Chapter IX.

Limitations of the study

1. The cross-country regression literature is enormous: a large number of papers have claimed to have found one or more variables that are partially correlated with the growth rate: from human capital to investment in R&D, to policy variables such as inflation or the fiscal deficit, to the degree of openness, rule of law, corruption, formal and informal rules governing society (institutions), financial variables or measures of political instability. In fact, the number of variables claimed to be correlated with growth is so large that the question arises as to which of these variables is actually robust. Our theoretical and empirical results show that life expectancy, trade openness, population rate of growth, savings rate apart from initial level of per capita GDP, are some factors which may be some major factors affecting growth rate of GDP per capita. It seems that there may be more important factors particularly in the South Asian region which can have deeper impact on convergence of incomes. These may be policies directed towards higher infrastructure spending, efficient bureaucracy, reducing corruption, less restrictive labour regulations, political stability, rule of law, 'institutions', social capital among others. It is upto future research to quantify such factors and generate time series data on such factors over long time period. Conditional convergence can then be tested using cross sectional average data on pertinent growth factors, like corruption perception indices, rule of law index, social capital and trust variables, formal and informal rules governing the society, among others. It will be interesting to find out the speed of conditional convergence by including such variables in the per capita growth equation.

2. This study does not test for cluster convergence (Giles, 2001, Stroomer and Giles, 2003). This methodology uses 'fuzzy sets' to cluster the data (for one series) for the different countries in the sample, with the purpose of measuring the distance between the centers of these clusters at each point in time. If the centers of the fuzzy clusters move towards each other over time, this represents a particular type of convergence in the variable in question (e.g. in output, or in life expectancy, gini coefficient, among other indicators of quality of life). However, we have not attempted this approach in the present study. The fuzzy regression could be used, for example, if the objective was to see whether countries which have had higher trade openness have a higher speed of convergence-
countries could then be clustered into open, partially open and other possibilities, by using fuzzy logic. The future research can take up this type of study for gaining insights into the growth process.

3. In recent times, cross country analysis has come under criticism from the "Twin-Peaks" literature led by Danny Quah (1996b, 1997). The researcher is interested in the evolution of the distribution of the world distribution of income and the variance is only one aspect of this distribution. Quah noticed that, in 1960, the world distribution of income was uni-modal whereas, in the 1990s, the distribution became bi-modal. He then used Markov transitional matrices & non parametric method to estimate the probabilities that countries improve their position in the world distribution. Using these matrices, he then forecasted the evolution of this distribution overtime. His conclusion was that, in the long run, the distribution will remain bi-modal, although the lower mode will include a lot fewer countries than the upper mode.

Even though Quah's papers triggered a large body of research, his conclusion does not appear to be very robust. Jones (1997) and Kremer, Onatski and Stock (2001) have recently shown that a lot of these results depend crucially on whether the data set includes oil-producers (for example, the exclusion of Trinidad and Tobago or Venezuela from the sample changes the prediction of a bi-modal steady state distribution to a uni-modal distribution; the reason is that these are two examples of countries that were relatively rich but have become poor so if they are excluded from the sample, the probability of "failure" -that is, the probability of a country moving down in the distribution- lowers substantially).

We find that for the sample of 29 countries (consisting of some South Asian, East Asian and EU countries) included in our study, the cross country per capita distribution were tri-modal in 1966 and it is only in the 1990s that it has been transformed from tri-modal to bimodal distribution. It seems that neither technological change, technological catch-up, capital accumulation and life expectancy are primarily responsible for this transformation.

4) We proxy human capital simply by life expectancy in years. The results of DEA depend heavily on the conceptual measurement of human capital and the underlying process of human capital accumulation. Most of the studies take years of education as
one of the ways in measuring human capital. Nevertheless, theoretical and empirical research, as well as simple intuition suggests that human capital is an element of the growth process that is too important to ignore.

