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CONVERGENCE CLUBS AND DIVERGING ECONOMIES*

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ABSTRACT

This paper focuses on the question of income convergence among countries. It examines the incidence of reduction in income gaps among countries at different levels of development. Some evidence is found of convergence clubs among the world's wealthiest countries, though even within this set of countries, the likelihood of finding convergence among randomly chosen countries is lower than the likelihood of finding divergence. Where the preponderance of convergence clubs turns out to be the highest is actually among the world's very poorest countries. The nature of convergence at the top and bottom ends of the income spectrum also differs: catch-up at the top and downward convergence at the bottom.

J.E.L. classifications: O1, O4, O5

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I. INTRODUCTION

Much has been written on the convergence issue in recent years. While the primary emphasis has tended towards questions of conditional convergence, there still remains a question regarding the behavior of actual income gaps over time. To the extent that similar income levels reflect similar developmental levels, then what has been the behavior of income differentials between countries with relatively similar incomes? Has actual income disparity among such countries been falling or rising? Empirical evidence on this issue has been mixed – and apparently quite affected by the choice of countries chosen for inclusion in the different groups analyzed by the various studies.

The goal here is to provide a descriptive account of the convergence issue and to shed some light on the stylized facts regarding the disparity of incomes among countries – and how this disparity has been changing over time. Is there income convergence, and if so, what is the preponderance of convergence clubs along the income spectrum? That issue is the focus of this paper.

Using a combination of cross-sectional and time-series data, Rostow (1980) concludes that countries do converge. He states that "the widely held notion that the rich typically get richer, the poor relatively poorer, is supported neither by evidence from the contemporary scene nor by that from the longer past" (pg. 259).

Kristensen (1982), focusing on the cross-section alone, grouped countries by their 1974 income levels and found a hump-shaped relationship between group's 1970-79 growth rates and their income levels, with the middle-income groups enjoying higher rates of growth than the wealthier and the poorer groups. This finding of divergence among the poorer countries and convergence among the relatively wealthier countries is supported by Chenery and Syrquin (1986), who combine time-series and cross-sectional data for several countries and find a similar hump-shaped development curve.

By testing for a negative relationship between average annual rates of growth and initial

levels of income, Baumol (1986) concluded that industrial countries appear to belong to one convergence club, middle income countries to a separate, only moderately converging club, and that low income countries actually diverged over time. He went on to note that these groups also exhibited very little convergence with one another. De Long (1988) commented that the strong convergence findings in the top group were primarily the result of an ex post selection of wealthy countries rather than an ex ante selection.

Other studies have raised doubts about the plausibility of global convergence altogether. In his examination of 115 countries, Romer (1987 and 1989) used a scatterplot that horizontally measured the 1960 per capita incomes of each country and vertically measured their average annual growth rates between 1960 and 1981. Global convergence requires a negative relationship between the points on the plot. But Romer (1989) found that "in the cross-section, the mean growth rate shows no variation with the level of per capita income" (pg. 55). One drawback to this type of a plot is that average growth rates could be susceptible to the possibility that 1960 or 1981 may be outlier years.

An alternative would be to horizontally plot each of the annual real incomes for each of the 113 market economies in the Summers and Heston (1988) data set in each of the years between 1960 and 1985 together with a vertical plot of the subsequent rate of growth experienced by each country for the following year. Ben-David (1994) shows that these 2825 observations are arrayed in a mean-preserving wedge that is very similar to the Romer plot. The lower the incomes, the greater the number of observations, and the larger the variance in growth rates. However, as Figure 1 indicates, there does not appear to be much fluctuation in the means.

The absence of evidence on global convergence was a major influence behind the seminal papers by Romer (1986) and Lucas (1988). These were followed by a large number of new growth models that endogenized technological progress and predicted very different outcomes

