Growth and Development

Convergence of Human Development Levels

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Reducing regional disparities can be seen as one of the main conditions of sustainable development. The neoclassical convergence hypothesis states that regional or intercountry differences would be reduced by development. Almost all studies test the convergence hypothesis by using per capita income levels and find mixed results. However, convergence of development levels and living standards is more important for the sustainability of economic growth.

This study aims to re-test the convergence hypothesis by employing two more indicators of development by the UNDP, namely health index and education index, in addition to per capita income levels. By using the beta convergence test, which controls if there is a tendency for per capital income to equalize across economies, convergence of development levels is tested among a panel of 177 countries.

The empirical evidences from the cross-sectional analyses suggest the existence of a significant converging trend among the countries with respect to education levels and per capita income levels.

Introduction

Convergence hypothesis states that regional or inter-country differences in terms of per capita income levels will be reduced by time, as less developed regions grow faster while developed ones slow down. As stated in Barro and Sala-i Martin (1992, 1995) and Mankiw et al (1992) and many others, several economic forces including diminishing returns to capital, spatial capital mobility, spatial labour mobility and diffusion of innovations and technologies across regions and countries give rise to convergence.

It is true that economic growth, by increasing a nation's total wealth, also enhances its potential for reducing poverty and solving other social problems. But history offers several examples where economic growth was not followed by similar progress in human development. Instead growth was achieved at the cost of greater inequity, higher unemployment, weakened democracy, loss of cultural identity or overconsumption of resources needed by future generation (Soubbotina and Sheram, 2000). UNDP's Human Development Report (1996) states that "human development is the end, economic growth a means" (UNDP, 1996).

In order to see whether development levels besides income per capita levels converge over time, this study aims to re-test the convergence hypothesis by employing two more indicators of development by the UNDP, namely health index and education index, in addition to per capita income levels. By using the beta convergence test, which controls if there is a tendency for per capital income to equalize across economies, convergence of development levels is tested among a panel of 177 countries.

In the remaining of the paper, firstly convergence hypothesis will be summarised and some recent empirical results will be given. After the data and methodology are explained, convergence hypothesis will be tested by β -convergence tests. The paper will be finalised by discussion of the findings.

Convergence Hypothesis

Convergence hypothesis is tested in various ways. Two techniques are commonly used in cross-sectional and panel data analyses :

σ-convergence explores if the dispersion of per capita income levels tend to decrease over time. σ-convergence can easily be observed by plotting the standard deviation of per capita income against time. Coefficient of variation can also be used to test σ-convergence (Kenworthy, 1999).

On the other hand, β -convergence refers to an inverse relation between the relative growth rate of income and its initial level, hence poorer countries grow faster than rich ones. The regression coefficient, β , of the initial income measures the speed of convergence. There are two types of β -convergence: With *absolute* or *unconditional convergence*, countries are converging to a common steady state. With *conditional convergence*, each country or region is converging towards its own respective steady state. In order to test the hypothesis, the following regression is estimated:¹

$$\Delta y_{i,t,t+T} = \alpha + \beta \log(y_{it}) + \varepsilon_{i,t} \tag{1}$$

where $\Delta y_{i,t,t+T} = \log (y_{i,t,t+T} / y_{i,t})$ and y represents income per capita (or per worker).

¹ It can be expressed in a non-linear form as: $(1 / T) \log (y_{i,t,t+T} / y_i,t) = \alpha + [(1 - e^{-\beta T}) / T] \log(y_{i,t}) + \epsilon_{i,t}$

A negative and significant β implies the existence of convergence among stated regions or countries. Some other variables such as capital, labour, human capital and so on, that influence growth can also be included in conditional regressions. For that purpose, augmented neoclassical Solow type models are often used.

Convergence hypothesis is also tested by using time series techniques. Time series notions of convergence imply that per capita output disparities between converging economies follow a stationary process. Stochastic or deterministic convergence is therefore directly related to the unit root hypothesis in relative per capita output.²

Various empirical analyses have done for different countries. Results are, more or less, sensitive to the sample, period, estimation technique as well as control variables particularly in conditional tests of convergence. To cite some recent examples: One of the leading studies is Barro (1991). He finds that there is a convergence in income levels among 98 countries in the period 1960-1985. Mankiw et al (1992) provides support to Barro for only OECD countries but not all countries. On the other hand, Bairam and McRae (1999) analyses 101 countries over the period 1970-1990 and does not find an empirical support for convergence hypothesis. With regards to regional studies, Feunte (2002) on 17 Spanish regions, Akdede and Erdal (2004) on 7 Turkish regions and 73 cities, Gianetti (2002) on 108 EU regions, Drennan (1999) on 273 US States, Mallick & Carayannis (1994) on 32 Mexican regions and Persson (1997) on 24 Swedish regions show both sigma and beta convergence in the stated regions or cities. On the other hand, Cheshire & Magrini (2000) test conditional beta convergence on 122 European regions and find no support for convergence hypothesis.

