panel A. Count. Contours Plot 1960-78
(Institutions Effects)



Panel B. Count. Contours Plot 1960-1978
(Transitional Dynamics)



Panel C. Count. Contours Plot 1979-2000
(Institutions Effects)



Panel D. Count. Contours Plot 1979-2000
(Transitional Dynamics)