5) To understand the economic dynamics of the industrial sector growth accounting, we need to work out the probabilities of Indian states in the lower modal distribution reaching higher modal distribution in the next period. We can use such transitional probabilities, matrix algebra and difference equations to give insights to the growth process across the Indian States.
CHAPTER X
Conclusions, Policy Implications and Directions for Future Research

The study is an attempt to understand and re-examine the convergence process (relatively poorer states catching up with richer counterparts) in the four regions (South Asian, East Asian, European Union and CIS countries) included in our study from 1961 to 2001. Major factors determining economic growth rates are modeled and identified. Our theoretical model shows that growth of GDP per capita is a function of initial level of GDP per capita, savings rate, technological growth rate, rate of growth of population, share of industry in GDP, trade openness and human capital. The last three factors determine the technological progress in the model. The model shows that absolute convergence holds under very strict conditions of common steady state level of GDP per capita and same steady state growth rates across countries/regions. The extended model has features of both exogenous and endogenous growth models and may have wider applications in dynamic macroeconomics.

Only EU and East Asian countries together have shown uniform evidence of absolute convergence in all periods 1961-2001, 1970-2001, 1980-2001 and 1990-2001. East Asian nations are catching up with their richer counterparts despite their setback in their economic growth performance in the late 1990s due to the currency and banking crises in the region. This (resilience) of the most of the East Asian economies like South Korea, Thailand, Indonesia, among others may be due to their higher labour productivity, quality of institutions, higher trade openness and relatively higher savings rate. While EU as a region has shown significant evidence of absolute convergence in two periods, 1961-2001 and 1970-2001, there is no convincing statistical evidence in favor of absolute convergence in the last two periods: 1980-2001 and 1990-2001. This latter evidence with declining rate of economic growth for EU since 1961 (see Table I) points to a challenge for designing EUs regional policies which also have to cope up new entrants - East European and Baltic nations (ten in all at this stage) who joined EU on May 1, 2004. Low growth is linked to high unemployment and the failure of the labor market as well as to the unsolved problems in the systems of social security. This will require good governance and institutional changes. Under current EU rules, regions with a per capita GDP of less
than 75 percent of the EU average automatically qualify for EU regional aid under the so-called Objective I facility. With the accession of the East Europeans, average EU GDP will drop by about 10 percentage points. This means that many of the regions that currently have GDP per head less than 75 percent of the EU average, and so qualify for regional support, will no longer do so. As a result, all Germany's new states, all but two Spanish legions, and all but one region in Italy will no longer qualify for Objective I funding. In addition, GDP per head in Spain will move above 90 percent of the EU average, which means that it will no longer qualify for cohesion fund money.

The speed of absolute convergence in the four periods range between 0.99-2.56 % in an year(2% for the EU as worked out by Barro and Xavier Sala-i-Martin, 1995 for European regions) for EU while it ranges between 0.57-1.16 % in an year for the countries in East Asia and EU regions together. There is no evidence of convergence of GDP per capita incomes among the South Asian countries in all periods and some major CIS republics since 1966. Divergence in GDP per capita incomes among the South Asian nations over a period of time will be challenge for the policy makers who are keen on forming the South Asian Free Trade Association. Unless efforts are made to legalize trade channels and promote trade based on comparative advantage, especially in petroleum and energy products there may not be much gain in regional liberalization efforts. However, statistical evidence shows that there is tendency for absolute convergence between countries of South Asia, East Asia and European Union particularly after the 1980s. Therefore, if at all, South Asia has to think of effective formation of regional block it has to look for partner countries of East Asia and the EU. The relatively inferior economic growth performances of some of the CIS republics particularly Russia have shown why socialism did not prosper in such countries. Most of the Eastern block nations and Russian federation are now keen to join the EU as they are eager to raise their living standards and catch up with their richer counterparts.

