Convergence And Mobility Of Capital Across Selected Countries Of The World

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INTRODUCTION

The need for amending the Neo-classical growth theory as attempted by Mankiw, Romer and Will (1992) or developing an alternative growth theory in the name of endogenous growth models which are associated with the names of economists like Romer (1986) and Lucas (1988) was basically on account of the fact that the empirical evidences could not substantiate the convergence hypothesis which is regarded as a natural inference of the Neo-Classical growth models.

There are two main issues which are related to the concept of convergence, as can be inferred from the Neo-Classical growth models. One if the world capital market is open and there is, perfect capital mobility, .then investment will fl0w towards the country having higher rate of interest. As capital flows into a country the marginal productivity of capital falls; as the marginal productivity of capital falls the rental rate that investors can charge for capital also falls. A free now of capital between countries should equalize rates of return around the world. For the Neo-Classical theory, rates of return depends only on the ratio of capital to labour. This is evident from the first derivative of Cobb-Douglas production function $Y = Ak^{\alpha} \ L^{1-\alpha}$ on which the Neo-Classical mode1s are based. Its first derivative is MPK $==$ $A\alpha \ (K/L)^{\alpha-1}$ where MPK is marginal product of capital, A and a are constant. K and L are amounts of capital and labour respectively. Further, suppose MPKD und MPKF represent marginal

products of capital in domestic and foreign country respectively, then under perfect capital mobility, marginal product of capital in the countries must converge. Moreover, in the Cobb-Douglas production function, output per worker is written as $Y/L = A \ (K/L)^{\alpha}$, which clearly implies that output per worker is dependent on capital-labour ratio only, therefore, convergence in marginal product of capital implies convergence of output per worker. Thus, if the inference based on the Neo-classical models on International capital mobility is correct, then one would expect a tendency of output per worker among countries to converge.

Another related issue associated with the concept of convergence was quite clearly expressed by Barro (1980), 'In Neo-Classical growth models with diminishing returns, such as Solow (1956), Cass (1965) and Koopmans (1965), a country's per capita growth rate tends to be inversely related to its starting level of income per person. Therefore, in the absence of shocks, poor and rich countries would tend to converge in terms of levels of per capita income. However, this convergence hypothesis seems to be inconsistent with the cross-country evidence, which indicates that per-capita growth rates are uncorrelated with the starting level of per capita product.'

Mankiw, Rower and Weil (1992) used this observation to modify the text book Solow model

and called it as augmented Solow model. In their viewpoint, both the models do not imply convergence in GDP per worker, rather these models only suggest conditional convergence i.e. economies of different countries move towards their steady state. However, the effect of international capital mobility Oil convergence of GDP per worker is not effectively dealt in these models. Similarly, Burro's observation was well considered by Romer (1986), Lucas (1988) to propound the endogenous growth models, but even the endogenous growth models do not take into account the effects of the movement of international capital mobility, because these models are largely based on the finding of Horioka and Feldstein (1980) that across different countries of the world domestic saving is closely linked to domestic investment. There is no denying this fact, but the decade of 1990s and the period thereafter witnessed greater integration, substantial openness and large flow of capital across different countries of the world. The effects of such integration and openness of the economies of different countries not only leads to large now of international capital but also result in quick transfer of technologies fr0111 one part of world to another. The net outcome of it from the theoretical viewpoint is that the GDP per worker across countries must exhibit a tendency or convergence i.e. countries lagging behind must catch-up the countries ahead of them, provided the decision of investors is based on economic consideration alone.

OBJECTIVE, SCOPE AND MYTHOLOGY

In this background, the main objective of the paper is to test the hypothesis that, 'if economic consideration alone govern the mobility of international capital, then GDP per worker must exhibit the tendency of convergence among countries.' The evaluation of this hypothesis crucially depends on the values of the speed of convergence (λ) under different alternative cases, therefore attempt is also made to estimate its value in each case. Moreover, certain inferences are also

drawn for India by analyzing the difference in the values of the speed of convergence and the coefficients associated with the rate of change in the degree of openness, by including and excluding India respectively among the selected countries. For the purpose of estimating regarding speed of convergence (λ) and the coefficients of the variable on which the change in output per worker depends, the entire data is borrowed from Penn World Table covering the period from 1950 to 2003. The selection of relevant countries for the purpose of analysts is not random but is based on the systematic evaluation of the trend of GDP per worker relative to US GDP per worker of 47 countries considered from different parts of the world. The empirical evaluation of the hypothesis is examined with the help of regression technique. All these equations are in the log-linear form. For estimating the growth rates regarding population, investment rate and degree of openness of the country's economy semi- log form of the regression equation is used. The speed of convergence (λ) is estimated on the basis of the following differential equation as considered by Mankiw, Romer and Weil (1992):

