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The Pitfalls of Convergence Analysis: Is the Income Gap Really Widening?

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ABSTRACT

A number of studies have tested whether, globally, per capita incomes are converging over time. To date, the majority of studies find no evidence of absolute convergence, but many find evidence of conditional convergence, i.e. convergence having controlled for differences in technological and behavioural parameters. The lack of evidence of absolute convergence has led to claims that global income inequality is deteriorating. We believe this to be untrue. Most convergence studies are aimed at proving or disproving the neoclassical growth model and hence take the 'country' as the unit of measurement. However, if one is making inferences about world income distribution the focus should be on 'people' rather than 'countries' to prevent China and Luxembourg, for example, receiving equal weighting in the

analysis. We use the β-convergence method and two different measures of per capita income and show that there is indeed evidence of income divergence between countries. However, crucially, we also find convincing evidence of income convergence if we weight our regressions by population. Thus, we find that poor peoples' incomes are growing faster than rich peoples' incomes, suggesting that global income inequality is in fact improving.

I. INTRODUCTION

Neoclassical growth theory predicts that poor economies grow faster than rich economies. If all economies are assumed to have the same steady state, then the only difference across countries lies in their initial level of capital and poor economies grow faster because they are further away from their steady state. This process is called absolute convergence. If, more realistically, economies are assumed to have different steady states contingent on differences in technological and behavioural parameters, then neoclassical theory only predicts conditional convergence, that is poor economies grow faster only if these differences in parameters are controlled for (Sala-i-Martin, 1996).

Convergence has been empirically tested for countries in the world, regions in Europe, American states, Japanese prefectures and many other economies. As concerns countries in the world, the results are somewhat mixed, but most evidence seems to suggest that there is no absolute convergence (De Long, 1988; Pritchett, 1997). Pritchett (1996, p. 40), for example, suggests that one can forget about absolute convergence: 'The overwhelming feature of modern economic history is a massive divergence in per capita incomes between rich and poor countries, a gap which is continuing to grow today'. However, there is evidence of conditional convergence. Sala-i-Martin (1996), for example, estimates a speed of conditional convergence of two per cent per annum in a sample of 110 countries if the primary and secondary school enrolment ratio, the saving rate and some political variables are controlled for.

In this letter, we focus on the finding of absolute divergence of incomes across countries. We have no quarrel with the finding that in a sample of world economies poor countries do not grow faster than rich ones. Indeed, further below we report evidence from the newly available update of the Penn World Tables (PWT) income data, a source used by most studies, which buttresses this finding. What we demonstrate is that this finding needs to be interpreted with great care. In particular, absolute income divergence across countries only implies that poor countries do not catch up with rich countries, but it does not imply that poor people do not catch up with rich people. We will show that there is absolute divergence only if countries are the point of reference. If one focuses on population as the point of reference instead, then there is evidence that the poor have grown faster than the rich and that world income distribution has become more equal over time. Thus, for example, Hobijn and Franses's (2001, p. 195) suggestion of a 'persistent gap between the rich and poor' is misleading as this gap only persists between countries, but not if one weights for differences in population.

One needs to focus on countries if the aim is to test neoclassical growth theory. After all, each country represents a separate economy and should follow the prediction of the theory. However, if we are concerned with issues of equity and how world income distribution changes over time, then our focus should be on population rather than countries. The two can lead to extremely contrary conclusions. A simple thought experiment makes this point very clear. Imagine the world consists of 1 rich country and 10 poor countries. Of these 10 poor countries, imagine 9 have small populations and 1 has a very large population that exceeds the combined populations of all the other countries (rich and poor). If the 9 poor countries with small populations grow slower than the rich country, but the one very populous poor country grows faster than the rich country, then we would observe absolute income divergence if countries are the point of reference. However, if population is our point of reference then we find absolute income *convergence* since the income of the majority of people in the poor countries grows faster than the income of people in the rich country.

II. CONVERGENCE ANALYSIS

To analyse country based versus population based income convergence, we test for so-called β-convergence. Strictly speaking, β-convergence is only a necessary, but not a sufficient, condition for convergence (see, for example, Quah, 1996, 1997). However, β-convergence is insufficient for convergence only if the once rich countries grow poor and the once poor countries grow rich such that the dispersion of incomes has not decreased (Sala-i-Martin, 1996). Because this is not the case empirically and due to space constraints, we refrain from applying more advanced statistical techniques such as kernel density, Markov transition or cluster analysis.