Dispersion of Annual Growth Rates
at Different Levels of Per Capita Incomes

113 Countries, 25 Years (2825 Observations)

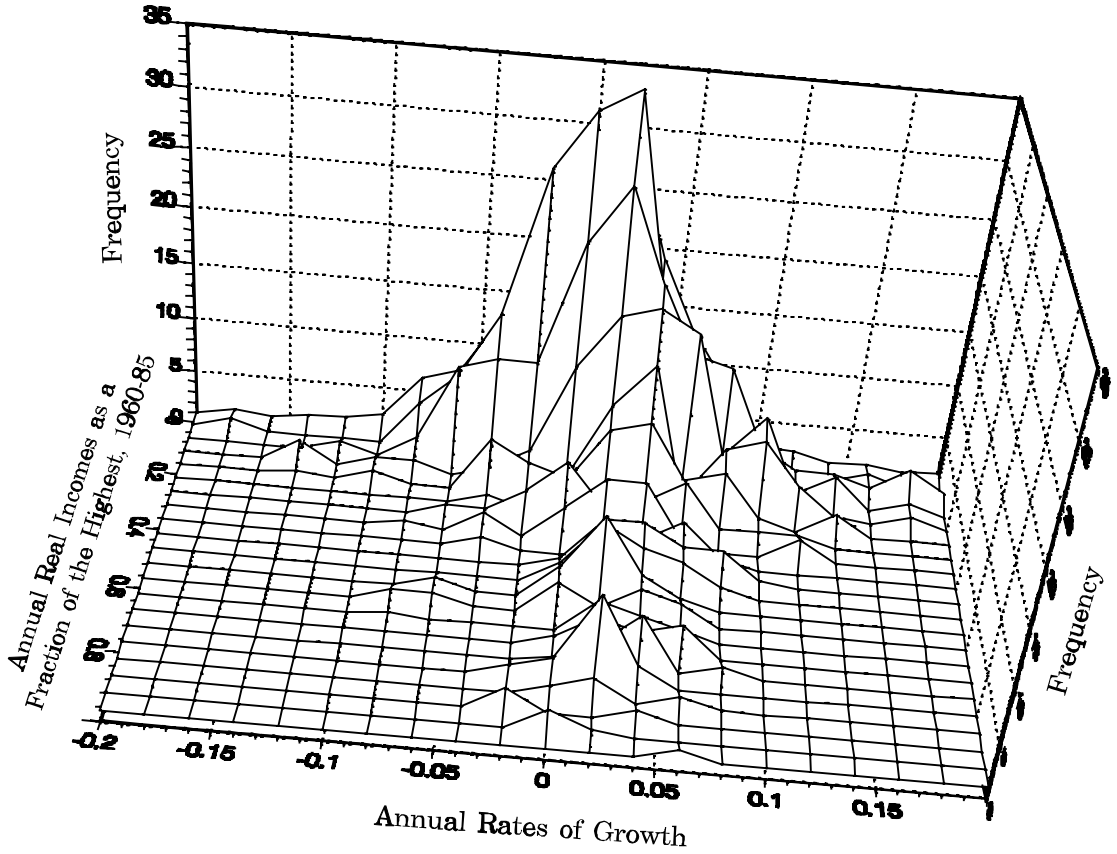

Figure 1

concerning the behavior of income differentials over time. One characteristic of many such models is the prediction that countries will converge to multiple equilibria rather than to a single target. While there exists a broad consensus in the more recent literature suggesting an absence of convergence to a single steady state, newer studies that control for various differing characteristics across countries point to the existence of conditional convergence (see for example: Mankiw, Romer and Weil, 1992; Barro, 1991; and Levine and Renelt, 1992).

The thread that ties together most of the above empirical literature on convergence is the cross-sectional nature of the majority of the tests. Friedman (1992) and Quah (1993a) have raised questions about the advisability of using such tests to indicate the existence of

convergence. Friedman echoes Hotelling's (1933) view that convergence is best measured by an examination of the behavior of cross-country income differentials over time. This concept provides the basis for testing convergence in this paper.

It should be noted from the outset that the primary contribution of this paper is not the convergence test used here, but rather the illustration of the convergence tendencies (or lack thereof) among countries at different levels of income. Aside from the common practice of regressing average growth rates on initial incomes, there are other methodologies available for determining convergence – among these: Bernard and Durlauf (1996) who use cointegration analysis; and Quah (1993b) who uses distributional dynamics. Like these latter methods for examining convergence, the convergence test used here utilizes the data from the interim years. It was chosen primarily for its ease of use in repeated convergence tests within relatively small groups of countries.

Baumol's finding of convergence among the wealthier countries receives some support in this study, though the convergence outcomes found here are not between *all* of the wealthy countries (regardless of the subjective criteria employed to determine which countries should be included under the "wealthy" heading). Rather, there appears to be a preponderance of income convergence between subsets of the wealthy countries.