$$\frac{d \log y\,(t)}{dt} = \lambda\,\{\log y^* \text{ - } dt \log y\,(t)\}$$

This differential equation is of the first order and whose final solution is:

$$\ln y\,(t) - \ln y\,(o) = (1 - e^{-\lambda t})\,\alpha\,/\,1 - \alpha \ln s - (1 - e^{-\lambda t})\,\alpha\,/\,1 - \alpha \ln (\delta + n + g) - (1 - e^{-\lambda t}) \ln y\,(0)$$

where, Y (o) & Y (t) are GDP per worker in the initial and t th years respectively, α is the share of capital in total income, s is the savings rate, δ, n and g are respectively depreciation, population and labour efficiency rates. For lack of availability of consistent date on depreciation and labour efficiency rates, it is assumed to0 increase at a constant rate of 5 per cent annum for all countries. This implies that only population growth rate influence change in income, since $\delta + g$ is constant across countries and therefore, can be

ignored from the equation governing the speed of convergence. Moreover, population growth rate and growth rate of workers are assumed to change proportionately.

ANALYSIS

An integral part or the testing of our hypothesis is to select it group of countries such that mobility of capital among the, countries in the group depends on economic consideration alone. This is extremely important in the global context, because it has often been witnessed that investors lack confidence in channelizing foreign capital in a country, despite the fact that return on capital is high in that country as compared to any other country of the world. It could be that the future prospects are not too optimistic for investors or may be on account of the absence of good

governance' political instability, insurgency and insecurity in a country etc. Due to these factors, global mobility of capital is adversely affected in many countries and hence it is rationally incorrect to expect convergence in GDP per worker across all countries. Rather, what is more logical and meaningful is to select those countries which have exhibited convergence in GDP per worker and to examine whether opening up of the economies of these countries had significant positive impact on the convergence of GDP per worker or not. Thus for evaluating our hypothesis we have selected only those countries whose GDP per worker relative to US GDP per worker has exhibited a catch-up tendency, since mobility of capital among these countries in all likelihood will depend upon economic consideration only. In this

Table 1 Tests for Unconditional and Conditional Convergence
Dependent Variable: Log difference GDP / Worker 1950-2003

	Un-conditional Convergence (All 22 countries Including India)	Conditional convergence (All 22 countries including India)	Convergence in GDP/ Worker and effect of openness(All 22 countries including India)		Un-conditional convergence excluding India	Convergence in GDP/ Worker and effect of openness excluding India
Constant	4.03	3.15	3.62	3.27	4.41	3.34
	(0.74)	(0.71)	(1.235)	(0.699)	(0.75)	(0.87)
1n (Y 1950)	-0.271	-0.187	-0.199	-0.24	-0.311	-0.244
	(0.084)	(0.078)	(0.083)	(0.0736)	(0.08)	(0.085)
1n (I/GDP)	-	22.7	24.7	-	-	-
		(8.003)	(9.18)			
1n (n+g+δ)	-	-	-6.40	-	-	-
			(13.35)			
1n (openness)	-	-	-	16.32	-	15.7
				(5.96)		
R^2 (%)	34.5	54.0	54.6	53.0	41.7	52.6
Adjusted R^2 (%)	31.2	49.2	47.0	48.0	38.7	47.3
λ	1.44	0.94	1.01	1.24	1.77	1.33

Source: Estimates are based on the date taken from 'Penn World Table' www.pwt.econe.ipenn.edu.

Note: 1. Figures in parentheses are the values of standard error.

2. g+d is assumed to increase at a constant rate of about 5 per cent p.a. for all countries. Its value therefore remain fixed across countries and

therefore while estimating regression equation its value can be ignored.

3. The value of $g+\delta = 0.05$ is assumed by many economists like Mankiw, Romer and Weil (1992).

category we have selected 21 countries after thoroughly scrutinizing the trend in GDP per worker relative to US GDP per worker from an overall broad sample of 47 countries considered from different parts of the world. The category-wise placement of each country is given in the Appendix – I. All the selected 21 countries exhibit definite convergence in real GDP per worker during the period 1950 to 2003(refer Appendix-II). In order to test our hypothesis step-wise regression method is employed by considering the variables which govern the speed of convergence. These variables are outlined in the methodology. The results of the step-wise regression of the change in the log 0f GDP per worker over the period 1950 to 2003 across 22 countries (21 selected countries + one base country USA) on the log of GDP per worker in1950 with and without controlling for investment, growth rate of population are presented in Table 1.

