

TRADE, GROWTH AND DISPARITY AMONG NATIONS *

by

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ABSTRACT

Evidence is presented on the growing income disparity between countries and on the contribution of international trade in reducing these income differences. Substantial trade liberalization between countries that are the major trade partners of one another is shown to have contributed to a significant reduction in the income gaps that had existed between the countries. The income convergence did not occur prior to the liberalization, nor is convergence a very common feature between countries in general. More generally, it is shown that countries that trade extensively with one another tend to exhibit a much higher incidence of income convergence than countries that do not trade much with each other. And finally, it is shown that the trade-related income convergence was accompanied by faster growth by the liberalizing countries.

* This paper is part of a project aimed at merging together evidence and conclusions from a number of the author's earlier studies into one manuscript that can provide a more comprehensive picture of the various related outcomes. Support by the World Bank for the first stage of this project is gratefully acknowledged as is support from the World Trade Organization for the project's continuation. The author alone is responsible for this paper's contents.

1. INTRODUCTION

The pluses and minuses of openness between countries have been a source of heated debate for much of the 20th century – with domestic trade policies lying in the balance. The century began with movement towards relative openness that eventually reverted to the erection of massive trade barriers during the interwar period. The current trend towards greater openness began in the 1940s with the end of the Second World War.

This trend received a major boost from two complementary factors. The first important factor is the continuous decline in transportation costs – the natural barriers to trade – throughout the century. The second factor is the change in trade-related policies: those that affected regional trade and those that affected trade at the global level.

How has this increased openness affected the incomes levels of the trading countries? In a world marked by huge – and increasing – income disparity among countries, has trade been a source of the divergence, or is it a source of income convergence? Is this a question of a zero-sum game, where movement toward freer trade can only benefit some of the countries at the expense of others, or can freer trade benefit all of the countries concerned?

The focus of this paper is on exactly these questions. It begins in section 2 with the overall – non-trade-related – picture of income disparity between countries. Once this benchmark is illustrated, the emphasis then shifts towards a number of the more important instances of trade liberalization (in sections 3 and 4) during the postwar period and examines how income disparity among the liberalizing countries compares with these benchmarks. The general relationship between trade and income disparity is analyzed in section 5, while section 6 provides evidence on the long-run growth behavior of countries that liberalized trade. Section 7 provides some explanations for the outcomes and section 8 concludes.

2. INCOME DISPARITY AMONG COUNTRIES

How big are the income gaps between countries and how have these gaps been changing over time? The goal of this section is to provide some evidence on this question – evidence which will serve as the backdrop for the remainder of this paper.

One of the most important data improvements made during the past couple of decades has been the increasing availability and usage of purchasing power parities (PPPs) instead of official exchange rates for comparison of national products and incomes. Since PPPs are based on cross-country price comparisons of representative baskets of goods and services, they are less prone to exchange rate distortions. Hence, they provide much more reliable cross-country output comparisons than do official exchange rates.

The determination of purchasing power parities for a large number of countries over a span of several decades began with the seminal work of Heston, Kravis Lipsey and Summers in the 1970s. This work evolved over several rounds and culminated with the most recent data set made available in 1995 by Summers and Heston which begins in 1950 for a number of countries and ends in 1992. In all, the dataset includes annual observations for 152 countries, though not all of the countries have data for all of the years.

Table 2.1 draws on this most recent Summers and Heston (1985) dataset and includes the 1985 per capita output of all 152 countries in U.S. dollars. The conversion of GDPs in the table

Table 2.1: GDP Per Capita in 1985

From Wealthiest to Poorest in U.S. Dollars
Using Purchasing Power Parities (Summers and Heston data) and also official Exchange Rates (World Bank data)

	Summers and Heston Data			World Bank Data			Summers and Heston Data			World Bank Data			Summers and Heston Data			World Bank Data	
	GDP Per Cap	Ratio of USA to Country	Avg ROG 60-92	GDP Per Cap	Ratio of USA to Country		GDP Per Cap	Ratio of USA to Country	Avg ROG 60-92	GDP Per Cap	Ratio of USA to Country		Avg ROG 60-92	GDP Per Cap	Ratio of USA to Country	Avg ROG 60-92	GDP Per Cap
1 United Arab E.	19648	0.84		17188	0.98	52 Poland	4177	3.97		1908	8.80	103 Yemen, N.	1574	10.53		644	26.07
2 Qatar	16986	0.98		16786	1.00	53 Malaysia	4146	4.00	4.47%	1990	8.44	104 Ivory Coast	1545	10.72	-0.04%		
3 United States	16570	1.00	1.88%	13804	1.22	54 Gabon	4072	4.07	2.23%	3674	4.57	105 Philippines	1542	10.75	1.26%	562	29.88
4 Canada	15589	1.06	2.57%	14339	1.17	55 Iran	4043	4.10	0.70%	3877	4.33	106 Cameroon	1487	11.14	1.49%	817	20.54
5 Switzerland	14864	1.11	1.65%	14009	1.20	56 Brazil	4017	4.12	2.46%	1645	10.21	107 Honduras	1387	11.95	0.90%	830	20.22
6 Norway	14144	1.17	3.23%	10646	1.58	57 Uruguay	3969	4.17	0.84%	1569	10.70	108 Laos	1340	12.37		659	25.48
7 Australia	13583	1.22	1.95%	12062	1.39	58 Czechoslovakia	3920	4.23		2668	6.29	109 Guyana	1265	13.10		581	28.92
8 Sweden	13451	1.23	1.93%	9414	1.78	59 Jordan	3561	4.65		1888	8.89	110 Pakistan	1262	13.13	2.56%	324	51.84
9 Luxembourg	13175	1.26	2.38%	12527	1.34	60 Panama	3499	4.74	2.37%	2270	7.40	111 China	1262	13.13	3.07%	372	45.11
10 Kuwait	13114	1.26		11350	1.48	61 Chile	3467	4.78	1.66%	1358	12.36	112 Zimbabwe	1216	13.63	0.51%	543	30.89
11 Denmark	12969	1.28	2.32%	7971	2.11	62 St.Kitts&Nevis	3447	4.81		1825	9.20	113 Bangladesh	1216	13.63	1.45%	160	105.14
12 Germany, West	12535	1.32	2.55%	10003	1.68	63 Suriname	3396	4.88		2387	7.03	114 Senegal	1163	14.25		404	41.51
13 Bahamas	12404	1.34		11996	1.40	64 South Africa	3322	4.99	1.06%	1644	10.21	115 Djibouti	1137	14.57			
14 Iceland	12209	1.36	2.96%	9482	1.77	65 Fiji	3281	5.05		1637	10.26	116 Benin	1108	14.95		259	64.90
15 France	12206	1.36	2.76%	10928	1.54	66 Costa Rica	3184	5.20	1.68%	1485	11.31	117 Nigeria	1062	15.60	1.72%	973	17.25
16 Finland	12051	1.37	2.59%	11124	1.51	67 Seychelles	3183	5.21		2590	6.48	118 Cape Verde	1052	15.75	2.66%	329	50.97
17 Japan	11771	1.41	5.23%	8837	1.90	68 Reunion	3093	5.36				119 India	1050	15.78	1.62%	280	59.93
18 Netherlands	11539	1.44	2.47%	6863	2.45	69 Turkey	3077	5.39	2.70%	1049	16.00	120 Lesotho	975	16.99	3.54%	160	104.92
19 New Zealand	11443	1.45	1.12%	8099	2.07	70 Algeria	2988	5.55	1.44%	2682	6.26	121 Nepal	936	17.70		150	112.08
20 Belgium	11285	1.47	2.84%	8073	2.08	71 Colombia	2968	5.58	2.20%	1184	14.18	122 Haiti	911	18.19		343	49.00
21 United Kingdom	11237	1.47	1.97%	8627	1.95	72 Ecuador	2913	5.69	2.09%	1303	12.88	123 Sierra Leone	905	18.31		360	46.65
22 Austria	11131	1.49	2.93%	7429	2.26	73 Tunisia	2758	6.01	3.26%	1140	14.72	124 Liberia	853	19.43		498	33.71
23 Italy	10808	1.53	3.26%	6142	2.73	74 Congo	2697	6.14	2.18%	1115	15.05	125 Mauritania	824	20.11	0.22%	395	42.48
24 Hong Kong	10599	1.56	6.42%	6359	2.64	75 Namibia	2604	6.36	1.38%	1037	16.19	126 Zambia	808	20.51		337	49.79
25 Trinidad & Tobago	9701	1.71		8717	1.93	76 Peru	2565	6.46	0.11%	830	20.21	127 Kenya	794	20.87	1.03%	303	55.42
26 Bahrain	9547	1.74		7922	2.12	77 Dominica	2563	6.47		1350	12.44	128 Ghana	792	20.92	0.21%	357	47.03
27 Germany, East	9337	1.77		7125	2.36	78 Belize	2529	6.55		1258	13.34	129 Sudan	791	20.95		469	35.80
28 Oman	9199	1.80		7002	2.40	79 Thailand	2463	6.73	4.57%	723	23.23	130 Rwanda	776	21.35	1.10%	288	58.33
29 Singapore	8616	1.92	6.56%	6103	2.75	80 St. Vincent	2411	6.87		1103	15.22	131 Madagascar	769	21.55		286	58.65
30 Saudia Arabia	8313	1.99		4299	3.90	81 Botswana	2337	7.09		1057	15.88	132 Gambia	769	21.55	-2.08%	285	58.94
31 Israel	8310	1.99	3.31%	5314	3.16	82 Jamaica	2215	7.48		893	18.80	133 Mozambique	749	22.12	-1.50%	246	68.19
32 Spain	7536	2.20	3.64%	6008	2.79	83 St. Lucia	2211	7.49		1589	10.56	134 Guinea	712	23.27	0.88%		
33 Ireland	7275	2.28	3.39%	3633	4.62	84 Swaziland	2198	7.54		548	30.64	135 Angola	711	23.31			
34 Puerto Rico	7120	2.33		3629	4.63	85 Dominican Rep.	2111	7.85	2.00%	700	23.99	136 Bhutan	672	24.66		150	111.68
35 U.S.S.R	7049	2.35		3366	4.99	86 Guatemala	2090	7.93	0.95%	1221	13.75	137 Somalia	653	25.38		131	128.06
36 Cyprus	6486	2.55	4.83%	4750	3.53	87 Paraguay	2072	8.00	1.94%	856	19.60	138 Guinea Bissau	650	25.49	0.73%	178	94.31
37 Venezuela	6225	2.66	0.35%	2468	6.80	88 Sri Lanka	2045	8.10	1.78%	384	43.74	139 Comoros	643	25.77	-0.09%	290	57.91
38 Greece	6224	2.66		2925	5.74	89 Romania	1995	8.31				140 Togo	637	26.01	1.16%	251	66.89
39 Barbados	6131	2.70		2959	5.67	90 Morocco	1956	8.47	3.11%	583	28.78	141 Central Afr.Rep	630	26.30	-0.98%	268	62.75
40 Mexico	5621	2.95	2.50%	1935	8.67	91 Egypt	1953	8.48	2.65%	746	22.51	142 Myanmar(Burma)	599	27.66		183	91.87
41 Taiwan	5449	3.04		1873	8.85	92 Tonga	1929	8.59		646	25.99	143 Niger	559	29.64		219	76.49
42 Argentina	5324	3.11		1858	8.92	93 Grenada	1873	8.85		1231	13.63	144 Uganda	540	30.69	-0.28%	172	97.34
43 Malta	5321	3.11		1831	9.05	94 Mongolia	1858	8.92		1323	12.69	145 Mali	532	31.15		168	99.71
44 Hungary	5278	3.14		1829	9.06	95 El Salvador	1831	9.05	0.86%	857	19.60	146 Burundi	527	31.44	-0.37%	242	69.34
45 Yugoslavia	5172	3.20		1790	9.26	96 Vanuatu	1829	9.06		916	18.32	147 Malawi	518	31.99	0.84%	157	106.66
46 Portugal	5070	3.27		1754	9.45	97 Nicaragua	1790	9.26		831	20.20	148 Burkino Faso	495	33.47	0.37%		
47 Bulgaria	4773	3.47		1726	9.60	98 Bolivia	1754	9.45	1.27%	469	35.81	149 Tanzania	473	35.03		326	51.45
48 Iraq	4249	3.90		1651	10.04	99 Western Samoa	1726	9.60		558	30.09	150 Zaire	442	37.49		227	73.90
49 Syria	4240	3.91		1638	10.12	100 Indonesia	1651	10.04	3.80%	536	31.34	151 Chad	409	40.51	-1.91%	145	115.83
50 Mauritius	4226	3.92	2.43%	1619	10.23	101 Solomon Islands	1638	10.12		584	28.73	152 Ethiopia	299	55.42		110	152.31
51 Korea	4217	3.93				102 Papua N. Guinea	1619	10.23	0.82%	701	23.96						

Avg ROG 60-92 = average annual rate of growth, 1960-92.