There appears to be an additional congregation of convergence clubs as well. This one is situated at the very bottom of the income ladder.[1] The difference between these two types of "clubs" is the difference between what one might describe as *upward convergence* versus *downward convergence*. While upward convergence may be defined as a case of poorer club members catching up to wealthier members, downward convergence is characterized by very low (and even negative) growth among the top club members.

Section two provides some background and motivation. Section three continues with the convergence analysis and section four concludes.

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[1] Quah (1993b) also provides evidence in support of this using transitional probability matrices, as do Blomström, Lipsey and Zejan (1992) within a conditional convergence setting.

II. THE SENSITIVITY OF COMPOSITION

Lorenz curves for the years 1960 and 1985 point to an increasing degree of disparity among the 113 market economies in the Summers and Heston (1988) sample (Figure 2). The curves appear to indicate that most of this rise in inequality was due primarily to a growing discrepancy among the world's relatively poorer nations.

The question is, what constitutes "wealthy", "poor", and other subgroupings? Each of the studies mentioned in the introduction grouped countries differently, and each came up with different results.

Kristensen's (1982) results for the 1970-79 period depict convergence among the top four of his seven income groupings. In his study for the years 1950-80, Baumol (1986) grouped nations into three groups and found very little convergence between the groups. On the other hand, he concluded that countries within the wealthiest group exhibited income convergence among themselves, thus constituting what Baumol calls, a "convergence club". Among the middle income group, Baumol found much less convergence, while the poorest group displayed diverging economies.

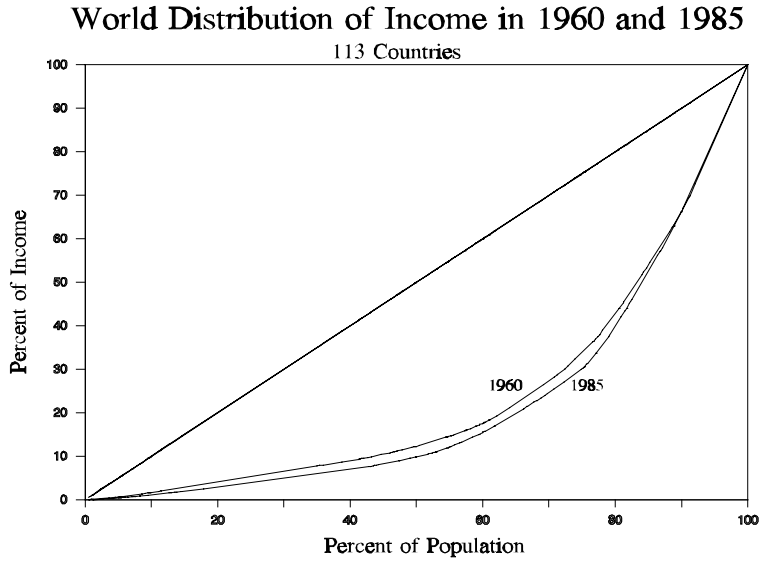

Figure 2

In each of these instances, convergence was inferred by an examination of the relationship between the starting level of per capita income and the countries' average rates of growth over

the ensuing period.[2] Whether this is representative of what happened in the interim is not always obvious. Furthermore, since the world was partitioned into only a limited number of country groupings, a question may be raised regarding the sensitivity of the results to group membership.

To highlight the sensitivity of the convergence results to sample selection, take for example, an analysis of the 1960-85 period, with a different grouping of countries than in either of the above studies. Based on rankings of real per capita incomes in 1960, it is possible to divide up the market economies of the world into 3 ad hoc income groups: wealthy, middle-income and poor. Let the wealthy group be defined as those countries that maintained, as a group, the same proportions of the world's total product and total population in 1985 that they had in 1960. The line dividing the middle income group from the low-income group is drawn at the per capita income level of $2000 where there is a relatively sizeable gap between the countries producing more than that amount and the countries producing less.

Sixteen countries comprise the top group and their incomes range from 60 to 100 percent of the top country's (the United States) income in 1960. The middle group consists of 15 countries with incomes ranging from 25 to 60 percent of the U.S. income. The poorest group consists of the remaining 82 countries.