Let $g_{i,t,t+T} \equiv \log(y_{t+T}/y_{i,t})/T$ be the country's annualised growth rate between t and t + T, then there is absolute β-convergence (divergence) if β is statistically significant and negative (positive):

$$g_{i,t,t+T} = \alpha + \beta \log(y_{i,t}) + u_{i,t}$$

We start our analysis with gross domestic product per capita in purchasing power parity (chain method) and constant 1996 dollars from the recently updated PWT 6.0 database (Heston, Summers and Aten, 2001). Whilst the series goes back to 1950, we take 1960 as the initial period as many countries do not have data available prior to this year. Column I of table 1 presents results for the regression with countries as the point of reference, that is without applying population weights. The regression coefficient is followed by its t-value and the number of observations. There is absolute divergence at the 90% significance level between 1960 and 1996 for 110 countries, covering approximately 85 per cent of the world population. There is divergence at the 99% level between 1980 and 1996 for 123 countries, covering approximately 88 per cent of the world population. The opposite is true, however, if weighted least squares is used where the weights are equal to the average population size in the period of study (see column II). Also note that whilst the country-based regression suggests a higher speed of divergence from 1980 onwards, the population-weighted regressions suggest a higher speed of convergence in that period. What is the reason for this striking difference? The answer is poor, populous, fast growing China that grows particularly fast from the 1980s onwards. If China is taken out in column III of table 1, then β is insignificantly positive in the period 1960 to 1996 and insignificantly negative in the period 1980 to 1996.

< Insert Table 1 about here >

If the income data are taken from World Bank (2001) instead, which uses a different methodology for computing GDP per capita data in purchasing power parity, then there is less sensitivity of the results with respect to China.[1] Column I of table 2 reports the unweighted, column II the population weighted regression results. Note that World Bank (2001) does not provide data on GDP per capita in purchasing power parity before 1975. In the unweighted regression, β is positive, but insignificant, whereas there is strong evidence for convergence in the weighted regressions. Convergence remains, and is still statistically significant, if China is removed from the sample (see column III).

< Insert Table 2 about here >

III. CONCLUSIONS

We have demonstrated in this letter that in looking only at country based convergence analysis one might be tempted to conclude that the gap between the rich and the poor is increasing rather than shrinking. We believe this to be an inaccurate conclusion which stems from the fact that country based convergence analysis does not assess whether, on average, the gap between poor people and rich people is shrinking over time. To test this one needs to weight for differences in population size and we have shown that there is substantial evidence for convergence in population weighted income levels. This is welcome news from an equity point of view and it also puts into doubt allegations that the process of globalisation leads to higher income inequality in the world.

We have shown that our result is sensitive towards the inclusion of China in the sample if income data are drawn from the PWT, but not from the World Bank. Note, however, that even in the PWT case it would be inappropriate to exclude China from

[1] Data are converted into constant 1995 dollars with the help of the U.S. GDP deflator.

the sample. The sensitivity of the results to the inclusion of China are because China covers more than 20 per cent of world population, and not because it is such a strong outlier in the classic statistical sense. No one could reasonably argue that in analysing trends in world income distribution one should exclude one fifth of the world population from the sample.

Of course, our analysis is still simplistic and represents merely a first step. Implicitly, we ignore within country income inequalities and changes therein. The problem is that within country income distribution data are so sparse and unreliable that a long-term convergence analysis is currently impossible. Milanovic (2002) represents one of the most comprehensive first attempts at taking into account both between and within country inequality, but he can only compare two years, 1988 and 1993. It remains to be seen whether future research that takes changes in the within country income distribution into account will confirm the results of our analysis and still find convergence in population weighted income levels.

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Table 1. Convergence analysis for PWT income data.

	I country-based	II population weighted	III population weighted, excluding China
log gdp1960	.0042*	-.0034**	.0007
	(1.92)	(2.33)	(.46)
	(N = 110)	(N = 110)	(N = 109)
log gdp1980	.0077***	-.0098***	-.0025
	(3.57)	(4.71)	(1.37)
	(N = 123)	(N = 123)	(N = 122)

Where *, ** and *** denote statistical significance at the 90%, 95% and 99% confidence levels, respectively.

Table 2. Convergence analysis for World Bank income data.

	I country-based	II population weighted	III population weighted, excluding China
log gdp1975	.0001	-.0136***	-.0035**
	(0.10)	(7.37)	(2.35)
	(N = 111)	(N = 111)	(N = 110)
log gdp1980	.0007	-.0163***	-.0049**
	(.33)	(7.74)	(3.10)
	(N = 124)	(N = 124)	(N = 123)

Where *, ** and *** denote statistical significance at the 90%, 95% and 99% confidence levels, respectively.