Table I clearly reveal that the speed of convergence is maximum ($\lambda = 1.44$) when the conditions for steady state growth are not applied i.e. these 22 countries have achieved considerable degree of unconditional convergence in GDP per worker. However, when the conditions of steady state grow are applied the speed of convergence has slowed down to conditions of steady state growth are applied the speed of convergence has slowed down to 1.01% i.e. these countries have shown tendency to approach their steady state at a lesser speed. It seems clear that there is an important exogenous factor (i.e. factor not considered among those which govern the steady state) which has acted as a catalytic agent in enhancing the speed of convergence of GDP per worker among countries. Theoretical viewpoint suggest that for countries having open economies and whose relative GDP per worker is rising, flow of international capital is determined by economic consideration i.e. larger flow of international capital will enter in countries having higher returns. The movement of international capital is not given in the Penn World Table, therefore as a

proxy variable for it, we have considered degree of openness of the economies whose consistent data is also available in the Penn World Table. Degree of openness is defined as the ratio of the sum of exports and imports to a country's GDP. By including this variable in the regression equation for unconditional convergence, we find that adjusted R-square improved substantially from 31. 2percent to 48 percent along with the fact that the coefficients associated with both the explanatory variables are statistically significant and have expected signs (refer Table-I). The speed of convergence has not much altered, it was earlier about 1.44 and now it is around 1.25 Thus it will not be for too wrong to conclude that degree of openness has definitely facilitated the process of convergence in GDP per worker among the 22 countries considered in our analysis. This also corroborates our hypothesis that, 'if economic consideration alone govern the mobility of capital then GDP per worker must exhibit the tendency of convergence among countries'. Perhaps, as the openness and integration of economic further takes place the place the speed of convergence in GDP per work will increase further.

It was observed during the course of analysis that the rate of change in the degree of openness in the case of India was least among the selected countries, and it's change in GDP per worker relative to US GDP per worker was slowest among all the 22 selected countries. As a consequence, China's whose GDP per worker was lower than India for a long time (1950-1996) has overtaken India from 1997 onwards (refer Appendix-II), Therefore, when we do not consider India among the 22 selected countries then the estimated regression coefficients for the remaining21 countries are given in Table-I.it is indeed noticeable that the speed of unconditional convergence has increased significantly from 1.44 to 1.77.Moreover,rate of change in the degree of openness and initial year (1950) GDP per worker continued to exercise significant positive and negative impact on the change in the value of

output per worker i.e. change in GDP per worker over time was more for countries whose rate of change in the degree of openness was high and change in GDP per worker over time was greater for those countries whose base year GDP per worker was low. This implies that increased speed of convergence in GDP per worker is especially due to the faster mobility of capital among these countries. As mentioned earlier that the rate of change in the degree of openness was least for India, therefore by including India the speed of unconditional convergence in GDP per worker has tended to slow down. If India intends to accelerate the improvement in the standard of living of its people then it must step up its process of integration with the other economies of the world.

CONCLUSIONS AND POLICY IMPLICATIONS

An important, inference that has emerged from the analysis, is that, the speed of unconditional convergence in GDP per, worker among 22 selected countries is 1.44, which is greater than the speed of convergence of 1.0l tor these countries, when conditions of steady state growth are applied. Our conclusion is in sharp contrast to the finding of Mankiw, Romer and Weil, where the speed of conditional convergence is higher than in the case of unconditional convergence. This significant difference is attributed to the rate of change in the degree of openness of the economies of 22 countries considered in the analysis, which we have regarded as a proxy variable for international mobility of capital. This is on account of the fact that the rate of change in the degree of openness along with the GDP per worker of the countries in the initial year (1950) have exercised a significant positive and negative impact respectively on the change in GDP per worker over time among the selected countries i.e. change in GDP per worker over time was more for countries whose rate of change in the degree of openness was high and change in GDP per worker over time was greater for those countries whose initial

year (1950) GDP per worker was low. Thus countries initially lagging behind in the standard of living were able to catch-up considerably the standard of living of those countries who were ahead of them and that mobility of international capital has contributed significantly towards convergence of GDP per worker among the 22 selected countries. This finding has substantiated our hypothesis that, 'if economic consideration alone govern the mobility of international capital then GDP per worker must exhibit the tendency of convergence among countries. An important policy implication which has clearly emerged from our inference is that, for achieving success in improving the standard of living of the people of country there is a need for greater integration of country's economy with the other economies of the world, since mobility of international capital definite leads to convergence in GDP per worker. This is equally true for India too, Therefore, government of India should systematically accelerate its economic reform programme.

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