Source of Table: Ben-David, Dan, *Free Trade and Economic Growth*, MIT Press, forthcoming.

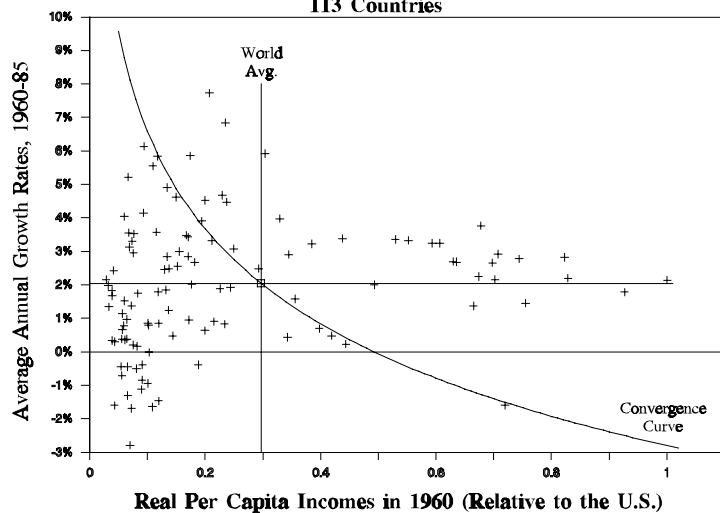
Sources of Data: Summers, Robert and Alan Heston (1995), "The Penn World Table (Mark 5.6)"
World Bank (1994), *World Tables*, CD-ROM.

is via both PPPs and official exchange rates so that it may be possible to compare the degree of discrepancy that can exist between the two measures.

As the PPP conversions indicate, the average American in 1985 made over 30% more than the average German, 40% more than the average Japanese, nearly 50% more than the average citizen of the United Kingdom, and 5,500% more than the average Ethiopian. While PPP's are much more accurate, the official exchange rates commonly used to convert national incomes into dollars paint an even grimmer picture.

These gaps nearly defy the imagination. As the growth rates between 1960 and 1992 indicate, several of these income gaps are much smaller today than they once were, while many of the other gaps have grown substantially. Overall, have these gaps been falling or rising

Figure 2.1
Growth vs. Real Per Capita Incomes
113 Countries



Source: Ben-David, Dan (1994), "Income Disparity Among Countries and the Effects of Freer Trade," in *Economic Growth and the Structure of Long Run Development*, Luigi L. Pasinetti and Robert M. Solow (eds.), London: Macmillan, 45-64.

between countries over time?

From the table, the pattern is not very easy to discern.

Figure 2.1 displays the relationship between the initial income levels and subsequent growth rates of 113 non-communist countries.¹ On the horizontal axis are the real per capita income levels of the countries in 1960 relative to the

¹ Data source: Summers, Robert and Alan Heston (1988), "A New Set of International Comparisons of Real Product and Price Levels Estimates for 130 Countries, 1950-1985," *Review of Income and Wealth*, 34, 1-25. The 113 countries examined here do not include communist countries.

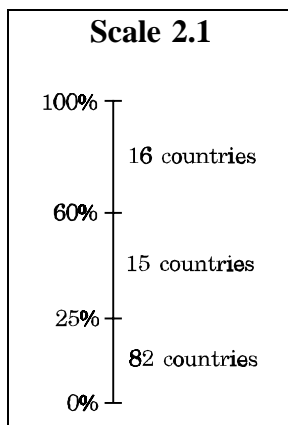
U.S., which was the wealthiest country at the time. The vertical axis measures the average annual growth rates of each country from 1960 to 1985. Dividing the graph into 4 quadrants are two lines that depict the average world income level in 1960 (which was just under 30% of the U.S. level) and the annual growth rate of the average world income level over the subsequent 25 year span. Convergence requires that all countries be located in either the top left quadrant, or the bottom right. It is clear, however, that the countries are arrayed in a mean-preserving wedge.

The convergence curve represents the locus of all points that the countries would have had to have been on to reach the world average level of income in 1985. The equation for this curve is:

$$ROG_i^{60-85} = 100 \left[\left(\frac{y_{worldavg}^{85}}{y_i^{60}} \right)^{\frac{1}{25}} - 1 \right]$$

where ROG_i^{60-85} represents the average rate of growth of country i between 1960 and 1985, y_i^{60} is the level of the country's real per capita income in 1960, and $y_{worldavg}^{85}$ is the world's average income level in 1985. As is clear from the graph, the countries of the world are nowhere near alignment along the convergence curve.

Rather than looking at the world as a whole, it is possible to divide it up into three income groups. Scale 2.1 ranks and classifies the 113 countries into the three income groups



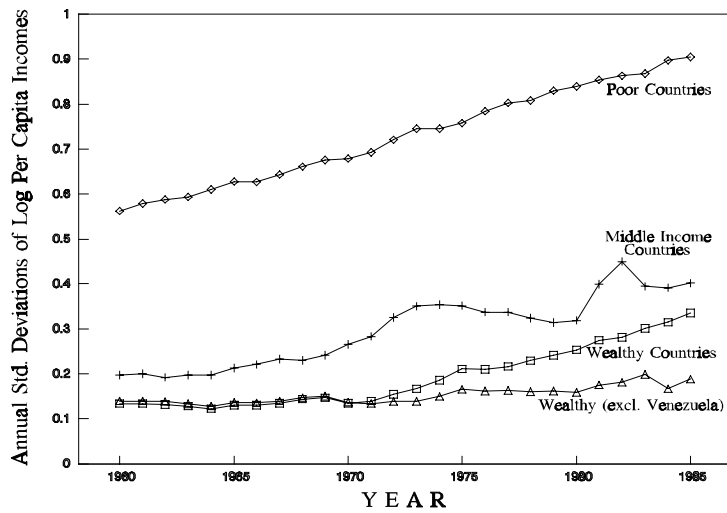
using the cutoff point of 60% of the 1960 U.S. income to distinguish between wealthy and middle income countries and 25% of the U.S. income as the dividing point between middle income and poor countries.

Figure 2.2 displays the annual income gaps within each of the groups between 1960 and 1985 using the standard deviation of the income logs as the measure of intra-group income disparity. As the

figure shows, the poorest group of **Figure 2.2**

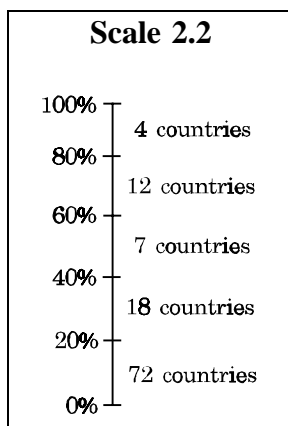
countries had the largest income gap in 1960 and it diverged steadily over time. The group of middle income countries exhibited the second-largest income gap and it too diverged over time. The group of wealthy countries exhibited the smallest income gap in 1960. As was the case within

Disparity Within Three Income Groups: 1960-85



Source: Ben-David, Dan (1995), "Convergence Clubs and Diverging Economies," Foerder Institute working paper 40-95.

the other two income groups, this gap grew over time. In contrast with the two poorer groups, one of the main reasons for the divergence among the wealthier countries is one country, Venezuela, a country that was among the wealthiest in 1960 that experienced negative average growth over the next two and a half decades. Exclusion of this outlier country yields weaker divergence evidence, if any still exists. In any event, none of the three groups exhibits any sign of a reduction in the degree of income disparity.



Rather than divide the world into three income groups using the admittedly subjective criteria above, it is possible to regroup the countries into 5 different groups according to quintiles based on the 1960 U.S. per capita income. Scale 2.2 shows how many countries are in each of the groups while Figure 2.3 depicts the behavior of the income

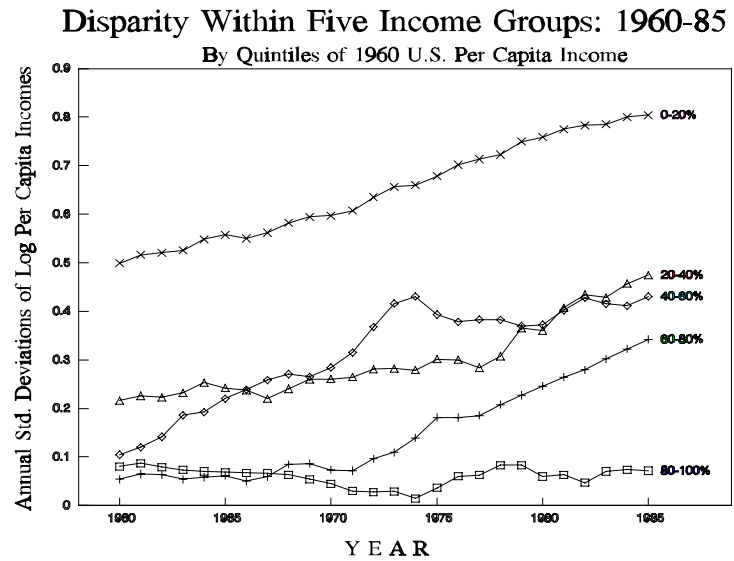
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Source: Ben-David, Dan (1995), "Convergence Clubs and Diverging Economies," Foerder Institute working paper 40-95.

over time. As in the earlier **Figure 2.3**

division of the world into 3 groups, the poorest countries exhibit the largest income gap in 1960 while the second poorest group exhibits the second largest income gap that year. In general, all of the groups but the wealthiest

diverged through 1985. The wealthiest group, which contained just 4 countries did not diverge, but did not exactly converge either.



Figures 2.2 and 2.3 suggest that if any conclusion at all might be reached at this point, it is that the world has not been characterized by a reduction in income disparity among countries. In fact, just the opposite appears to have occurred.

