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CROSS COUNTRY ECONOMIC GROWTH DYNAMICS
A Comparative Study among Islamic and Non Islamic Economies

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Abstract-This paper aims to explore the evolutionary dynamics of per capita income among Islamic and non Islamic economies over the period of 1960-2009. First, the behavior of dynamics of relative per capita income over time is analyzed by visual inspection of their non-parametric density distributions. Next, we employ the Markov chains approach to predict a pattern of convergence among the two groups of countries. Our tentative conclusions that can be drawn from the three analyses are as follows. First, there is a high level of persistence in the relative position of Islamic economies, consistent with a low degree of mobility in the income distribution. Second, the non Islamic economies tend to polarize gradually, which may be attributed to externalities linked to localization or to the proximity economic relationship among the countries. Those findings suggest that cross countries reallocation to the economic resources seems to have fostered growth of per capita income in those countries that have experienced it over time.

Keywords: Islamic and Non Islamic Economies, Convergence, Polarization, Kernel Densities, Markov Chains
JEL Code: O10, O15, O40, O53

Introduction

Convergence of cross section economic growth has long concerned both economists and politicians in the last two decades (for more extensive review, see for example: Capolupo, 1998; De La Fuente, 2000). The central issue of the theory and empirics of economic growth is whether there is a tendency for the poorer economies to grow faster than the richer economies and thereby to converge in living standard. Or instead, are there tendencies for the initially richer regions to get richer and the poor to get poorer, so that the gap across different regions tends to widen over time?

The existence of convergence is quite important. For point of view of researchers, it is an important test for the validity of neo-classical models when confronted with the endogenous growth models (see: Romer, 1986, 1990; Lucas, 1988; Robelo, 1991). Policy makers, in turn, consider convergence also as crucial issue, especially regarding developing countries or regions. If the convergence property is present, the poorest areas potentially will be able (at least on theoretical basis) to catch up with the richest in the long run and therefore improve their relative levels of per capita income. In contrast, the endogenous growth models imply permanent differences in growth rates across economies.

A number of studies concerning the issue have been conducted (see for example: Barro, 1991, Barro and Sala-i-Martin, 1992; Mankiw, Romer, and Weil, 1992; Islam, 1995; Caselli, Esquivel, and Lefort, 1996). The focused on cross countries disparity covering US, European, OECD, and a wider countries. In general, they found that the cross country per capita income disparity in those samples was persistent. Unfortunately, they did not explore yet the transition dynamics of per capita income distribution across countries. Also, none of them exploits cross countries income disparity based on similar economic characteristics.

Islamic countries provide a unique opportunity to examine the nature of economic growth and convergence within an economy which contains wide variation in socio-economic and geographical characteristics. Given the significance of having abundant natural resources, specific tax transfer system, and equalization payments, whether the poor stay poor is a key political and economic issue. It has been also the subject of intense research for last decade, especially since economic crisis in 1997/1998 and global financial crisis in 2007/2008.

This paper contributes to the cross countries economic growth literature concerning particularly to Islamic economies compared to non Islamic countries. Our approach is in the same spirit with the previous studies, although it has two significant differences. First, we employ the non-parametric method (i.e. Kernel density function) to identify the pattern of per capita income distribution across countries. Second, we focus on the transition dynamics of relative per capita income distribution using Markov chain. This paper also detects some particular changes in the movement of economies according to their per capita income.

Our findings seem quite revealing. In general, we find that the high level of persistence in the relative position of economies in Islamic countries, consistent with a low degree of mobility in the income distribution. In contrast, we find that the low level of persistence in non Islamic economies. More specifically, the richest Islamic countries tend to concentrate gradually and perform twin-peaks. The rest of this paper is organized as follows. Section 2 briefly summarizes of the existing literature. Section 3 highlights the previous results. The methodology is described in the next section. This is followed by reporting the main empirical results. Finally, some concluding remarks are drawn.

2. Review of Literature

Three main concepts of convergence appear in the classical literature (see: Galor, 1996). First, the absolute convergence hypothesis that is per capita incomes of

countries converges to one another in the long run independently of their initial conditions. In the literature economists state it as unconditional convergence. Sala-i-Martin (1996a; 1996b) stated it as σ-convergence. It holds if other thing being equal the dispersion of real per capita GDP levels tends to decrease over time.

Second, the conditional convergence hypothesis that is per capita incomes of countries that are identical in their structural characteristics (e.g. preferences, technologies, rates of population growth, government policies, etc.) converge to one another in the long run independently of their initial conditions. Barro and Sala-i-Martin (1992) stated it as β-convergence. It can be divided further into conditional and unconditional β-convergence referring in the change of their structural characteristics. It holds if the poorer regions tend to grow faster than rich ones.