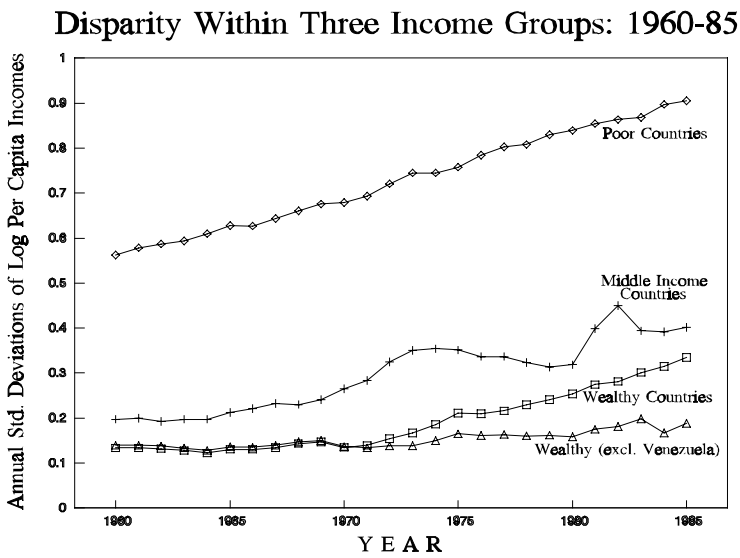

Figure 3

In 1960, the degree of inequality within groups (measured by the annual

[2] Although Baumol, Blackman and Wolff (1989), for example, supplement their cross-section regressions with examinations of annual income differentials as well.

standard deviation of the log real per capita incomes) appeared to be positively related to the group's average level of income (Figure 3). Furthermore, the disparity among the poorest countries rose steadily from year to year. Income differentials among the middle income countries also increased over time, while only the wealthiest countries appear to maintain any semblance of preserving the status quo, and even this was accomplished only after the exclusion of Venezuela (which was an outlier in the group).

The impact of one country, Venezuela, on the entire group, highlights the point raised above. How robust are all these results to changes in the composition of the various groups? Suppose that, rather than using the above criteria for partitioning the world, the segmentation into groups is arbitrary.

For example, let the cutoff points between groups be set at 20 percent intervals of the 1960 U.S. level of income. In this case, the world is partitioned into 5 groups where the first group comprises the four wealthiest countries with incomes between 80 to 100 percent of the U.S. income. Incomes in group two range between 60 and 80 percent of the U.S. income in 1960. There are 12 countries in this group, 7 in the third group (40-60%), 18 in the fourth group (20-40%), and 72 in the fifth and final group (0-20%).

The only group exhibiting no divergence at all is group one, the wealthiest group (Figure 4). The countries within each of the remaining groups displayed income divergence, with the degree of inequality tending to be higher, the poorer the group. Both figures provide support for Baumol's argument that disparity is higher among poorer countries, though these figures fail

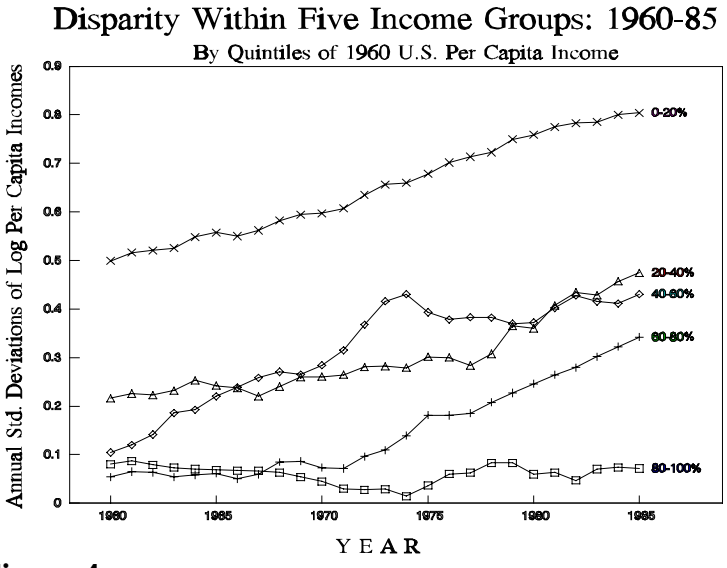

Figure 4

to provide much visual support for the existence of a convergence club among the wealthier countries. On the other hand, two sample segmentations of the world do not provide enough evidence for determining the existence of one or more convergence clubs. The remainder of this paper centers on exactly this point.