It is possible to quantify the rate of convergence within a given group by using the following equation:

$$(y_{i,t} - \bar{y}_t) = \phi(y_{i,t-1} - \bar{y}_{t-1}) + \varepsilon_{i,t} \quad (2.1)$$

where $y_{i,t}$ is country i 's log real per capita income in year t , \bar{y}_t is the group's average log per capita income in year t , $\varepsilon_{i,t}$ is the stochastic shock, and ϕ is the estimated convergence coefficient. The countries of the group are pooled together in order to estimate the equation so that ϕ represents the group's rate of convergence or divergence.

The equation is basically a regression of the gap between country i and the group average in year t on the gap between country i and the group average in year $t-1$. If there is no change

in this gap, in other words, no convergence or divergence, then one would expect the estimated ϕ to equal one. Convergence implies that the gap is falling over time, hence the estimated ϕ in such instances should be less than one. In the case of divergence, ϕ should be greater than one.

Because of unit root issues associated with equation 2.1, the augmented Dickey-Fuller form of the equation is estimated,

$$z_{i,t} = \phi z_{i,t-1} + \sum_{j=1}^k c_j \Delta z_{i,t-j} + \varepsilon_{i,t} \quad (2.2)$$

where $z_{i,t} = y_{i,t} - \bar{y}_t$ and $\Delta z_{i,t} = z_{i,t} - z_{i,t-1}$.

What do we get when this equation is estimated on all 113 countries in the sample between 1960 and 1985? The first line in Table 2.1 lists the results for this estimation (country 1 is the wealthiest country and country 113 is the poorest) and the estimated ϕ is significantly greater than one. The rate of divergence over the 25 year period is such that the world-wide income gap will be doubled in one and a half centuries.

Division of the world in half according to 1960 per capita incomes yields 57 countries in the "wealthier" half and 56 countries in the "poorer" half. The top half exhibits neither significant convergence nor significant divergence while the bottom half diverged over time. A division of the world into 3 equally sized groups yields a significant outcome, divergence, only for the middle group.

Continuing to divide the world into increasingly smaller ranges of countries begins to yield a pattern. As the size of the country ranges falls, we see increasing evidence of

Table 2.1: Convergence Coefficients By Range

Country Range		$\hat{\phi}$	<i>t</i> -statistic ($H_0: \phi=1$)	<i>k</i>	NOBS	\bar{R}^2	Half/Double Life*
First	Last						
1	113	1.00476 (1.00533)	4.06 (4.49)	3	2373	0.997	146
1	57	0.99803 (0.99882)	-0.74 (-0.43)	2	1197	0.992	-352
58	113	1.00898	2.73	3	1176	0.990	78
1	38	0.99745 (0.99758)	-0.60 (-0.56)	2	798	0.986	-272
39	76	1.02230	4.76	1	798	0.986	31
77	113	1.00216	0.37	3	777	0.978	321
1	29	1.00882 (1.00769)	1.49 (1.28)	2	609	0.981	79
30	57	1.01945	2.61	4	588	0.978	36
58	85	1.02138	3.72	1	588	0.984	33
86	113	1.00343	0.47	4	588	0.976	202
1	23	1.00548 (1.00490)	0.90 (0.82)	4	483	0.986	127
24	45	1.01952	1.96	2	462	0.964	36
46	67	1.01174	1.16	2	462	0.967	59
68	89	1.02618	3.60	1	462	0.981	27
90	111	1.01079	1.45	0	462	0.976	65
1	19	1.01059 (0.99404)	1.16 (-0.66)	4	399	0.976	66
20	37	1.00582	0.58	2	378	0.967	119
38	55	1.04945	5.29	0	378	0.971	14
56	73	1.00374	0.43	1	378	0.976	186
74	91	1.04071	4.29	4	378	0.984	17
92	109	1.00504	0.54	0	378	0.968	138
1	17	1.02667 (0.99243)	2.89 (-0.65)	1	357	0.975	26
18	33	0.99958	-0.04	2	336	0.966	-1650
34	49	1.04586	5.16	0	336	0.976	16
50	65	1.01113	1.16	1	336	0.975	63
66	81	1.04030	6.17	0	336	0.987	18
82	97	1.03173	3.04	1	336	0.973	22
98	113	0.99183	-0.85	0	336	0.969	-85
1	15	1.03140 (0.99960)	3.21 (-0.03)	1	315	0.976	22
16	29	1.01433	1.29	2	294	0.970	49
30	43	1.03960	2.72	4	294	0.968	18
44	57	1.02484	1.69	4	294	0.965	28
58	71	1.01274	1.26	4	294	0.984	55
72	85	1.04138	3.20	4	294	0.973	17
86	99	1.04841	4.43	0	294	0.969	15
100	113	0.96751	-2.60	1	294	0.955	-21

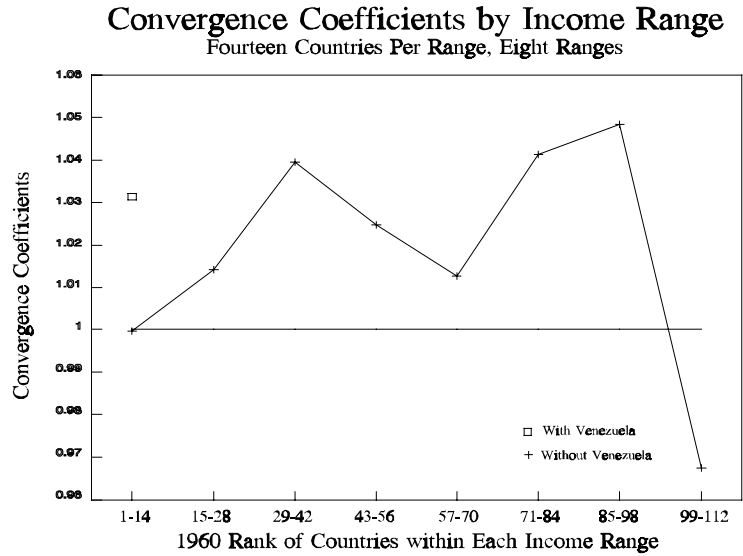
The parentheses denote values without Venezuela.

* The half-lives are denoted by negative numbers.

Source: Ben-David, Dan (1995), "Convergence Clubs and Diverging Economies," Foerder Institute working paper 40-95.

convergence at the bottom end, and divergence elsewhere. Moving to the bottom of the table, the countries are divided into 8 ranges containing 14 countries each (with exception of the first range that contains 15 countries). All of the estimated convergence coefficients are greater than one (most of these significantly so) with the exception of the poorest range of countries

Figure 2.4



Source: Ben-David, Dan (1995), "Convergence Clubs and Diverging Economies," Foerder Institute working paper 40-95.

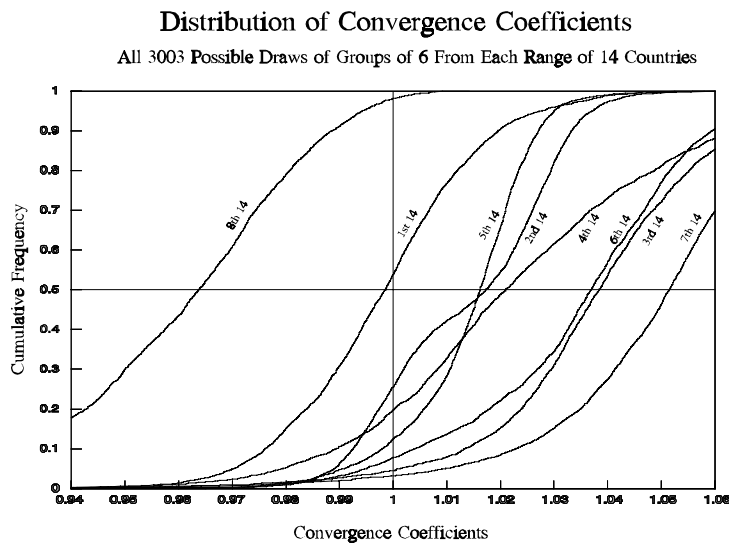
(Figure 2.4). This latter range is the only one to exhibit income convergence among its members. Even with the exclusion of the outlier country, Venezuela, from the top range, there is very little support for the determination of convergence among the wealthy countries (from here on, Venezuela will be excluded from the sample).

Are these results, however, really indicative of who is converging and who is not? What is the likelihood of finding convergence within a group of, say, 6 countries, if this group is randomly selected from each range? Or, put differently, what is the percentage of sub-unity ϕ 's (*i.e.* convergence) groups within each of these ranges of 14 countries?

It is possible to create 3003 different possible groupings of 6 countries from ranges of 14. All 3003 groups were created for each of the 8 ranges and equation 2.2 estimated in each case. The resultant estimated ϕ 's for each of the groups is plotted in Figure 2.5. The horizontal axis lists the ϕ 's and the vertical axis lists the cumulative distribution of the estimated ϕ 's. For

example, in the case of countries 30 through 43 in range 3 (curve "3rd 14" in the figure), the smallest ϕ in any of the 3003 groups was no less than 0.95 and the highest ϕ was greater than 1.06. The curve crosses the vertical line (dividing both sides of the graph at $\phi=1$) at a height of approximately 0.05 – indicating that roughly 5% of the estimated ϕ 's were less than one (*i.e.* convergence groups) while 95% of the groups exhibited divergence.

Figure 2.5



Source: Ben-David, Dan (1995), "Convergence Clubs and Diverging Economies," Foerder Institute working paper 40-95.

The most evidence of convergence is among the poorest countries with nearly all of the groups in the range exhibiting convergence. With the exception of the wealthiest range of countries, there is non-convergence or divergence in over three-quarters of the other randomly-created groups. And among the wealthiest countries, one is just as

likely to find $\phi > 1$ as they are of finding $\phi < 1$.

Although the two ranges at both ends of the income spectrum exhibit the highest incidence of convergence, the nature of the convergence is different in each of them. While convergence at the top end of the spectrum is of the catching-up variety – where the poorer group members catch-up with the wealthier group members – the convergence at the bottom end of the income spectrum is one of negative growth by the initially better-off members of the poorest range, *i.e.* this is a downward convergence. Convergence at both ends of the income

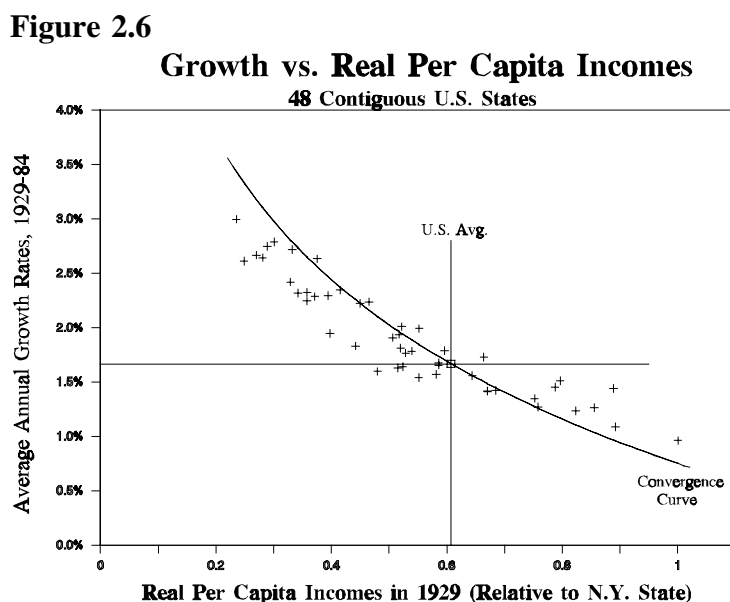
spectrum with divergence in between is also shown, using different methodology, in Quah (1993 and 1996).