Third, the club convergence hypothesis (polarization, persistent poverty, and clustering) (see: Durlauf and Johnson (1995) and Quah (1996) for supporting evidence for the club convergence hypothesis), that is per capita incomes of countries that are identical in their structural characteristics converge to one another in the long run provided that their initial conditions are similar as well. It means that countries converge to one another if their initial condition is in basin of attraction of the same steady state equilibrium.

Some basic idea underlying most models of economic growth may shed light on this issue. The classical approach of convergence can be traced back to the neoclassical economic growth model. If the production function is of the neoclassical type (y=f(k)), it can be shown that there is only one steady state to which the economy converges (see: Barro and Sala-i-Martin, 1992; 1998). This is the well-known property of the Solow (1956) model for a constant saving rate or of the Ramsey-Cass-Koopmans model (see for instance: Romer, 1996: chapter 1).

Focusing, for simplicity, on the Solow model the dynamics of the economy can be described by a very simple expression. Denoting the constant saving rate by s, the average product of capital by y/k, and allowing for constant rate of depreciation and population growth, δ and n, respectively, the rate of growth g is given by the following equation (all variables are expressed in per capita terms):

$$g = s\frac{f(k)}{k} - (\delta + n) \qquad \ldots\ldots\ldots(1)$$

This rate of growth may be positive, negative, or zero. When it takes this last value it refers to the steady state situation. Because of the aforementioned assumptions, marginal and average productivity of capital are monotonically decreasing, in which case there is a unique steady state level of both output and capital per capita. It means that the neoclassical growth model predicts a unique equilibrium (steady state).

Several steady states are possible, however, if some assumptions concerning the production function are relaxed and, in particular, if it is allowed for the average productivity to increase within a certain range. Notice that the increasing returns are only necessary in a limited interval of the domain of k, but not at all possible values of k (for a graphical analysis see Barro and Sala-i-Martin, 1998). Thus, conceivably, a country with a small level of per capita capital could end up in an abnormally low-level equilibrium state with respect to k, a considerably higher amount of investment being required in order to reach the higher steady state.

Since the corresponding increase in saving may be difficult to implement, the country may remain permanently in the so-called poverty trap represented by the low steady state. If there were many countries in this steady state, in turn associated with smaller values of capital and income per capita, the world income distribution would display the so-called 'twin peaks' property. A rationale for this fact is that multiple equilibria steady states are indeed possible within the framework of endogenous growth models.

According to Quah (1996, 1997), countries are not automatically headed towards a common level per capita income. He claims that the likelihood of a smooth trend toward convergence should be replaced by polarization of countries in two or more groups that do not seem to reduce the gap between them over time. Consequently, countries are breaking down into two categories: the low-income countries, on one side, and the developed nations, on the other. This is the consequence of increasing returns, externalities or other non-convexities in the production function (Barro and Sala-i-Martin, 1998).

At the empirical level, the facts that not only the observed per capita GDP levels but also their growth rates varied considerably across countries over the past few decades are widely documented (see Barro and Sala-i-Martin, 1998). There are a number of theoretical results that offer justification for having different possible growth regime. For example, Quah (1996) points out that coalition of economies with different convergence dynamics, depending upon initial condition, from endogenously. Equally, Jones (1997) argues that there is no reason to expect that current per capita output leaders maintain their position in the long run as the factors determining the entire cross sectional distribution may change.

There are also several factors that may imply possible different growth patterns, such as political instability (Alesina, et.al., 1996), location of countries (Moreno and Trehan, 1997), and free trade (Ben-David and Loewy, 1998). Other factoring implying heterogeneous growth are government intervention (Lee, 1996), regional instability (Ades and Chua, 1997), social conflict (Benhabib and Rustichini, 1996), and the distribution of human capital (Galor and Tsiddon, 1997). In short, those studies offered some useful different approaches to address economic growth and income distribution across economies.

3. Previous Empirical Studies

Recent interest in the convergence hypothesis began with two papers by Abramovitz (1986) and Baumol (1986). Furthermore, since the introduction of the traditional approach to economic convergence by Barro (1991), Barro and Sala-i-Martin (1992) and Mankiw, Romer, and Weil (1992), various extensions and applications have been conducted. Originally, most researchers have used cross-section regressions of the growth rate of per capita income, over some period, on the level of per capita income at the beginning of the period (or initial per capita income); conditional on a number of variables specific to each economy. They generally have found that economies converge at rates of about 2 percent.