36 Time series evidence, however, show lack of convergence of per capita GDP between these three regions from 1960-2001.
Conditional convergence is prevalent among almost all pairs of regions in our sample except East Asian and South Asian nations together. It seems that there are more important factors particularly in South Asian Region, besides the ones taken in the study, which can have impact on convergence of incomes. These may be policies directed towards higher infrastructure spending, making bureaucracy efficient, reducing corruption, less restrictive labor regulations, achieving political stability, implementing rule of law, understanding institutions, among others. It is up to future research that could quantify such factors and generate time series data on such factors over long time period. The Global Competitive Report (2003-04) is one such attempt.

Domestic savings rate as % of GDP is one robust factor across all regression equations and samples. Average trade openness as % of GDP, and average annual rate of growth of population have positive and negative influence on growth rates respectively. Life expectancy in the initial years tend to have positive impact on growth per capita GDP. In Europe, however, rate of growth of population has positive influence on growth per capita GDP while life expectancy in the initial year have negative influence on GDP per capita. Average industry value added as % of GDP most of times enters negatively in the regression equation signifying the rise of services sector value added in GDP across regions and its impact on growth of per capita incomes.

Speed of conditional convergence ranges from 0.2 % in an year to 22% across samples and over the years. In the European nations, the speed of conditional convergence works out be nearly 20 % unlike the speed of absolute convergence which hovered around 2 %. Such results would mean that countries in Europe are converging very quickly to their own potential level of incomes per capita but not so quickly to a common potential level of income per capita. The elasticity of output which is also estimated ranges from 0.54 to 0.91 implying that capital is to be interpreted as broad capital inclusive of human capital stock. It seems that human capital not only affects technological progress (as in the theoretical model spelt out earlier) but affects output levels directly by increasing capital stock levels (assumption of including human capital stock in the production function is appropriate; as in Mankiw, Romer and Weil, 1992).
The results for the speed of convergence favors use of an extended Solovian model inclusive of human capital. Conditional beta convergence seems to be a better empirical exercise (as evident from our theoretical model) because it reflects the convergence of countries after we control for differences in steady states. Conditional convergence is simply a confirmation of a result predicted by the neoclassical growth model: that countries with similar steady states exhibit convergence. It does not mean that all countries in the world are converging to the same steady state, only that they are converging to their own steady states.

We work out efficiency levels of 29 countries included in our sample using data envelopment analysis. Luxembourg has an efficiency score of one in all the years with or without life expectancy (human capital). Netherlands also has an efficiency score of one in 1966, 1971, 1976 and 1981. Japan, UK, Belgium, Ireland, Indonesia, Spain and Germany has an efficiency score of one in at least one of the years from 1966 to 2000. In the year 2000 though mean efficiency levels (without including life expectancy as input) of South Asian countries is higher than the European Union Countries and East Asian countries. Japan has the highest average efficiency followed by Hong Kong in the East Asian region in the period 1966-2000. Also, initial level of labour productivity and efficiency index in 1966 had significant impact on efficiency changes from 1966 to 2000 signifying that there is evidence of technological upturn among countries which were relatively backward in 1960s. This seems to hold for sure in respect of the East Asian economies which got the boost due to technological transfers from the developed nations during the same period and also because they started opening their economies at the same time. South Asian economies on the other hand remained closed in 1960s and could not grow at faster rates subsequently.