The focus in the remainder of this paper will be on isolating one of the possible sources of the catch-up convergence. In particular, from among the wealthier countries within the top 2 ranges, are there any identifying characteristics that tie the converging groups together and sets them apart from the remaining groups? One possibility is that international trade may be one of the main threads connecting the convergers from the non-convergers.

What kind of a role might trade barriers play in yielding the non-convergence between countries – and what kind of an effect might their removal produce? Or more generally, how does one go about identifying trade’s effect on cross-country income differentials?

One might want, for example, to compare the behavior of income differentials between U.S. states to cross-country income differentials. In this kind of an example, the U.S. could represent a proxy for an integrated world economy with free trade and mobility of factors.

As Figure 2.6 indicates, there has been substantial convergence within the U.S. Nearly all of the states are in the upper-left or lower-right quadrants – an indication that the below-average states (in terms of



Source: Ben-David, Dan (1994), "Income Disparity Among Countries and the Effects of Freer Trade," in *Economic Growth and the Structure of Long Run Development*, Luigi L. Pasinetti and Robert M. Solow (eds.), London: Macmillan, 45-64.

initial income levels) grew at faster than average rates while above average states grew at below average rates.² This state-wide income convergence stands in stark contrast to the non-convergence observed in the world (Figure 2.1).

The question is whether it is the relatively free flow of goods between states that is the primary force behind this convergence outcome, or whether there might be other explanations as well. These would include the relatively unrestricted flows of factors – both capital and labor – between states and regions of the U.S. as well as the existence of a central government.

How might it be possible to isolate trade's contribution to the U.S. convergence? The answer is that, without data on trade between states, this contribution is very hard to pin down. Trade data does, however, exist for countries.

In this regard, the European Economic Community (or EEC) provides a very useful arena for isolating the effects of trade on incomes. This is due to the fact that the EEC represents a *fixed* group of countries that *formally* integrated most of their trade policies. While the EEC exhibited significantly increased trade during its evolutionary period, (we'll look at these changes in the volume of trade in just a moment) there have been a considerable number of studies pointing out that the early years of the Community were *not* distinguished by significant improvements in factor flows among countries. Hence, the primary changes that occurred during the formative years of the EEC were in commodity flows rather than in factor flows.

How does the relationship between growth rates and initial income levels compare between the six founding members of the EEC and the 107 remaining countries of the sample? Correlation coefficients ranging from -1.0 (for a perfect negative correlation) and 1.0 (for a

² The convergence, while extensive, is nonetheless incomplete inasmuch as the below-average states are still a bit below the convergence curve while the above average states are a bit above it.

perfect positive correlation) – where 0 indicates no correlation at all – may be used to compare these relationships between the two sets of countries. For the 107 non-EEC countries of the world, the correlation coefficient between their 1960 per capita incomes and their 1960-85 growth rates is 0.13, which indicates a slight positive correlation. By comparison, the correlation coefficient for the EEC is -0.88, indicating a strong negative relationship between initial incomes and subsequent growth rates.

3. TRADE LIBERALIZATION'S IMPACT ON TRADE

Before going into a more direct analysis of the relationship between trade reform and income convergence, it is useful to examine whether the trade reforms discussed below had any sort of an impact on the actual trade of the reforming countries. Such an examination is the focus of this section.

Postwar trade liberalization between the countries that would later form the EEC began in earnest with the implementation of the Marshall Plan in 1947. As a part of the Plan's conditions, the United States required recipient countries to begin liberalizing their trade. These steps led primarily towards a movement from discriminatory quotas towards non-discriminatory quotas and to a partial easing of some existing quotas.

That same year, 1947, saw the creation of the Benelux Union by Belgium, the Netherlands and Luxembourg. The Union's provisions for allowing unrestricted movement of goods and services, as well as the implementation of a common external policy, broke new ground and gave a hint of things to come. In the early 1950s, the Benelux countries were joined by France, Germany and Italy in a series of treaties that eventually culminated in the signing of the Treaties of Rome and the creation of the European Economic Community in 1957. Nearly all internal barriers to trade within the EEC were eliminated by 1968.

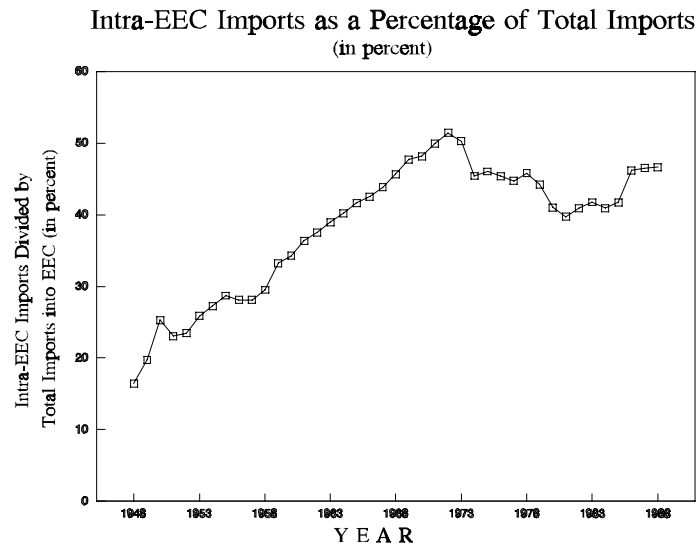
What kind of an impact did this integration have on intra-Community trade? As Figure 3.1 indicates, the proportion of imports by the EEC countries from each other (*i.e.* total intra-EEC trade) to total imports by the EEC countries from other, non-EEC, countries was roughly 15% in 1948. This proportion rose steadily throughout the liberalization period until leveling off in the late 1960s and early 1970s at about 3 times the 1948 ratio.

Figure 3.2 shows how this increase in intra-EEC trade compared with output growth in the Community. The intra-EEC trade-output ratio grew from about 3½% in the early 1950s along a relatively monotonous path until the 1970s when it reached a plateau of just over 10% of GDP.

A similar pattern emerged when the EEC was enlarged from 6 to 9 countries in 1973 (upper panel of Figure 3.3). The ratio of imports into the 6 from the 3 to EEC 6 output was fairly constant until the enlargement was implemented. The ratio then began to rise to over double its pre-enlargement level.

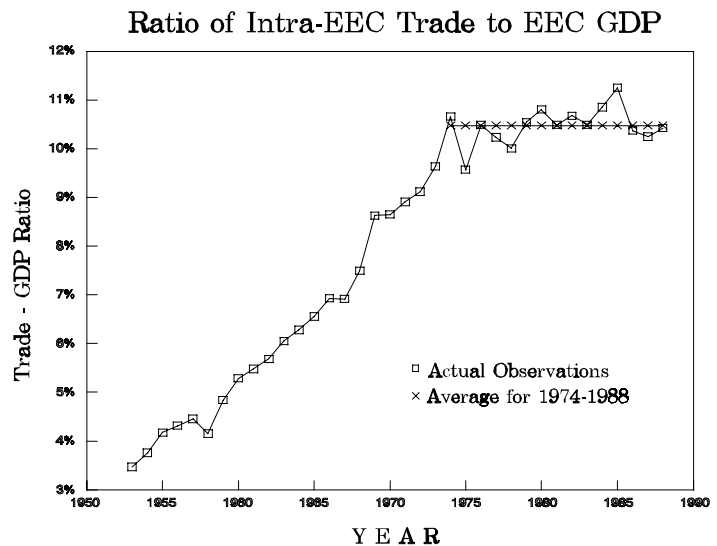
While different EEC trade liberalization periods coincided with different periods of trade increases, it is important to note that not all EEC trade exhibited this kind of behavior. For example, the United States

Figure 3.1



Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

Figure 3.2

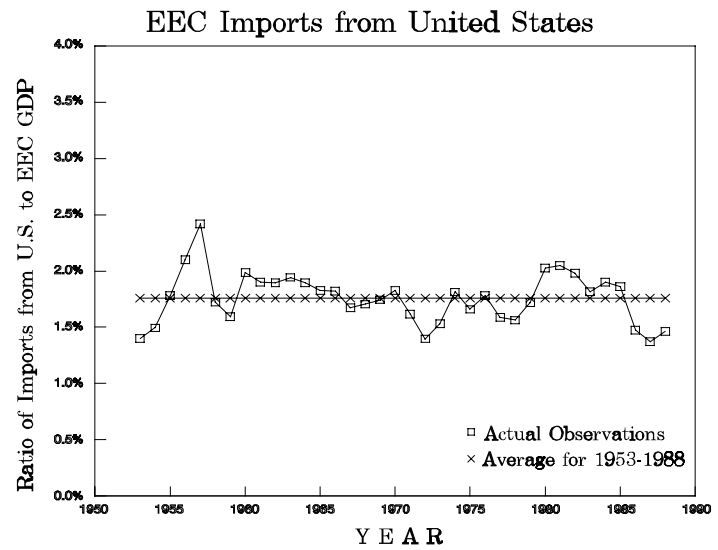
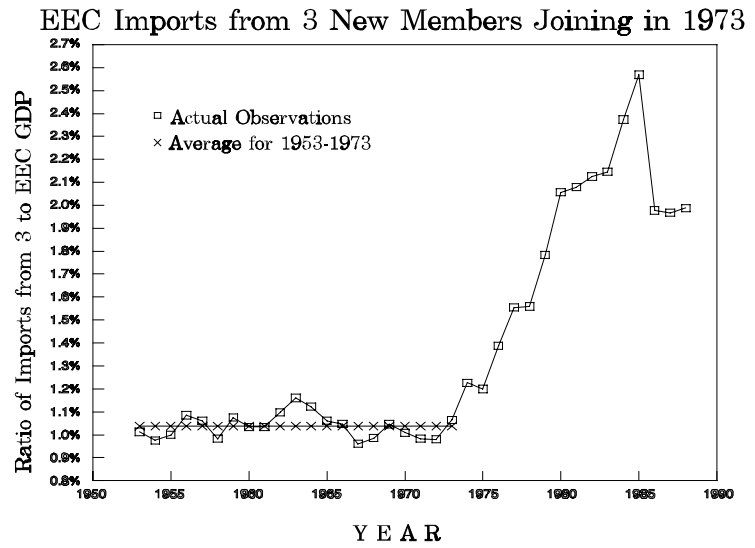


Source: Ben-David, Dan and Ayal Kimhi (2000), "Trade and the Rate of Income Convergence," CEPR Discussion Paper 2390.

did not enjoy the unlimited access to EEC markets that the Community members enjoyed, and as the bottom panel of Figure 3.3 indicates, EEC imports from the U.S. grew at the same rate as EEC output throughout the entire period.

In short, in the instances that trade was liberalized, the impact on the affected trade volumes is readily apparent. Different instances of trade liberalization coincided with different instances of increases in trade-output ratios. In lieu of such trade reforms, trade-output ratios tended to remain unchanged.

Figure 3.3



Source: Ben-David, Dan and Ayal Kimhi (2000), "Trade and the Rate of Income Convergence," CEPR Discussion Paper 2390.