III. CONVERGENCE CLUBS

Following Friedman (1992) and Hotelling (1933), convergence within a given group of countries will be defined here as a decline in the degree of income disparity within the group over time. As in the earlier graphical depictions, annual income differentials are measured as standard deviations of log real per capita incomes. These are then regressed on trend. Negative trend coefficients indicate convergence and positive coefficients indicate divergence.

Since the objective of this paper is to explore the sensitivity of convergence outcomes with respect to (a) group membership – i.e. the relative wealth of the countries in the group – and (b) group size, a different methodology than the conventional convergence test (which regresses rates of growth on initial incomes) is preferable. Aside from the criticisms by Quah (1993a), Friedman (1992) and others, the conventional method of determining convergence is further handicapped – in the context of this paper – by the relatively low power of the test when the analysis covers only a small group of countries. While there are other alternatives to the conventional test, the method used here is purposefully straightforward and simple – a feature that readily facilitates testing for convergence within the many repeated samplings and resamplings of the groups below.

Continuing with the exercise from the preceding section, the 113 market economies in the Summers and Heston sample are ranked according to their 1960 real per capita incomes. The wealthiest country is labeled country 1 and the poorest country is labeled 113. An examination of all 113 countries together during the 1960 to 1985 period yields a significantly positive estimated trend coefficient of 0.009 (Table 1), indicating that the overall income spectrum has

been widening over time.[3] When the world is divided in half, both halves exhibit significant divergence over time, though the rate of divergence is greater within the poorer half.

When the world is partitioned into three country ranges of equal size, all three ranges exhibit divergence with the middle range diverging the fastest. Further partitioning of the world into equally-sized ranges produces similar outcomes: there is significant divergence in nearly every range regardless of its size or relative income level. These results differ from those of the other studies mentioned above in that, not only do the wealthiest countries fail to converge, but the countries whose income differentials exhibit the slowest rate of increase over time (and in the bottom-most case – where the world is divided into 8 groups – they even appear to decline, though not significantly) are the very poorest countries.

One of the first questions that comes to mind here is the sensitivity of these results to the inclusion/exclusion of individual countries. This is best illustrated by the distortion that may be caused by an outlier country such as Venezuela, a country that ranked among the ten wealthiest in 1960, but which displayed negative average annual growth over the next quarter century.

As the size of the country ranges decreases, the exclusion of Venezuela from the wealthiest category (in parentheses in Table 1) reduces the trend coefficient, though it is still not negative. This accords with the visual evidence of non-convergence for the wealthiest groups in Figures 3 and 4.

The lack of convergence in the top group is striking in that it does not corroborate the common perception of convergence among industrialized countries. To what extent does this outcome represent the convergence/divergence behavior within *subsets* of countries from among the 14 comprising the entire range? For that matter, how likely is it to find a convergence club in a random drawing of countries from any of the larger ranges?

[3] The issue of serial correlation, when it is found to exist, is addressed in the estimations.

Table 1 Trend Coefficients By Range

Country Range First	Last	Trend Coefficient	*t*-statistic	R^2
1	113	0.0090 (0.0095)	45.6 (46.5)	0.989 (0.989)
1	57	0.0009 (0.0013)	2.0 (3.2)	0.141 (0.300)
58	113	0.0121	15.3	0.911
1	38	0.0014 (0.0014)	2.3 (2.5)	0.176 (0.203)
39	76	0.0188	22.0	0.954
77	113	0.0068	10.2	0.812
1	29	0.0047 (0.0061)	7.4 (4.0)	0.696 (0.415)
30	57	0.0128	26.1	0.966
58	85	0.0188	14.2	0.897
86	113	0.0080	12.9	0.875
1	23	0.0051 (0.0032)	10.7 (8.2)	0.826 (0.737)
24	45	0.0111	12.9	0.874
46	67	0.0175	9.1	0.784
68	89	0.0198	39.1	0.985
90	111	0.0100	12.9	0.878
1	19	0.0045 (0.0002)	7.0 (0.2)	0.671 (0.002)
20	37	0.0076	8.8	0.772
38	55	0.0139	12.2	0.867
56	73	0.0203	8.7	0.766
74	91	0.0207	31.5	0.976
92	109	0.0077	8.8	0.770
1	17	0.0063 (0.0014)	9.6 (2.3)	0.792 (0.192)
18	33	0.0072	6.7	0.659
34	49	0.0170	20.2	0.944
50	65	0.0153	23.4	0.958
66	81	0.0250	16.2	0.919
82	97	0.0163	17.5	0.927
98	113	0.0041	4.5	0.469
1	15	0.0074 (0.0019)	11.8 (4.2)	0.854 (0.438)
16	29	0.0105	7.7	0.723
30	43	0.0172	23.0	0.956
44	57	0.0143	15.1	0.908
58	71	0.0220	23.8	0.959
72	85	0.0186	23.5	0.960
86	99	0.0190	25.0	0.963
100	113	-0.0005	- 0.3	0.005