The cross-section approach, however, has been questioned in several aspects (for more critical reviews, see: Maddala and Wu (2000) and Quah (1996)). First, this type of regressions is likely to produce invalid inferences on convergence rates. Specifically, Evans (1997) shows that even if the conditioning variables control 90 percent of the variance of the per capita output in the steady state, the probability limit of the estimator of the coefficient on initial level per capita income is about half of its true value.

Second, Levine and Renelt (1992) found that the cross-section regressions are not robust to the set of control variables used. Also, it has been pointed out that this approach does not consider the heterogeneity across economies and mislead the dynamics of output, since it uses averages of growth rates over long periods of time, implying that economies grow continuously and uniformly over time (Grier and Tullock, 1989; Evans, 1998). As a result, it misleads the dynamics of output since it uses averages of growth rates over long periods of time, implying that economies grow continuously and uniformly over time (Quah, 1993a, 1993b).

Several alternative methods have tried to deal with the aforementioned problems. Generally, they use dynamic panel data models with individual effects, formally derived from a partial adjustment mechanism between actual and steady state levels of per capita income. Some examples are Canova and Marcet (1995), Evans (1996, 1997, 1998), Islam (1995), and Caselli, Esquivel, and Lefort (1996). In general, most of the previous authors find evidence of conditional convergence among groups of countries relatively homogenous, such as the USA states, OECD countries or European regions.

Islam (1995) presents evidence on conditional convergence in a wide and heterogeneous sample of countries. Islam's study can be considered as an extension of Mankiw, Romer, and Weil (1992) to a panel context. Islam argues that the low convergence rates obtained by Mankiw et.al. is due to the omission of country specific effects and finds, using minimum distance and LSDV (least squares dummy variables) estimators, higher convergence rates (between 4 and 5 percent).

This study, though, has also been subject to several objections. As in Mankiw et.al., it is not possible to pool 98 different countries in a single sample (Grier and Tullock, 1989), neither in Islam (1995) is possible to pool all the countries in a single panel (Grier, 1998). Moreover, Lee, Pesaran, and Smith (1998) and Maddala and Wu (2000) show that the homogeneity restrictions imposed a priori will bias the convergence estimates.

On a different avenue of research, Durlauf and Johnson (1995) estimated cross section regressions allowing for sub sample heterogeneity and concluded in favor of the existence of possible different steady state regimes for different groups of economies. Following Friedman's (1992) suggestion that researchers should focus on the time series properties of the cross-economy variance process of the logarithm of per capita output, Evans (1996) finds that growth rates per capita outputs of 13 OECD countries seem to revert toward a common trend.

In order to capture heterogeneity, some researchers explicitly incorporate it into the cross section growth regression. According to Anselin (1988) heterogeneity could take the form of spatial interdependency and spatial heterogeneity. In principle Anselin would take into account regional proximity to the cross section economic growth regression model. Rey and Montouri (1999) and Fingleton (1999), among others, successfully explained that economic growth in one region is determined significantly by economic growth in surrounding regions so that regional convergence is achieved.

Quah (1993) -- and series of his papers -- is on of the authors that have given this topic most of its present popularity. Furthermore, he has forcefully stressed the point of using the Markov chains approach as a suitable test for the existence of convergence clubs. Quah (1993) analyses a sample of 118 nations during the period 1962-84 and does find some evidence of polarization into two groups: a group of rich-income countries and a group of low-income countries.

In subsequent papers (Quah, 1996, 1997), he extends his analysis to the US, finding a larger degree of mobility among states and no tendency to polarization. One of the most revealing finding of Quah's (1993a, 1993b, 1996, 1997) studies is that the entire cross-sectional distribution of per capita income seems to have evolves towards a bi-modal distribution at the end of the sample period, which clearly challenges several regression based convergence results and is more in line with cross national heterogeneity and a polarization process.

Canova (1999) finds clubs within the distribution of per capita income of OECD countries, by means of employing a technique that applies some ideas from Bayesian statistics to the analysis of polarization. Chatterji (1992) has proposed an alternative technique used in order to test of convergence clubs. The basic idea is to focus in the pattern of convergence or divergence of income gap with the leader. Using the technique, Chatterji and Dewhurst (1996) identified a high-income and a low-income group of regions

for the UK in the period of 1977-91. Villaverde and Robles (2001) have also used this approach and identified some degree of divergence from the leader within the Spanish provinces during the last decades.

Using more advanced techniques, Cermeno (2002) utilized Markov-switching process to model the rate of growth of per capita income. He considers panel data sets of 48 USA states, 13 OECD countries, and a wider sample of 57 countries, all with observations for the last 4 decades. For each sample, he characterizes each regime's first and second moments, the transition probabilities as well as the unconditional probabilities of being in each regime. He found in general that low growth regimes exhibit high volatility but are not persistent while the high growth regimes are less volatile and more persistent.