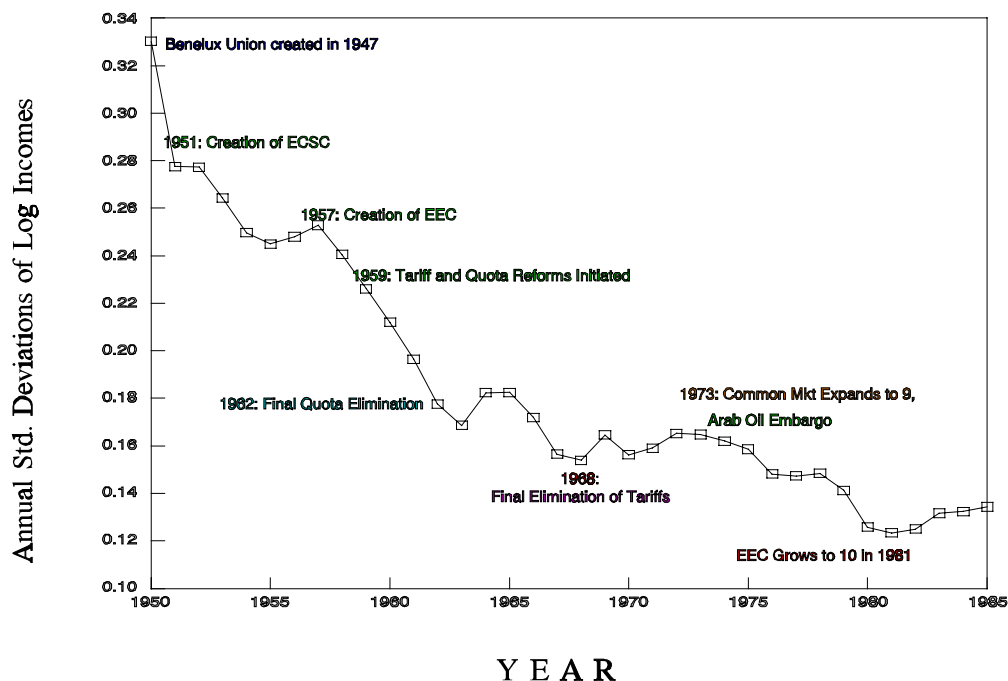
4. TRADE LIBERALIZATION AND INCOME CONVERGENCE

As the preceding section illustrated, trade liberalization appears to have had a visible effect on trade. But, what is its effect on income disparity among the countries? To get an idea of the relationship between the income differentials within the EEC, and the *timing* of its trade liberalization, it is useful to examine the behavior of the annual cross-country standard deviations of the log real per capita incomes (σ). A graphical depiction of this behavior appears in Figure 4.1.

The signing of the Treaty of Paris creating the European Coal and Steel Community (ECSC) and consolidation of the coal and steel industries of the area was accompanied by a 16% reduction in σ . From 1954 to 1958, the σ 's behaved in a cyclical manner, though they fell a bit.

Figure 4.1 Per Capita Income Dispersion

Between Six Original EEC Countries, 1950-1985

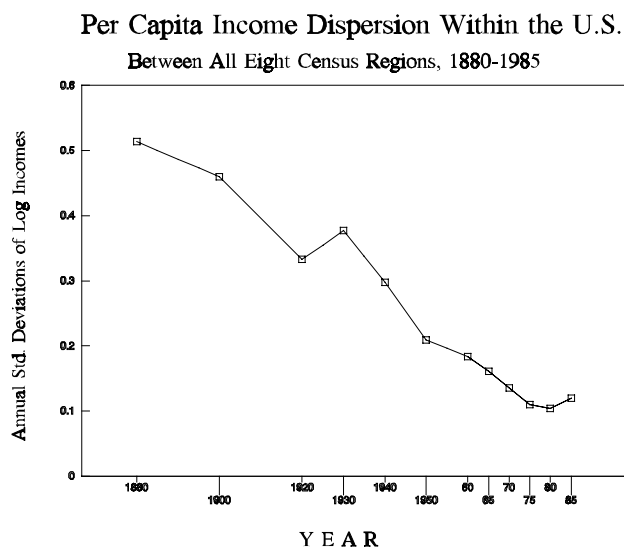


Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

The EEC was created with the signing of the Treaties of Rome in 1957 and in 1959, internal trade barriers began to be eliminated within the formal framework of the EEC. That year, σ fell beneath its previous level and headed downward until 1962, the year that all remaining quotas were abolished. The next 3-4 years saw a stabilization around this lower level of income disparity. From 1965 to 1968, there occurred further, though moderate, reductions in the degree of income dispersion.

One of the first questions that arises when one looks at the EEC convergence outcomes is the question of whether this convergence should be attributed to the shocks induced by the Second World War? In other words, did the fall in income disparity following the war reflect a return to relatively low levels of σ 's that may have existed prior to the onset of WWII? Or, alternatively, was the reduction in income differentials a continuation of a long-term convergence trend? Existence of either of these scenarios would weaken the case for a link between trade liberalization and income convergence.

Figure 4.2



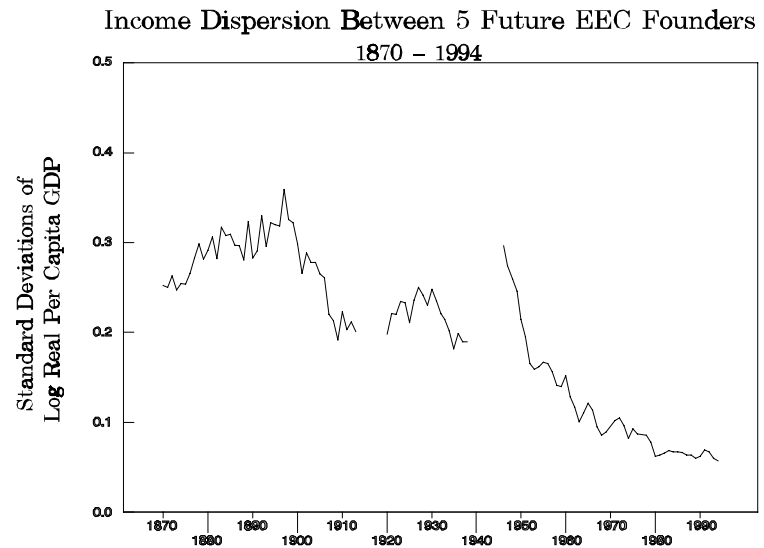
Ben-David, Dan (1990), "From Liberalization to Equalization: Some Evidence on the Impact of Freer Trade on Income Differentials," unpublished University of Chicago Ph.D. dissertation.

Long-term convergence has, in fact, been the case within the U.S. Figure 4.2 provides an indication of how interregional income differentials declined between 1880 and 1985. Despite a slight rise in disparity during the interwar period, the U.S. income convergence resumed and even returned to the earlier pre-WWI convergence path. There had been

no regime of interstate trade barriers that had to be abolished and the graph reveals no abrupt change in direction that might have accompanied a major change in policy. Instead, it would appear that the primary trade barriers were the costs of transportation and communication and as these gradually declined over time, so did the income differentials between the different regions.

What was the path of the EEC income gap in the decades prior to the creation of the Community? Using Maddison's (1995) data, it is possible to determine if either of the two alternative scenarios described **Figure 4.3**

above might be applicable. The income gaps between the EEC founders since 1870 appear in Figure 4.3 (the Maddison data does not include Luxembourg so it is not included in the calculations of the income gaps).



Looking at the gaps since 1870, the behavior of the σ 's clearly indicates that, during the three decades prior to WWII, *neither* of the alternative two scenarios appears to hold. The dispersion of real per capita incomes was fairly stable during the interwar period preceding WWII. Only after the onset of

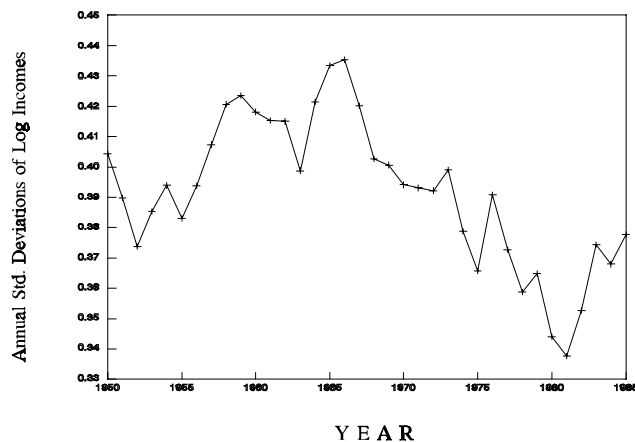
the postwar trade liberalization did the σ 's begin to drop in a sustained manner to gaps that had hitherto been unseen among the countries during the previous eight decades.³

The liberalization-equalization focus has, until now, been on the founding countries of the EEC. Would it be possible to reproduce similar convergence results for the next three countries that joined the EEC (Ireland, Denmark and the UK)? And, if these countries exhibit a reduction in income differentials *after* eliminating trade barriers amongst themselves, would this behavior be any different than their *pre*-liberalization behavior?

Figure 4.4

Per Capita Income Dispersion

Between the United Kingdom, Denmark, and Ireland, 1950-1985



Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

The income gaps between the three new members are plotted in Figure 4.4. The σ 's between the three actually *increased* until the mid-sixties. With the implementation of the Kennedy Round agreements in 1968 and the subsequent accession of the three countries to the European Economic community in 1973, the σ 's began to stabilize and then decline as the countries began to

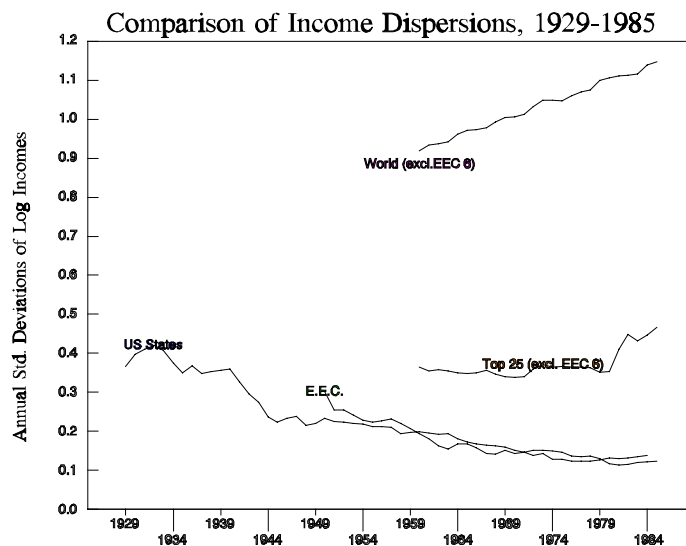
³ As Rodriguez and Rodrik (1999) point out, the period between 1879 and 1901 was accompanied by increases in tariffs by Germany, France and Italy. As the figure indicates, incomes gaps rose considerably during this period – after which the fell by a substantial margin in the years prior to WWI. From the long-run perspective, σ was relatively stable during the interwar years, though it is still noteworthy to point out that the erection of trade barriers in Europe during this period was accompanied by a slight, though noticeable, rise in the size of the income gaps. As Germany began to prepare for war in the 30s, the income of that country (which had been among the poorest of the group at that point) began to rise – an outcome that is reflected in the slight non-trade related reduction in income differentials that occurred in the 1930s, which later bottomed out by the outbreak of WWII.

converge with one another – and also with the 6 original members of the Community (the latter convergence is not shown here).

While the EEC countries have exhibited a significant reduction in the degree of income disparity among themselves, this has not been a prevalent feature of the international data, as was indicated earlier. An interesting experiment would be to compare the EEC to opposing benchmark cases and see to how the Community moved from one type of income gap path to another.