Data, Model and Methodology

It is true that countries with similar average incomes can differ substantially when it comes to people's quaility of life, access to education and health care, availability of clean air and safe drinking water and so on. Although many studies indicate that average incomes converge each other by time, there is no research that investigates whether development levels converge too. Thus this study intends to test convergence hypothesis by employing education and health indexes of Human Development Index of the UNDP besides income index. Repeating the equation 1,

$$\Delta y_{i,t,t+T} = \alpha + \beta \log(y_{it}) + \varepsilon_{i,t} \tag{1}$$

where $\Delta y_{i,t,t+T} = \log (y_{i,t,t+T} / y_{i,t})$ and y now will indicate not only per capita income measured by PPP approach but also education index (measured by literacy rate) and health index (measured by average life expentancy).

All data on 177 countries are collected from various reports of UNDP.

The model 1 is estimated by the Ordinary Least Squares for three separate indexes and the aggregate HDI index.

Before estimations, it may be useful to have a look at some descriptive statistics, presented in Table 1, in order to see the differences among the countries:

 $^{^2}$ Because cross-sectional and panel data are used in our analysis, details of time series tehniques will not be given here. Readers may see Estrin et al (2001), Li and Papell (1999) and many others.

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		HDI	EDU	LIFE	GDPPC
			(Adult		
			Literacy Rate)		
	Mean	0.711	79.22	65.81	9566.341
	Std	0.189	20.62	12.27	10247.64
Dev					
	Max	0.963	100	82	62,298
		(Norway)	(Georgia)	(Japan)	(Luxembourg)
	Min	0.281	14.4	32.5	548
		(Niger)	(Niger)	(Swaizaland)	(Sierra Leone)

Table 1: Descriptive Statistics (2003)

Descriptive Statistics (2000)

		HDI	EDU	LIFE	GDPPC
			(Adult		
			Literacy Rate)		
	Mean	0.703	78.13	65.37	1133.041
	Std	0.187	20.75	11.60	4842.307
Dev					
	Max	0.960	100	81	50,061
		(Norway)	(Slovakia)	(Japan)	(Luxembourg)
	Min	0.271	15.9	38.9	490
		(Niger)	(Niger)	(Sierra	(Sierra Leone)
				Leone)	

As seen from table 1, in year 2000 and 2003 Norway has the highest HDI value.Niger has the lowest HDI value in both years 2000 and 2003. Adult literacy rate is the highest with % 100 in Georgia in 2003 and Slovakia in 2000. Niger has the lowest adult litracy rate in 2003 and 2000, % 14.4 and 15.9, respectively.Luxembourg is the richest country with GDP per capita 62,289\$ and 50,061\$. Sierra Leone is the poorest country with 548\$ and 490\$ GDP per capita levels.

According to convergence hypothesis it is expected that the countiries with lower level of HDI will develop fater than then those with higher HDI level so in the long run countries' development levels will converge.

The data set is not sufficent for a sigma test but the standard deviations can give an idea of sigma test .

Empirical Results

Beta convergence test requires regression the growth rate of a variable on the its initial value. The model 1 is estimated by the OLS initially for the HDI index. The years 1990, 1995 and 2000 are taken as the initial year respectively. Due to data constraint, the estimations for Health Index and Education Index are carried out for only 2000 initial year.

As can be seen from Table 2, the countries of the world gets closer in terms of Human Development Index and the speed of convergence increases as the time span expands. The speed of convergence is 0.064 between 2000 and 2003, while it rises to 14.917 between 1990 and 2003. Having a negative and significant coefficient for the education index indicates the

educational differences reduce by time as people become more literate. However, the differences in health standards measured by average life expactancy do not seem to be decreasing as a result of the test. GDP per capita disparities, expressed in terms of purchasing power parity seem to be decreasing, a result that is consistent with various studies in the literature.

	Constant	β	<i>R2</i>	n
HDI(2000)	0.0391 (2.260)	-0.064** (-2.750)	0.064	113
HDI(1995)	10.148 (5.067)	-8.486** (-2.980)	0.058	145
HDI(1990)	16.645 (5.976)	-14.917** (-3.716)	0.093	136
EDU	14.641 (4.486)	-14.854** (-3.556)	0.068	173
LIFE	-4.049 (-1.229)	6.577 (1.399)	0.011	173
GDPPC	5.128 (4.321)	-3.643* (-2.063)	0.024	173

Table 2: Estimation Results

Concluding Remarks

The notion of human development incorporates all aspects of individuals well-being, from their education and health status to economic and political freedom. The classical convergence tests by average incomes indicate only one part of the whole picture. The study attempts to shed light on some other aspects of human development. The empirical analyses indicate thae human development levels among the countries of the world converge over time. The speed of convergence gets higher as the time span gets longer. Educational differences decreases as more people get literate. There is no sign of convergence in terms of health standards, measured by life expectency. Income per capita differences also reduce over time. More analyses are necessary to measure the club convergence (within the continent, within the country groups etc). More indicators of development could be tried to measure convergence or divergence in order to cover many other aspects of human development.

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