To sum up, various studies above suggest that transitional dynamics of per capita income across countries really matters to analyze economic growth convergence. In line with those studies, we will try to apply their approaches to look at the cross section disparity in the case of Islamic and non Islamic economies. We hope that the use of them will provide a deeper explanation. Furthermore, it then stimulates other researchers to re-estimate using more sophisticated devices so that the profile of cross countries disparity will be more accurate for policy makers to address the related problems.

4. Research Method

In order to have a better understanding about the shape of the relative income distribution or how it evolved over the years in Islamic and non Islamic countries, the Kernels of the actual relative regional income in different time periods are estimated so that their shapes and inter-temporal dynamics can be studied. A Kernel estimator of a set of observations – in this case the relative rankings of the cross countries per capita income – is an estimated distribution function from which the observations are likely to have been drawn (for details, see Silverman (1986)). Mathematically, the Kernel estimator f(x) is defined as

$$f(x) = \frac{1}{Nh} \sum_{j=1 \to N} K\left[\left(\frac{x - X_j}{h}\right)\right] \quad \ldots\ldots. (2)$$

where,
X_j = data
N = number of data points
H = window width/smoothing parameter
K = Kernel/weighting function (assumed to be the normal distribution in this paper)

The Kernel density estimation requires several steps (see Silverman, 1986). In the first step, in each year, the real per capita income of each group of countries was re-scaled as a fraction of the total average real per capita income, such that the distribution is restricted to lie in the positive values. Since by construction, the national average real per capita income is always 1 (100 percent).

In the next step, for a suitably large number of points spanning the interval, the relative frequency, i.e. the unconditional probability, with which each of these values could have occurred, was estimated. The probability of each point was computed as the weighted average of the distance of that points from the given relative incomes of all the countries in each group, with the weights drawn from a normal or Gaussian distribution centered at that point. Weights drawn from an Epanechnikov distribution, which is the other frequently used weighting method, did not seem to make any material difference to the shape of the estimated Kernels.

In the third step, the relative frequencies of these points were filtered for noise using the procedure in Silverman (1986). The collection of the filtered relative frequencies formed the Kernel of the relative cross countries incomes in that year. The area of the distribution was normalized to 100 (percent). The Kernel estimators tell us how likely it is that real per capita income, on average, was a certain fraction of national average real per capita income in a particular year.

As stated above, the Kernel density distribution is helpful to identify the shape of the relative income distribution or how it evolved over the years. But it can not predict each transition probability of the distribution will converge toward each steady state. Markov chain offers the transition probability of each distribution to achieve each steady state. Markov processes can be considered as a special case of stochastic processes. They can be defined in continuous of discrete time and relate to a continuous or discrete set of states. Following Amemiya (1985), a Markov model can be characterized by the following two properties:

(1). A sequence of binary random variables taking the values

$y_j(t) = 1$ if the ith unit is the state j at time t and

$y_j(t) = 0$ otherwise,

for i = 1,...,n

If, in a discrete-time context, for each unit i, the distribution of the vector $y_i(t)$ depends fully and only on $y_i(t-1)$, then the process is a first-order discrete-time Markov process.

(2). A set of transition probabilities, in which $pi_{jk}(t)$ denotes the probability of unit i being in the state j at time (t-1) and jumping to state k at time t. If the set of states is finite and denumerable then all the transition probabilities may be ordered in the form of the so-called Markov matrix.

$Pi = \{pi_{jk}(t)\}$, in which the sum of all the element of a row will add up to one.

Let p(t) be the vector describing the distribution of the units over the different states at moment t. It holds of course that

$$p_j(t) = 1/n \sum_{i-1 \to n} yi_j(t) \quad (3)$$

where n is the number of units. Such model is called a Markov chain.

Furthermore, if the transition probabilities do not depend on time or on the unit, the model is called homogenous and stationary. It can be shown that, under fairly general conditions, there exists a uniquely defined long run, or 'ergodic', matrix of transition probabilities P^{∞} and a corresponding vector of equilibrium probabilities associated to a stationary Markov chain. More formally, if we denote the transition matrix by $P = \{p_{jk}\}$, then the 'ergodic' equilibrium vector is π, verifying

$$\pi = p'\pi \quad (4)$$

Such that

$$\pi_j \geq 0 \text{ and } \Sigma_{j \in E}\, \pi_j = 1 \quad (5)$$

It follows that

$$\lim_{t \to \infty} p_j(t) = \pi_j \quad (6)$$

In other words, in the long run the elements of the transition matrix will reach the state of nature j with probability π_j, irrespective of the starting position. These ideas are intuitively appealing for the study of a spatial convergence or divergence, as Quah (1993a) has shown in the papers mentioned above. If we consider a finite number of states (as determined, for example, by different levels of per capita income), the shift of the units among states can be easily traced and, therefore, the transition probability matrix can be obtained.