As noted above, the United States can be used as a best-case scenario for what may be accomplished within a completely integrated world economy, where there is unrestricted trade *and* factor flows. At the other end of the spectrum is the cross-country – or world – case, where there exist curbs on the mobility of goods and factors between countries. The EEC provides the intermediate case that depicts a steady liberalization of trade, but where factors do not flow as freely as within the U.S. This places **Figure 4.5** the restrictive world case and the free trade, free factor flow, U.S. case.

Figure 4.5 provides visual support for the worldwide divergence that occurred during the postwar period. However, such a grouping that includes extremely poor developing countries is not too useful a benchmark for comparison with the EEC. Instead, a subgroup comprising the 25 middle and



Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

high income countries of the world was formed and the income gap within this group plotted. For all but the latter years of the sample, the income gaps within this group display neither convergence nor divergence – a feature that resembles quite closely the relatively flat path of the prewar EEC income gaps in Figure 4.3. The EEC income gaps moved from their flat prewar path (that was at a relatively similar height as that of the 25 benchmark countries in the postwar) to a path that exhibits convergence rates and income gaps quite similar to those between the U.S. states.

The estimation results in Table 4.1 support the visual evidence. Prewar EEC convergence coefficients are not significantly different from one. Neither are the convergence coefficients for the top 25 countries or for the 14 countries with initial incomes between the wealthiest and poorest EEC countries.

On the other hand, postwar EEC convergence coefficients are significantly less than one, with the strongest convergence occurring during the ten-year transition period in which the EEC formally removed all remaining barriers on trade within it. It is interesting to note that the half-life during the transition period was very similar to the half-life of the United States convergence over the past 55 years.

Until now, the emphasis has been on trade liberalization and income convergence within the European Economic Community. But this is not the only instance of substantial trade reform coupled with declines in income disparity. Another example is that of the United States and Canada, two current members of the North American Free Trade Agreement (NAFTA). These two countries embarked on the road

Table 4.1: Convergence Coefficients, by Group ^a

	$\hat{\phi}$	N	R^2	t -stat. $H_0: \phi=1$	Half Life	Double Life
EEC						
Prewar, ^b 1900-1933	0.9909 (0.0094)	135	0.988	-0.98	75.5	
Postwar, 1951-1985	0.9709 (0.0066)	204	0.991	-4.39**	23.5	

Transition Period 1959-1968	0.9494 (0.0103)	60	0.993	-4.90**	13.3	
UNITED STATES, 1931-1984						
	0.9558 (0.0038)	2554	0.961	-11.64**	15.3	
WORLD (excl. EEC 6), 1960-1985						
All 107 Countries	1.0074 (0.0012)	2675	0.996	6.42**		93.9
Top 25 Countries	1.0027 (0.0056)	625	0.981	0.47		260.9

14 Countries ^c (w/o Venezuela)	1.0132 (0.0093)	325	0.973	-1.42		52.7

^a Standard deviations are in parentheses.

^b Does not include Luxembourg due to lack of data and excludes the WWI years, 1914-1919.

^c These are the 14 countries with the same per capita income range as the EEC 6 in 1960.

** Significant at the one percent level.

Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

to free trade a couple of decades prior to the creation of NAFTA, first with the signing of the auto pact in 1965 and then within the framework of the Kennedy Round Agreement signed under the auspices of the GATT. Under the terms of the Kennedy Round Agreement, they removed approximately 40% of the tariffs on their bilateral trade between the years 1968 and 1973. As the bottom panel of Figure 4.6 shows, the relatively stable trade-output ratio began to rise as the trade reforms were initiated. By the end of the reform period in the early 1970s, this ratio again

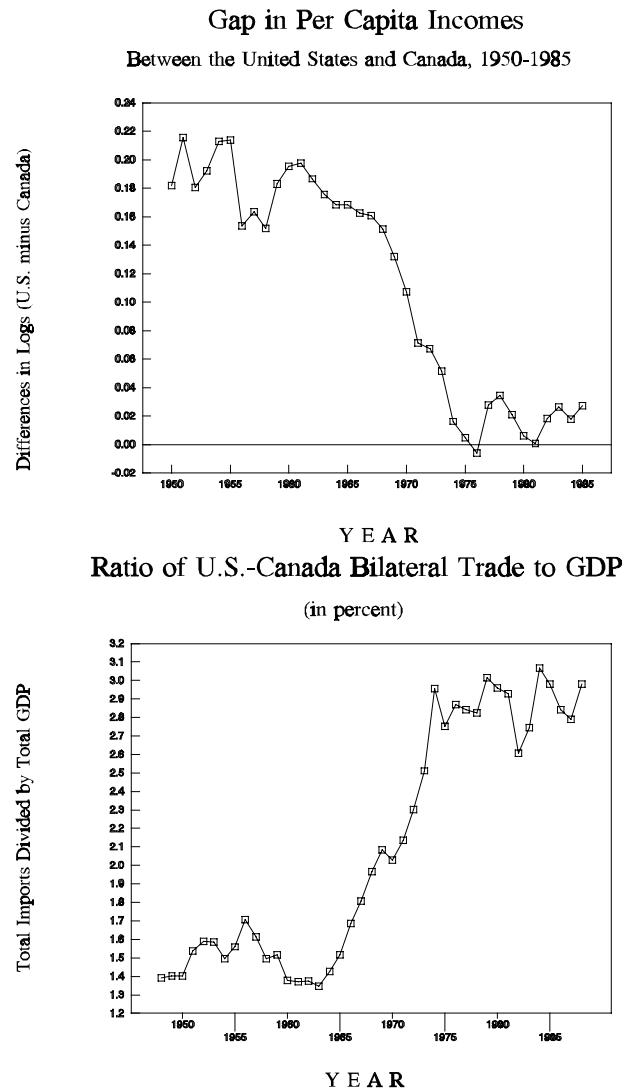
stabilized – at over twice its pre-reform levels.

The top panel shows how the income gap between the two behaved during the postwar period. After fluctuating between 15% and 20% between 1950 and 1967 (as well as for many decades prior to WWII), the gap began to fall in 1968 and to level off in 1973 at levels between 0 and 4% – a very close reflection of the Kennedy Round trade reform dates.

A final example of the link between trade liberalization and income convergence is that of the European Free Trade Association, or

EFTA as it came to be called. EFTA, which comprised eight countries, began to abolish tariffs on trade in manufactured goods in 1961 and completed the process by 1967. The EFTA countries included Austria, Denmark, Finland, Norway, Portugal, Sweden, Switzerland, and the United Kingdom. Portugal was exempt from a large number of the Association’s trade reforms, hence it is not included in the EFTA analysis here. Another country omitted from the analysis is Austria, a country that was among the most developed in Europe at the turn of the century and devastated economically in the two World Wars. The resultant postwar resurgence of Austria

Figure 4.6



Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

led to substantial convergence with the EFTA countries that were initially wealthier following WWII. Since the focus here is on trade-related convergence, Austria is removed from the sample of EFTA countries in order to remove the pro-convergence bias that it introduces.

In contrast with the previous cases of trade liberalization examined above, the income gap in EFTA did not begin falling as the countries began to remove obstacles to trade (top panel of Figure 4.7). Instead, it began to decline later, between the late 1960s and the mid-1970s. This mismatch between the timing of the reforms and the timing of the convergence reflects an apparent contradiction with the earlier findings.

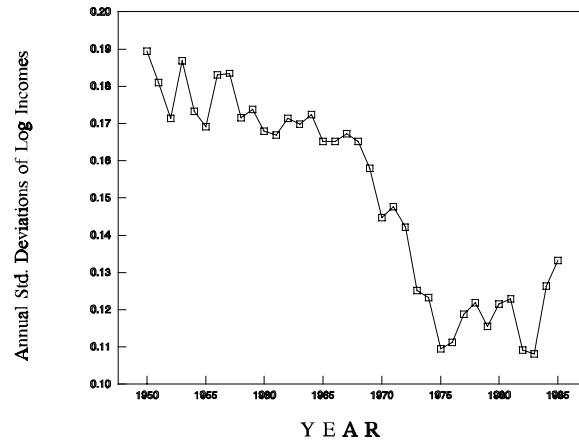
However, it turns out that EFTA did not represent a grouping of countries that traded extensively with one another as was the case in all of the examples studied above.

Their primary trade partners

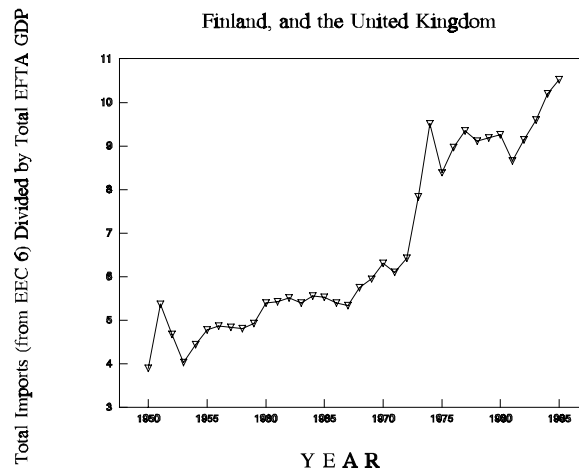
belonged to the EEC and as such, it was the implementation of the Kennedy Round Agreement between the EEC and EFTA between 1968 and 1973 that brought about income convergence

Figure 4.7

Per Capita Income Dispersion Among EFTA 6
Switzerland, Sweden, Denmark, Norway,
Finland, and the United Kingdom



Ratio of EFTA 6 Imports to EFTA 6 GDP:
Switzerland, Sweden, Denmark, Norway,
Finland, and the United Kingdom



Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

between the countries of the two groups (not shown here) as well as within EFTA as is borne out in the top panel of Figure 4.8. The bottom panel of the figure displays the behavior of EFTA imports from the EEC relative to EFTA output. The changes in this ratio appear to have coincided with the timing of the Kennedy Round agreement.

Table 4.2 provides a comparison of the convergence coefficients by liberalization group and by time periods. Significant income convergence in the 1950s occurred between the EFTA and EEC countries as they began to dismantle the quantitative restrictions on trade with one another. Between 1959 and 1967, the formative years of the EEC, it was only this group of countries that exhibited significant convergence. The subsequent decade began with the implementation of the Kennedy Round and it included income convergence within each of the affected groups. The last period, 1978 to 1985, involved no major trade reforms by any of the groups and it was not characterized by significant convergence either.

One last issue remains before this section ends. The previous examples have shown European convergence within the EEC and also among the EFTA countries. While these instances of convergence occurred at different times and in apparent conjunction with the relevant free trade agreements, there might still be a question of whether the postwar convergence was, in fact, a universal phenomenon among the European countries – even those that did not engage in trade liberalization.