The parentheses denote values without Venezuela. 26 observations.

Within each range of countries, smaller groups were formed and their trend coefficients calculated.[4] Continuing with the above example, if the world is divided into eight ranges of equal sizes, each range will comprise fourteen countries. Within each range it is possible to create smaller groupings of countries and examine whether these smaller groups behave similarly to the range as a whole.

For example, suppose that from each range of 14 countries, groups comprising 6 countries are drawn and their trend coefficients are calculated. There are 3003 different possible draws of groups of 6 from within each range of 14.[5] The cumulative distributions for the ranges appear in Figure 5 while the outcomes are summarized in Table 2.

In six of the eight ranges (*i.e.*, every range but the wealthiest and the poorest ranges), there is a total of 18,001 groups with positive trend coefficients – versus 17 groups with negative trend coefficients (17,890 versus 0 in terms of significant outcomes). By contrast, 30% of the country groupings in the wealthiest range exhibit income convergence, 20% significantly so. The greatest likelihood of finding convergence however, is not among the wealthiest countries, but among the world's poorest countries. About half of the groups have negative trend coefficients – and two-thirds of these are

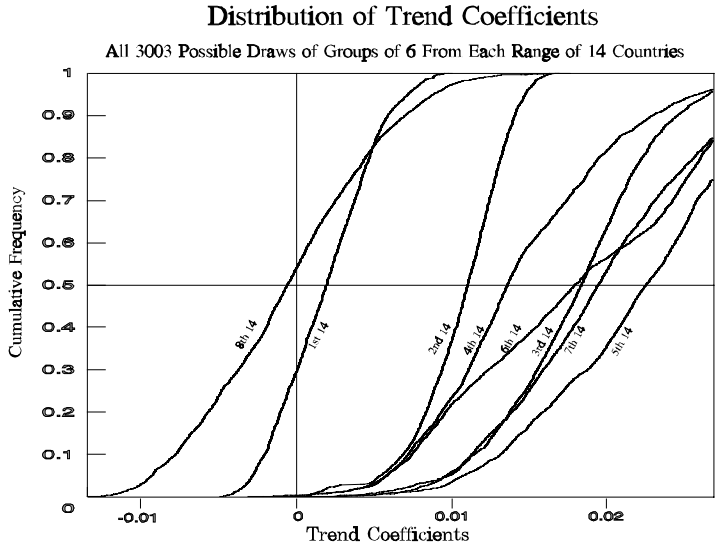

Figure 5

[4] For the remainder of the paper, Venezuela is excluded from the data.

[5] In a range with n countries, it is possible to draw a maximum of $n!/(k!(n-k)!)$ different groups with k members. In other words, out of each range with 14 countries, 3003 groups with six countries can be drawn, 3432 with seven, etc.

Table 2

Distribution of Trend Coefficients

(All 3003 Possible Groups of 6 Per Range of 14 Countries)

	Sign of Trend Coefficients		Sign of Significant* Trend Coefficients	
	Negative	Positive	Negative	Positive
Total	3003		3003	
1	887	2116	616	1757
2	1	3002	0	2976
3	0	3003	0	3002
4	5	2998	0	2964
5	0	3003	0	3002
6	11	2992	0	2957
7	0	3003	0	2989
8	1624	1379	1021	839
In Percent				
1	30%	70%	21%	59%
2	0%	100%	0%	99%
3	0%	100%	0%	100%
4	0%	100%	0%	100%
5	0%	100%	0%	100%
6	0%	100%	0%	98%
7	0%	100%	0%	100%
8	54%	46%	34%	28%

* significant at the 10% level.

significantly negative.