This matrix will show the dynamic behavior of the units, since the transition matrix expresses, roughly speaking, and the probability of a unit starting off in a particular state and ending up in the same or in a different state. Notice that, by means of using first-order Markov chains, it is implicitly assumed that all the relevant information about the past behavior of a particular region is embedded in its fundamentals underlying the steady state towards which a country or region converges are fairly stable over time.

We can apply -- again following Amemiya (1985) -- the rule that the maximum likelihood estimator of the transition probabilities can be computed as follows:

$$P_{jk} = \frac{\sum S_{jk}(t)}{\sum_t \sum_k S_{jk}(t)} = \frac{\sum_t \sum_i yi_j(t-1) yi_k(t)}{\sum_t \sum_k \sum_i yi_j(t-1) yi_k(t)} \quad \ldots (7)$$

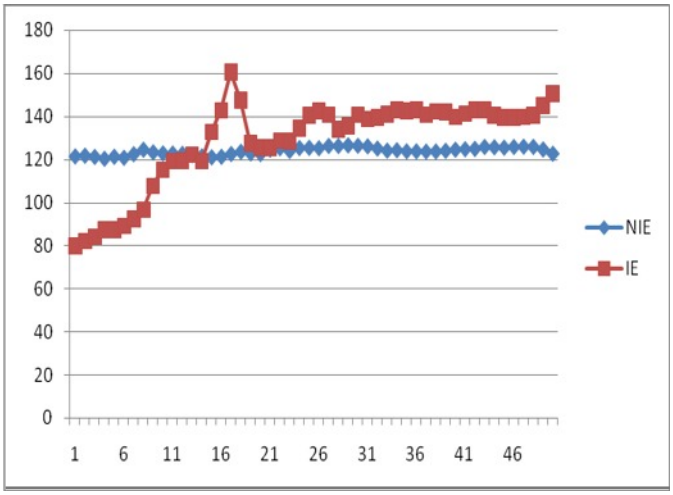
in which $s_{jk}(t)$ denotes the number of units that have changed from state j to state k in period t. The ergodic vector, that describes the income distribution of the units in the long run, is obtained by means of iterating the transition matrix. If the ergodic density vector has only one maximum, it suggests some degree of convergence. Instead, if it tends to a bi-modal (or even tri-modal) structure it may be pointing to some degree of polarization.

The nature of this analysis, however, suggests that results regarding the steady state income distribution should be looked at with some caution. The computation of long-run probabilities implicitly implies that historic probabilities will somehow carry over in the future. In other words, there is no place for shocks to alter the course of this economy and change the current trend. This surely is unrealistic; there is no reason to believe that institutions, the rate of technological progress, the nature of human capital and other crucial factors determining per capita income will remain constant over time.

5. Results and Discussion

Before presenting the results, a word about data is in order. Data on cross country real per capita gross domestic product in constant price 2000 US Dollar published electronically by World Bank are used to test the existence of polarization among Islamic and non Islamic economies. The Islamic countries do not necessary those are constitutionally Islamic country. We define that the Islamic economies are those countries that the majority of population is Muslim. We also consider that the Islamic countries are those joined to IOC (Islamic Organization Conference) as well as IDB (Islamic Development Bank). We select 27 Islamic economies and 66 non Islamic countries which have complete data covering 1960-2009.

In order to be comparable to the previous studies, the sample covers the period of 1960-2009. All samples period are divided into 3 sub-periods consisting of 25 years observations, they are 1960, 1984, and 2009 in order to provide a complete picture about the dynamics of relative



income distribution. Figure 1 presents the sigma convergence for the two groups respectively.

Figure 1: Disparity Indices of Islamic (IE) and Non Islamic Economies (NIE), 1960-2009

It is notable that the income disparity (calculated by mean value to standard deviation ratio) in the Islamic economies have been increasing over the sample periods compared to

the non Islamic countries. At the beginning year, the income disparity index in Islamic economies was relatively low (around 80 percent) and then increased sharply in the next

decade. The highest value of disparity index was in 1976 (at least 160 percent) regarding to the Israel-Egypt war causing high income generated by oil export revenue. The income disparity in non Islamic economies, on the other hand, was relatively stable around 120 percent.