Table 4.2: Postwar Convergence Coefficients, by Group^a

Period	Group		Std.Dev.	<i>N</i>	<i>R</i> ²	<i>t</i> -stat. <i>H</i> ₀ : $\phi=1$	Half Life	Double Life
<u>1951-1985</u>	EEC6	0.9709	0.0066	204	0.991	-4.39**	23.5	
	EFTA6	0.9809	0.0097	204	0.981	-1.98	35.9	
	US-Can ^a	0.9534	0.0240	34	0.980	-1.95	14.5	
	EF6-EC6 ^b	0.9676	0.0091	204	0.976	-3.58**	21.0	
<u>1951-1958</u>	EEC6	0.9752	0.0144	42	0.991	-1.73	27.6	
	EFTA6	0.9858	0.0180	42	0.987	-0.79	48.5	
	US-Can ^a	0.9435	0.0559	7	0.979	-1.01	11.9	
	EF6-EC6 ^b	0.9544	0.0151	42	0.980	-3.02*	14.8	
<u>1959-1967</u>	EEC6	0.9496	0.0118	48	0.993	-4.28**	13.4	
	EFTA6	0.9903	0.0144	48	0.990	-0.68	71.0	
	US-Can ^a	0.9845	0.0154	8	0.998	-1.01	44.3	
	EF6-EC6 ^b	0.9834	0.0125	48	0.988	-1.33	41.3	
<u>1968-1977</u>	EEC6	0.9893	0.0154	54	0.987	-0.70	64.1	
	EFTA6	0.9460	0.0230	54	0.970	-2.35*	12.5	
	US-Can ^{ac}	0.8145	0.0416	5	0.990	-4.46**	3.4	
	EF6-EC6 ^b	0.9254	0.0247	54	0.958	-3.02*	8.9	
<u>1978-1985</u>	EEC6	0.9784	0.0159	42	0.989	-1.35	31.8	
	EFTA6	0.9972	0.0293	42	0.966	-0.10	242.9	
	US-Can ^{ad}	0.7657	0.2298	11	0.526	-1.02	2.6	
	EF6-EC6 ^b	1.0242	0.0313	42	0.959	0.77		29.0

EEC 6 includes Belgium, France, Netherlands, Germany, Italy and Luxembourg.

EFTA 6 includes Sweden, Switzerland, Finland, Norway, the United Kingdom and Denmark.

^a The annual US-CAN data are gaps, rather than differences from a group mean as in the case of the other groups.

^b The annual EF6-EC6 data are differences between each of the EFTA 6 incomes and the EEC 6 average income rather than from the EFTA average as in the EFTA 6 rows.

^c Period: 1968-1973.

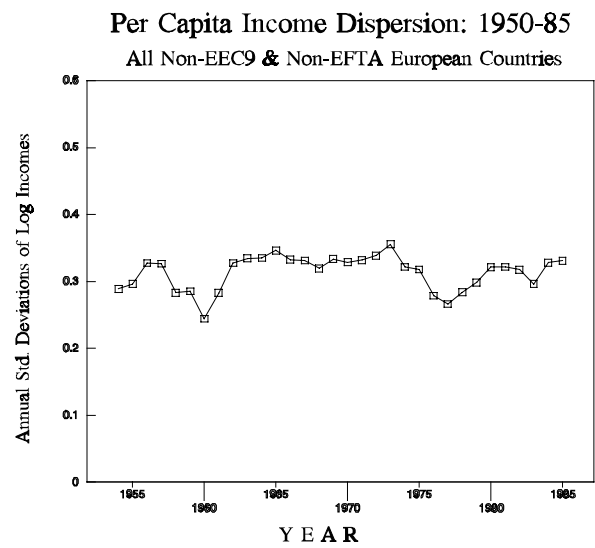
^d Period: 1974-1985.

** Significant at the 1 percent level.

* Significant at the 5 percent level.

Source: Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*, 108, 653-79.

Figure 4.8



Source: Ben-David, Dan, *Free Trade and Economic Growth*, MIT Press, forthcoming.

The remaining non-EEC and non-EFTA countries of the Summers and Heston sample are collected in Figure 4.8. In contrast with the EEC and EFTA examples, the annual income gaps between these countries have not tended either downwards or upwards, *i.e.* no signs of either convergence or divergence.

5. TRADE (IN GENERAL) AND INCOME CONVERGENCE

The emphasis in the earlier sections has been on an examination of specific cases of trade liberalization and the impact of the trade reforms on trade volumes and income gaps. The goal of this section is to move beyond these limited instances of trade liberalization to an examination of the relationship between international trade in general and cross-country income differentials.

The experiment is as follows. The sample period is 1960 through 1985. All of the non-communist and non-oil-producing developing countries in the Summers and Heston (1988) dataset are ranked according to their 1960 per capita incomes. Since the IMF's directional trade data declines in accuracy with the developmental level of countries, then all countries with per capita incomes below 25% of the wealthiest country's – the United States – are omitted from the sample. The 25 remaining middle and high income countries with per capita incomes above the 25% threshold will heretofore be referred to as *source* countries (this group excludes countries that are primarily oil-producers and communist countries).

In light of the earlier evidence that trade liberalization among countries that trade extensively with one another is linked to income convergence amongst them, a list of each source country's major trade partners is created, once on the basis of exports and once on the basis of imports. The criteria for determination of a given country j as a major trade partner of source country i is that i 's exports to j must comprise at least 4% of i 's total exports.⁴ Or alternatively, i 's imports from j must comprise at least 4% of i 's total imports.⁵ This criteria yields trade-based groups ranging in size from 3 to 9 countries in each.

⁴ *Data source:* International Monetary Fund, *Direction of Trade Statistics Yearbook*, various editions.

⁵ This experiment is detailed more fully in Ben-David (1996).

Hence, each source country has two trade groups associated with it, one created on the basis of its exports and one on the basis of its imports. The question at the center of this experiment is whether these trade-based groups exhibit income convergence. The distinction between the export-based and import-based groups is made in order to allow for the possibility that the outcomes from each might not be the same.

Equation 2.2 is estimated for each one of the trade groups and the outcomes appear in Table 5.1 with the left side of the table detailing the export groups' results and the right side detailing the import groups' results. In both the export and import cases, the source country's name is listed in the left column. To the right of this column is a column of numbers representing the number of countries in each of the trade-based groups. The groups are sorted according to their t -statistics. Out of the 25 export-based groups – one per source country – 24 have estimated ϕ 's below one, 16 of these significantly below one. 22 of the import-based groups have ϕ 's below one with 17 of these significantly below one.

In other words, while most of the countries in the world have exhibited income divergence from one another, this experiment suggests that major trade partners tend to exhibit income convergence more often than not. But is the statistical significance of these results really indicative of this conclusion?

Table 5.1: Trade Group's Convergence Coefficients

(sorted by *t*-statistics)

	Export-Based Groups [‡]				Probability of Random Replication From Among all 32 Traders	Import-Based Groups [‡]				Probability of Random Replication From Among all 32 Traders
	Source Country	#	$\hat{\phi}$	<i>t</i> -stat		Source Country	#	$\hat{\phi}$	<i>t</i> -stat	
1	CAN	3	0.935	-4.571 ***	1%	CAN	3	0.935	-4.571 ***	1%
2	AUSTR	6	0.974	-3.760 ***	1%	NOR	9	0.959	-4.452 ***	1%
3	GER	9	0.976	-3.713 ***	1%	SWED	9	0.959	-4.452 ***	1%
4	ICE	5	0.957	-3.565 ***	5%	FIN	6	0.955	-4.380 ***	1%
5	JAPAN	3	0.984	-3.470 ***	5%	ICE	9	0.958	-4.024 ***	1%
6	FRA	8	0.978	-3.236 ***	5%	GER	8	0.973	-3.526 ***	1%
7	NZ	5	0.966	-3.057 ***	5%	JAPAN	3	0.959	-3.496 ***	1%
8	ITAL	6	0.979	-2.883 ***	5%	DEN	9	0.969	-3.249 ***	1%
9	SWIS	6	0.979	-2.883 ***	5%	SWIS	8	0.978	-3.236 ***	1%
10	BELLU	7	0.981	-2.643 ***	5%	AUSTR	4	0.975	-3.233 ***	1%
11	NETH	7	0.981	-2.643 ***	5%	AUSTL	6	0.966	-3.209 ***	5%
12	SPA	7	0.983	-2.413 **	5%	NZ	6	0.966	-3.209 ***	5%
13	AUSTL	4	0.973	-2.309 **	5%	FRA	7	0.981	-2.643 ***	5%
14	SWED	9	0.979	-1.990 **	5%	UK	9	0.979	-2.613 ***	5%
15	UK	8	0.992	-1.796 *	10%	ITAL	6	0.983	-2.300 **	5%
16	FIN	7	0.980	-1.745 *	10%	BELLU	6	0.979	-2.078 **	10%
17	IRE	7	0.994	-1.359	10%	NETH	6	0.979	-2.078 **	10%
18	DEN	7	0.985	-1.237	10%	SPA	7	0.993	-1.339	20%
19	CHIL	8	0.993	-1.117	20%	IRE	5	0.994	-1.295	20%
20	NOR	7	0.988	-1.037	20%	US	6	0.996	-0.731	30%
21	ARGN	5	0.996	-0.909	30%	URUG	5	0.998	-0.445	40%
22	US	6	0.996	-0.731	30%	MEX	3	0.999	-0.208	30%
23	URUG	6	0.998	-0.404	30%	SAFR	6	1.003	0.553	50%
24	MEX	4	0.998	-0.327	30%	ARGN	8	1.003	0.883	40%
25	SAFR	7	1.005	1.782 *		CHIL	6	1.006	0.903	

*** Significantly different from one at the 1% level.

** Significant different from one at the 5% level.

* Significant different from one at the 10% level.

Export groups include all countries that receive over 4% of the source countries total exports.

Import groups include all countries that are the origin of over 4% of source countries total imports.

The column heading, #, represents the number of countries in each group.

Source: Ben-David, Dan (1996), "Trade and Convergence Among Countries," *Journal of International Economics*, 40, 279-298.

It turns out that if one creates a pool of all of the major trade partners and all of the source countries, then this pool will comprise 32 countries – just 7 more than the total number of source countries. In other words, most of the source countries reappear as major trade partners of other source countries. So it may be that any randomly selected group from the pool of 32 countries might exhibit the same incidence of convergence as the trade-based groupings.

Since trade group sizes range from 3 to 9, then up to 5000 random groupings in each of these various sizes were created from the pool of 32 countries and equation 2.2 estimated for each grouping. Table 5.1 indicates the uniqueness of each of the trade group outcomes.

For example, take NZ (New Zealand), the 7th source country on the list of export-based groups. Its export-based group included 5 countries and yielded a convergence coefficient of 0.966, an outcome that is significantly less than one at the 1% level. What is the likelihood of reproducing such an outcome of 0.966 in a group of 5 countries that are *randomly* selected from the pool of 32? As the right-hand column indicates, there is less than a 5% likelihood that a randomly-created group will yield such an outcome.

The probabilities of attaining each of the trade group outcomes in random groupings is listed in the table for each of the groups for which this probability is less than 50%. In all, the likelihood of replicating the convergence coefficients is less than 10% in 35 of the 50 groups – *i.e* in 70% of the trade groups. Further tests were also conducted (these are reported in Ben-David, 1996) to gauge the sensitivity of the results to various other possible reasons that might be behind these outcomes, but the conclusion remains that grouping the countries together on the basis of major trade ties yields income convergence in many instances where such convergence is not otherwise found when these same countries are grouped according to different criteria.