We decompose labor productivity growth into components attributable to technological changes (shifts in the overall production frontier), technological catch up (movement towards or away from the frontier), capital accumulation (movement along the frontier) and human capital accumulation (proxied by life expectancy). The overall production frontier is constructed using deterministic methods requiring no specification of functional form for the technology nor any assumption about market structure or the
absence of market imperfections. Growth accounting results tend to convey that for the East Asian and the South Asian countries efficiency changes have contributed the most while for the European countries it is the technical changes which has contributed to labour productivity changes between 1966-2000. We also analyze the evolution of cross country distribution for the 29 countries included in our sample consisting of some South Asian, East Asian and EU countries using Kernel densities. It seems that there are factors like savings rate, trade openness, quality of institutions, geography, among others rather than the ones that are included above for the growth accounting exercise which are primarily responsible for the existence of bimodal labour productivity distribution for countries included in our sample. This particular research problem may be taken up by researchers in future. Our results contradicts the Kumar and Russel(2002) and Henderson and Russell(2003) results which found that different rate of capital accumulation and human capital across nations are primarily responsible for the existence of differential levels of per capita income levels and growth rates across nations respectively and further such factors were also responsible for the evolution of bimodal distribution of labour productivity today across nations. In a way their results(KR) confirmed the use of simple and extended Solow model(Solow,1956,Jones,2002) along with their factor accumulation assumptions in analyzing the convergence process of per capita incomes across nations. Our growth accounting exercise and regression exercise suggest that there is some evidence of absolute convergence(supports the use of Solovian model(1956) in this context) and convergence in statistical terms of efficiency changes and human capital accumulation across countries of the EU, South Asian and East Asian regions.

Generally, speaking policies that will increase labour productivity and particularly in the services sector, open up trade with all countries, increase share of savings in GDP, reduce adverse administrative regulations, increase infrastructure spending, policies that support private capital flows along with technology and human capital skills transfers from rich to poor nations can increase efficiency levels of countries, help more in reducing per capita income differences and growth rates across countries and regions, and also help in achieving the basic goal of planning- i.e., improve the living standards of the people.
Technical Efficiency of the Indian States have been worked out using data envelopment analysis. Goa has an efficiency score of one in all years except 1981-82, 1983-84, 1984-85 and 1987-88. Delhi also has an efficiency score of one in all years from 1986-87 through 1997-98 except 1996-97. Pondicherry, Maharashtra, Himachal Pradesh, Punjab, Bihar, Tamil Nadu, Meghalaya, Andaman and Nichobar Islands and Assam have an efficiency score of one in at least one of the years from 1980-81 to 1997-98. Goa has the highest mean efficiency index of 0.94 from all the years, followed by Delhi with an index of 0.903, then followed by the industrial state of Maharashtra with 0.902. Tripura has the lowest mean efficiency index of 0.376 among the 22 states in our country followed by that of Meghalaya with a score of 0.389. It seems that the small sizes of states has had its impact on their production efficiency. Both Delhi and Goa are small states compared to other states and are ranked first and second in terms of their efficiency scores. The North East states have not been doing well in terms of their efficiency scores. This underscores the need to transfer technology by the centre to North East states. The mean efficiency index from all states over the years surprisingly show a declining trend since 1983-84. The mean efficiency index which was 0.685 in 1980-81, went up to 0.76 in 1983-84 and then came down to 0.57 in 1997-98.

To account for labour productivity changes of 224.2% over the period 1980-81 through 1997-98, the efficiency factor accounts for 6.56% only, technological change accounts for 15.10% while the contribution of capital deepening is relatively higher at 23.06%.

We analyze the evolution of cross states net value added distribution for the 22 Indian states from 1980-81 to 1997-98 using Kernel densities. The overall averages provide striking evidence that none of the three factors are primarily responsible for most of the productivity improvements of 224.2% over this period.

The results seem to suggest that there are other factors suggested in the literature like barriers to exit, a maze of rules and regulations, government import policies, high concentration, among others, rather than the ones that are included for the growth accounting exercise, which may be primarily responsible for the existence of multi-modal net value added per worker distribution for the 22 states. These latter factors also seem to explain reasons for the regional variations of net value added per worker across
states. Also, we do find that the efficiency levels for the Indian states have gone down from what it was in 1980s to what it were in 1997-98. However, the smaller states have out performed the larger states in terms of their efficiency levels.

Regional policies that will augment technological transfers to laggard states, will help more in reducing net value added per worker differences and growth rates across states and regions and also help in achieving the basic goal of planning—i.e., reduce regional variations.