Figures 2 highlights some basic features of the income distribution among Islamic and non Islamic economies in selected years. The non-parametric densities have been computed using Gaussian Kernel, with optimal bandwidth selected for each case. Figures 2 panel I captures the income profile for the starting year (1960). It departs largely from the normal distribution, and the probability density is left-skewed. In particular, some back-of-the-envelope computations show that a large proportion of the countries (more than a half) did not even reach 75 percent of the national average real per capita income. Panel B represents the situation in 1984. The progress experienced in the lowest part of the distribution is noticeable, since the probability mass of Islamic economies has partly shifted slightly to the left. For the non Islamic economies the probability mass has remained constant relatively. It is also notable that a local peak at the left of the mode is now dramatically low, form 0.0013 to 0.0008 for Islamic economies and form 0.00011 to 0.00006 for non Islamic economies, suggesting some degree of polarization for this specific year. The two local peaks at the right now appear, suggesting that some degree of polarization of the higher-income regions for this specific year was also occurred. Panel C exhibits the distribution in 2009. Even though the probability mass in Islamic economies has remained unchanged, only one local peak at the right now appeared, suggesting that some degree of polarization of the higher-income regions for this specific year was also decreased. For non Islamic economies, the situation has been same as in 1984. There was not local peak at the right side of the probability mass implying that the degree of polarization progress was stagnant.