Note that convergence among the wealthy and divergence among the middle-income countries does not necessarily imply that the middle income countries are converging towards the top. This would depend on how the growth rates of the middle income countries compare to the growth rates of the richest countries. With the exception of fast growing Japan, Singapore and Hong Kong in the third range of countries (29-42), and Malaysia from the fourth range (43-56), the average growth rates of the top 4 ranges are roughly the same, indicating no overall convergence trend towards the top. The bottom four ranges have decreasing average growth rates from the 5th range (57-70) to the 8th range (99-112).

Although not shown here, altering the size of the groups does not change the conclusion that most countries in the six intermediate ranges are diverging. Whereas this example was performed on eight ranges with fourteen countries in each, the results are robust for other partitions of the world as well. Most of the convergence appears to be concentrated among the wealthiest countries and, in particular, among the poorest.

While there appears to be a clustering of convergence clubs at the two ends of the income spectrum, the two types of groups exhibit quite different convergence characteristics. The

distinction between the upward convergence exhibited by the top groups, and the downward convergence displayed by the bottom groups can be seen by comparing the average growth rates of the countries in each of the ranges. The 7 countries comprising the upper half of the top range grew at an average rate of 2.30 percent between 1960 and 1985. This compares with an average growth rate of -0.04 percent for the top 7 countries of the bottom range.

IV. CONCLUSION

The primary purpose of this paper is to establish a stylized fact regarding the issue of income convergence across countries. One of the main findings is that income gaps have increased within most possible groupings of countries in the world. Where "convergence clubs" tend to be more prevalent is at the two ends of the income spectrum.

Convergence among the wealthiest countries, which has received the most attention in the literature, is indeed more prevalent than it is within all of the intermediate income ranges, but it is still non-existent in the majority of possible country groupings. But the highest incidence of convergence is not among the wealthier countries, it is among the world's poorest countries.

This is not to say that the middle of the income spectrum is emptying out towards its two ends – it is not, as noted in the previous section. Instead, what appears to be occurring is a widening of the overall income spectrum. At its very top, there is some evidence of convergence. When this occurs, it tends to be a result of catching-up by some, though not all, of the relatively wealthy countries. At the bottom of the income spectrum, there is evidence of stagnancy and even negative growth which results in a higher incidence of convergence among the very poorest countries.

What might be some possible explanations for the existence of convergence among the poorest countries? Endogenous growth models (see for example: Azariadis and Drazen, 1990; Becker, Murphy and Tamura, 1990; and Rebelo, 1992) have tended to focus on the contribution of human capital to the growth process – with countries that invest too little in the accumulation

of human capital being drawn into a poverty trap.[6]

But, as Solow (1956) showed in his classic paper, if the savings rate (s) is an increasing function of the capital-labor ratio (k), with $s < 0$ for very small k's, then two steady states are possible in the exogenous growth model as well. In an attempt at explaining the existence of the poorer convergence clubs found here, Ben-David (1997) modifies the neoclassical growth model by focusing on how living standards bordering subsistence in the very poorest countries can lead to convergence among them. Using Stigler's (1945) estimation of the least-cost subsistence diet, as well as figures from the World Bank and the U.N., the paper provides evidence that the concept of subsistence consumption may be quite an appropriate assumption to make for countries belonging to the poorer convergence club. Furthermore, investment rates for each of the 8 ranges of 14 countries are shown to be positively related to income levels. Hence, it is not inconceivable that *net* savings rates in the poorest countries may in fact have been negative.

As noted above, while there is evidence that many countries are converging at the top end of the income spectrum, this is far from a robust result that can be attributed to all developed countries, or even to the majority of them. Is there a common element that can be found within those groups of developed countries that converged which is not evident in those groups that did not converge? Ben-David (1996) focuses on the contribution of international trade to the convergence process, using bilateral trade statistics to create groups of major trade partners. Nearly every one of the trade-based groups exhibits convergence – in contrast with random groupings (of the same countries that make up the trade groups) which do not exhibit any propensity at all towards convergence. In other words, grouping the wealthier countries on the basis of trade instead of on a random basis tends to provide a considerable boost to the incidence of convergence findings.

[6] Additional work on convergence-divergence outcomes may be found in Brezis, Krugman, and Tsiddon (1993) and Goodfriend and McDermott (1994). Galor (1996) discusses and compares some of the competing convergence hypotheses.

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