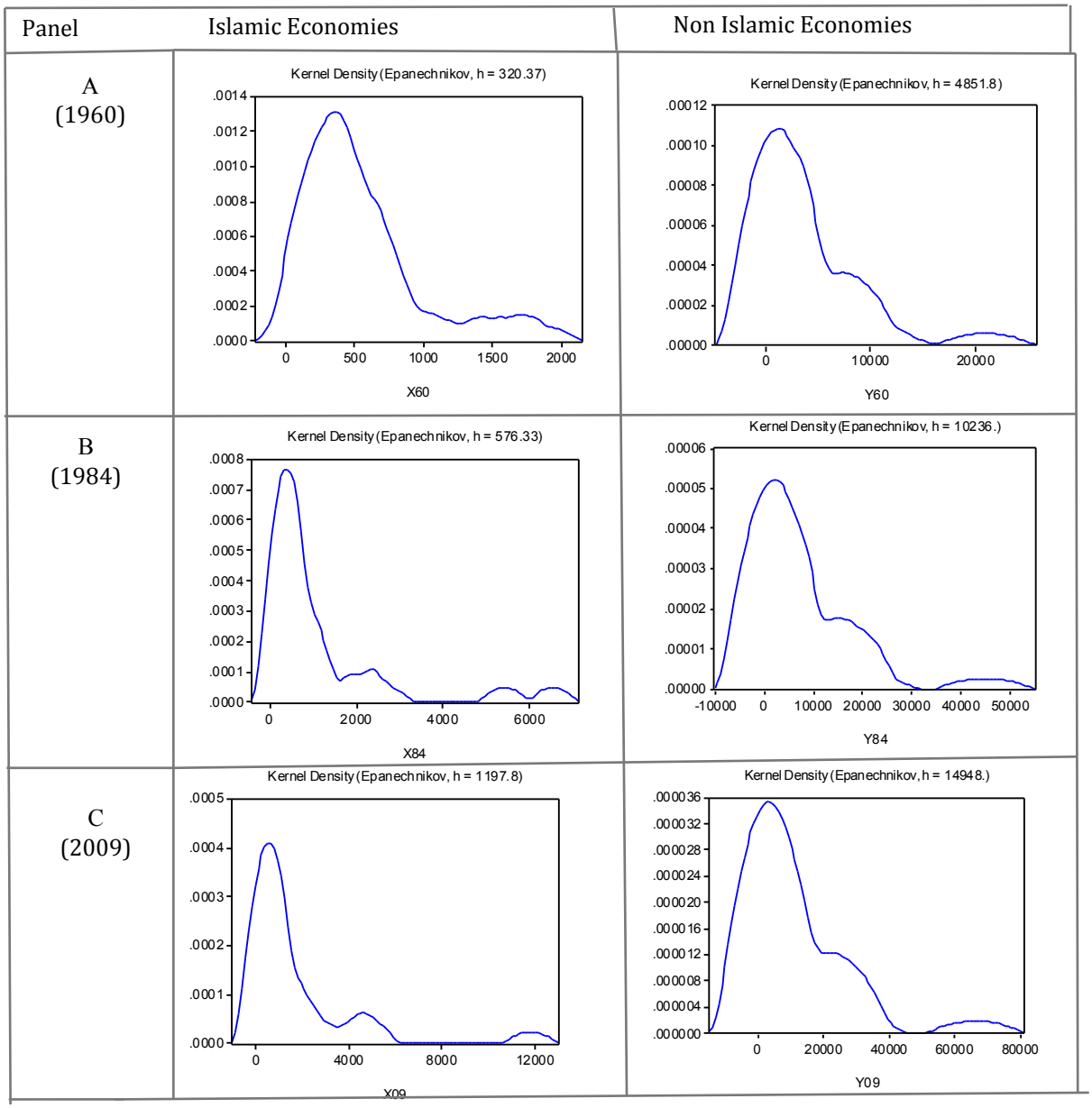


Figure 2: Income Per Capita Distribution across Countries, 1960-2009

It is notable that the slope of the probability density, however, reverts remarkably over the pattern of initial year, displaying a large protuberance at that level. The multi-dimensional crisis, that has been attacking world economy in 1997 and 2008, seems to be a source. In general, it is observable that the 'twin peaks' property is not apparent any more at the end of the period. However, it is also true that the densities are not entirely Gaussian in some years, having small plateau that have lead eventually to a bi-modal distribution.

All of the three features are consistent with some of the results of the cross countries income disparity studies provided in the previous section. They show that there was tendency in the early economic development periods for -convergence, which decreases in the later periods. They are also consistent with an increase in the standard deviation of the cross countries relative income in the 1960-1980, i.e. -convergence, followed by a declining trend in the 1990s as described in Figure 1. The important point here is that the economic crisis in 1997 and 2008 was improved the income distribution in Islamic countries rather than in non Islamic countries.

After the graphical analysis, attention is shifted to a quantitative approach. Following other similar studies (i.e. Villaverde and Robles, 2001) , the entire distribution has been defined in terms of 5 states, state 1 representing the group of countries with the lowest levels of per capita income: for more computational reasons the analysis has been carried out in a discrete-state fashion. It has indeed been a complex task to choose the appropriate grid in order to make the income distribution discrete and establish the different classes.

In the end, a common practice in cross section studies has been applied, defining classes in terms of a specific percentage of average per capita income at the cross national level. In this case, the first class comprises countries earning an income less than 50 percent of the average. The second class refers to those placed between 50 and 100 percent, the third corresponds to interval 100-150 percent, and the forth to 150-200 percent. Countries exceeding the 200 percent of the total average of each group are included in the fifth class*).

Next, the Amemiya (1985) methodology for estimating Markov chains has been applied. The first step has consisted in computing the number of countries that change from one state to another one or, instead, remain in the same state. For each sub-period, this procedure is carried out 10 times. In the second step, the transition matrix, composed by the pjk computed according to expression (7) is obtained. Finally, this transition matrix has been iterated in order to get the ergodic matrix. The iteration is executed by POM For Windows 3 (Weiss, 2006).

The upper part of Table 1 shows the results for the period 1960-2009 for Islamic and non countries in initial period. It conveys a few in interesting messages. First, except state 4 the degree of persistence in the relative position of the countries is high, indicated by the large valued in the main diagonal of the matrix. This persistence attains its highest value for state 1 and 2. The highest persistence in the lowest state of countries should, no doubt, be a matter of concern for both academic and policy makers: it may be hiding some kind of poverty trap.

It presents that because of structural constrains those countries can not grow as fast as others. As a result, their position remains unchanged. For example, on the average per capita income in some countries (Malawi, Bangladesh, Burkina Faso, Togo, Chad, Pakistan, Sierra Leon, and Indonesia) was less than a half of total average in 1960. This condition partially was also found in 2009. The economic conditions for growth could be linked, in turn, to a particular level of human capital, political turbulence, infrastructure endowments or availability of financial services.

Second, jumps are only observed to the adjacent state. There are evidently no jumps from state 1 to 3 or 2 to 4 are visible -- there are no growth miracles in this sample -- and thus the degree of mobility is limited to the next category. The highest degree of mobility is found in state 1. The long run equilibrium of the cross countries income distribution is, not surprisingly, characterized by a distribution that has a maximum in state 1 (the ergodic value is 0.8452). The likelihood of belonging to state 4 and 5 is smaller and the minimum correspond to the extremes of the distribution, state 1 and 2.

The similar patterns happened in non Islamic countries. There were no dramatic changes in state 1 and 2. The extreme mobility took place in state 3. The position of that country (Ireland) in 1960 was in state 3 and then jumped to be in the state 5. In contrast, New Zealand was in state 5 in 1960 declining to be in state 3 in 2009. However, the income disparity among non Islamic countries was persistent displayed by the unchanged position in state 1 and 5. The long run equilibrium of the cross countries income distribution is characterized by a distribution that has a maximum in state 1 (the ergodic value is 0.4849, lower than that in Islamic countries).

*) We have also tried some alternative approaches in order to construct the grid but the results obtained by these cast doubts upon their appropriateness.

Table 1: The Observed Frequencies and Transition Matrices: 1960-2009

1960-2009	Islamic Economies				
States	1	2	3	4	5
1	7 (0.8750)	1 (0.1250)	0 (0.0000)	0 (0.0000)	0 (0.0000)
2	6 (0.7500)	1 (0.1250)	1 (0.1250)	0 (0.0000)	0 (0.0000)
3	3 (0.5000)	1 (0.1667)	1 (0.1667)	1 (0.1667)	0 (0.0000)
4	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)	2 (1.0000)
5	0 (0.0000)	0 (0.0000)		0 (0.0000)	2 (0.6667)
Ergodic	0.8452	0.1252	0.0235	0.0039	0.0117
1960-2009	**Non Islamic Economies**				
States	**1**	**2**	**3**	**4**	**5**
1	35 (0.9459)	1 (0.0270)	1 (0.0270)	0 (0.0000)	0 (0.0000)
2	1 (0.1429)	4 (0.5714)	2 (0.2857)	0 (0.0000)	0 (0.0000)
3	1 (0.2500)	2 (0.5000)	0 (0.0000)	0 (0.0000)	1 (0.2500)
4	0 (0.0000)	0 (0.0000)	0 (0.0000)	3 (0.4286)	4 (0.5714)
5	0 (0.0000)	0 (0.0000)	1 (0.0909)	0 (0.0000)	10 (0.9091)
Ergodic	0.4849	0.0917	0.0524	0·000	0.1444

Notes: Figures in parentheses are probability
Totals of frequencies may not tally due to rounding off
Source: World Bank (Recalculated)

The previous results agree with the intuitions obtained from the visual inspection of the graphs above, since they do not predict polarization among Islamic and non Islamic economies in 1960-2009 but, rather, some kind of concentration around the average values. Nevertheless, these results may also suggest some sort of geographical externality, along the lines of Krugman (1991a, 1991b). Spillovers among neighboring regions may foster the development of the contiguous areas. In particular, when examining the countries in the highest states in 1980s and 2000s, a shift of the most prosperous non Islamic countries was located in America and Europe.

The uneven condition existed in Islamic countries. In the same periods, the most prosperous Islamic countries were located the mid-west. Some Islamic countries nearby to the mid-west (i.e. Togo, Chad, Sierra Leon etc) did not enjoy geographical externality. Therefore, the final distribution of Islamic countries in each groups (or states) may not suggest externalities associated to location -- either their relative closeness to dynamic countries or their proximities to the center of growth -- since the richest countries tend to concentrate over time in mid-west. One possible explanation, apart from the spillover of capital, is related to the spatial distribution of natural resources, whereby some industries prefer to establish themselves in nearby those countries that have lower costs of distribution and raw material (Kuncoro, 2002).

6. Concluding Remarks

In this paper the Quah's (1993a) methodology has been employed in order to analyze the pattern of regional real GDP per capita dynamics of Islamic and non Islamic economies over the period of 1960-2009. After some visual inspection of the non parametric densities of per capita income distribution, the transition probability matrices were computed to ascertain the degree of spatial externalities behind the success of some countries. The results are consistent with other obtained in the previous contributions. These can be summarized as follows.

There is a large degree of persistence in the relative position of Islamic economies rather than non Islamic economies over the period examined. However, it can be observed some slight mobility among classes that shifts the position of some countries in the ranking. There is some evidence of convergence towards the left side of the probability distribution for the whole period 1960-2009. A tendency is visible the richest Islamic countries tend to progressively concentrate in the mid-west. In contrast, in the case of non Islamic economies the large degree of persistence can possibly be attributed to some sort of geographical externality linking economic development in one areas to that experienced by nearby zones (through technological spillover, for example), or simply to the proximity to the most prosperous areas of America and Europe or to a particular zone of the country.

For Islamic economies, those results have some important implication. There is also connection between the sectoral reallocation to the industrial sector and a sound performance of the per capita income in a particular area. The specialization in this specific kind of activities seems crucial in order to achieve high level of income and welfare. This idea is consistent with the preliminary evidence of geographical externalities mentioned above. Those findings suggest that sectoral reallocation to the industrial sector seems to have fostered growth of per capita income in those countries that have experienced it over time.

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