Table 5.2 Convergence in Output Per Worker(trade groups sorted by t -statistics)

	Export-Based Groups [†]			
	Source Country	Size	$\hat{\phi}$	t -stat
1	NZ	5	0.956	-7.05 ***
2	CAN	3	0.945	-5.19 ***
3	AUSTL	4	0.945	-5.01 ***
4	GERM	9	0.963	-4.64 ***
5	US	6	0.966	-4.14 ***
6	IRE	7	0.975	-4.06 ***
7	JAP	3	0.977	-4.01 ***
8	FRA	8	0.964	-3.99 ***
9	AUSTR	6	0.965	-3.86 ***
10	UK	8	0.975	-3.85 ***
11	ICE	5	0.967	-3.72 ***
12	ITAL	6	0.966	-3.53 ***
13	SWIS	6	0.966	-3.53 ***
14	BELLU	7	0.968	-3.48 ***
15	NETH	7	0.968	-3.48 ***
16	MEX	4	0.966	-3.29 ***
17	SPA	7	0.973	-3.19 ***
18	SWED	9	0.975	-3.07 ***
19	FIN	7	0.973	-2.90 ***
20	NOR	7	0.976	-2.56 ***
21	DEN	7	0.978	-2.29 **
22	ARGN	5	0.986	-2.25 **
23	CHIL	8	0.991	-1.53
24	URUG	6	0.994	-0.91
25	SAFR	6	1.002	0.91

	Import-Based Groups [†]			
	Source Country	Size	$\hat{\phi}$	t -stat
1	GERM	8	0.966	-5.94 ***
2	UK	9	0.967	-5.74 ***
3	ICE	9	0.963	-5.41 ***
4	FIN	6	0.962	-5.35 ***
5	SWED	9	0.968	-5.22 ***
6	NOR	9	0.968	-5.22 ***
7	CAN	3	0.945	-5.19 ***
8	JAP	3	0.936	-5.15 ***
9	AUSTL	6	0.964	-5.10 ***
10	NZ	6	0.964	-5.10 ***
11	AUSTR	4	0.938	-4.77 ***
12	DEN	9	0.972	-4.48 ***
13	US	6	0.966	-4.14 ***
14	SWIS	8	0.964	-3.99 ***
15	MEX	3	0.959	-3.58 ***
16	FRA	7	0.968	-3.48 ***
17	ITAL	6	0.970	-3.25 ***
18	IRE	5	0.980	-2.70 ***
19	BELLU	6	0.976	-2.57 ***
20	NETH	6	0.976	-2.57 ***
21	SPA	7	0.978	-2.54 ***
22	SAFR	6	0.992	-1.63
23	ARGN	8	0.997	-0.90
24	URUG	5	0.994	-0.85
25	CHIL	6	1.006	0.67

Significantly different from unity at the 1% (***) and 5% (**) levels.

Source of Table: Ben-David, Dan, *Free Trade and Economic Growth*, MIT Press, forthcoming.

Using more recent Summers and Heston (1995) data that includes output per worker rather than output per person, the incidence of convergence is even higher (Table 5.2). In this case, 22 of the 25 export-based groups and 21 of the import-based groups – or 86% of the trade-based groups – exhibit significant convergence at the 5% level.

These tables show that grouping countries according to trade criteria yields convergence results considerably more often than do random groupings of countries. From among these major trade partners, is it also the case that those who increase trade the most also exhibit the fastest rates of convergence?

Let $R_{i,t}$ equal the ratio of total intra-group trade to total group output for group i at time t and let $\sigma_{i,t}$ equal the standard deviation of the group members' log output per worker. Then an equation of the type

$$\sigma_{i,t} = \beta_0 + \beta_1 T_t + \beta_2 R_{i,t} + \varepsilon_{i,t} \quad (5.1)$$

provides an indication of how changes in the trade-output ratio affect the income gaps. To eliminate fixed effects and focus just on the impact of *changes* in trade on *changes* in the rate of income convergence, Equation 5.1 is differenced,

$$D\sigma_{i,t} = \beta_1 + \beta_2 DR_{i,t-2} + \xi_{i,t} \quad (5.2)$$

and then estimated twice, once for the 25 export-based groups (which are all pooled together) and once for the 25 import-based groups. Simple convergence resulting from the trade-based groupings of the countries is reflected in a negative trend coefficient, β_1 . As Table 5.3 shows, that is indeed the case for both exports and imports, indicating convergence in both – which is not surprising given that most of the groups individually exhibited income convergence in the earlier analysis.

The difference here is in the inclusion of the trade ratios in the equation. The significantly negative coefficients for the trade ratios (β_2) indicate that *increases* in trade contribute to even *faster* rates of convergence.

Table 5.3: Relationship Between Changes in Trade and Changes in Income Disparity

	β_1	β_2	N	R^2
Exports	-0.022 (-11.39)	-0.058 (-2.23)	575	0.009
Imports	-0.024 (-12.41)	-0.079 (-2.86)	575	0.014

t-statistics in parentheses. N is the number of observations.

Source: Ben-David, Dan and Ayal Kimhi (2000), "Trade and the Rate of Income Convergence," CEPR Discussion Paper 2390.

6. ECONOMIC GROWTH

It is interesting to note that, while the postwar period has been characterized by movement towards freer trade, most countries experienced either growth slowdowns, or no noticeable growth improvements.⁶ Using structural break tests that endogenously determine the existence of a trend break along a given growth path – and determine its statistical significance – Ben-David and Papell (1998) examine the postwar growth paths of 74 countries between 1950 and 1990. We find that 54 of the countries exhibit a significant structural trend break in their growth path during this period. Of these 54 countries, 46 experienced significant slowdowns following their breaks and only eight countries out of the entire sample exhibited increases in their rates of growth.

The postwar growth paths of the three biggest EEC founding countries, France, Germany, and Italy, appear in the three panels of Figure 6.1. Together with the actual paths are the extrapolated paths (based on the coefficients derived in the structural break tests) that the countries would have continued to be on had they not experienced the trend breaks. As the pictures quite clearly illustrate, the original EEC's Big Three experienced substantial growth slowdowns.

While most countries slowed down during the postwar years, the majority of them exhibited increases in the volume of their trade (Ben-David and Papell, 1997). The evidence of heightened trade on the one hand, combined with growth slowdowns on the other, appears

⁶ A sample of the studies examining these slowdowns includes Griliches (1980), Bruno (1984), Romer (1987), Baumol, Blackman, and Wolff (1989), and De Long and Summers (1992).

to indicate that the relationship between trade and growth, to the extent that one exists, is a negative one.

But this is not the only way to interpret the empirical evidence. The postwar period is, by definition, a period following a major upheaval. Standard growth theory tells us that in the aftermath of a negative shock as great as World War II, countries should be expected to exhibit growth rates that initially exceed their steady-state rates (upper panel in Figure 6.2). Eventually, as countries return to their original growth paths, their growth rates should fall back to the original steady-state values (Ben-David and Papell, 1995, calculates and compares the pre- and postwar steady state growth paths). One source for such an explanation of the postwar slowdowns would be the Solow growth model.

So maybe, instead of focusing on just the postwar, we should take a step back and look at the big picture. The fact that growth

Figure 6.1: Big 3 EEC Founders

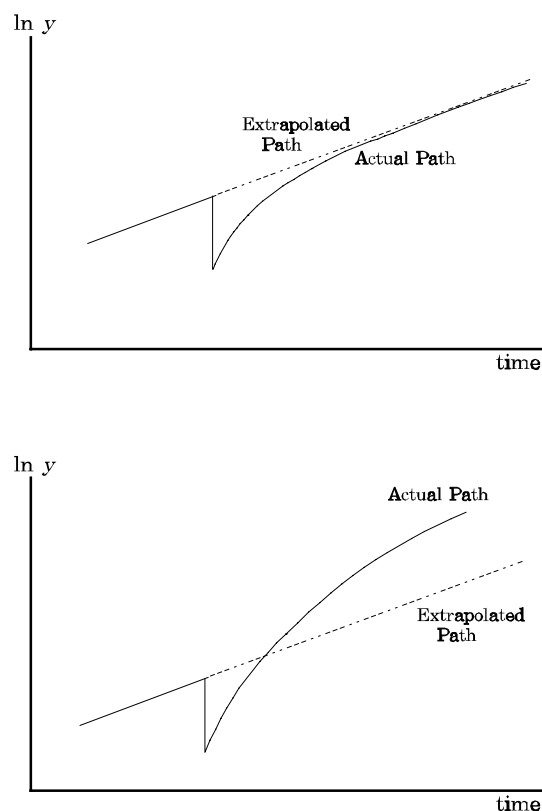


Source: Ben-David, Dan and David H. Papell (1998), "Slowdowns and Meltdowns: Postwar Growth Evidence from 74 Countries," *Review of Economics and Statistics*, 80, 561-571.

rates have fallen during the past several decades could very well be due to the return of countries to their long-run growth paths.

However, in light of the extensive trade liberalization that has occurred since the war, one might ask whether postwar steady-state paths are the same as the prewar paths or are they new

Figure 6.2 Postwar Slowdowns in a Long-Run Context



Source: Ben-David, Dan, *Free Trade and Economic Growth*, MIT Press, forthcoming.

paths characterized by faster growth and higher incomes? In other words, could the relevant diagram be the lower panel in Figure 6.2 rather than the upper panel?

One illustration of postwar slowdowns within the long-run context is Japan (Figure 6.3). The country had two significant trend breaks over the past century: in 1944 and 1973. The first was followed by a sharp drop in levels and subsequent high growth. The period of high growth ended in 1973, and the slowdown began. But the *levels* of the new post-slowdown path followed by Japan are clearly above the levels of the pre-WWII path.

Also, the *slope* of the post-1973 path is higher than that of the pre-WWII path, even though Japan exhibited a substantial slowdown following the steep postwar transitional phase. From 1885 to 1944, Japan grew at an average rate of 1.7%. Between 1944 and 1973, this rose to 7.7% – and then fell to 3.3% between 1973 and 1989, a ratio of nearly 2:1 when compared to the pre-WWII average.

What happened to the EEC countries? The earlier sections showed that they converged with the onset of liberalization, but is the trade-related convergence that they exhibited a goal that countries should strive for? If, for example, one comes from a country that is initially better off than its trade partners, then the distinct convergence towards the middle as opposed

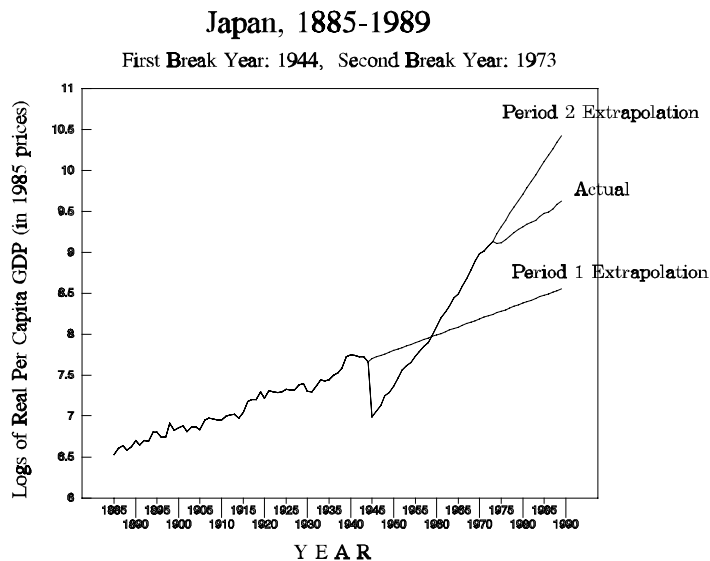
to catch-up convergence towards the wealthier group members is not a trivial concern. Is this a zero-sum game where any benefits that accrue to one country must come at the expense of its trade partner?

A look at Belgium between 1870 and 1989, in the top left corner of Figure 6.4, is revealing.

Growth rates prior to the First

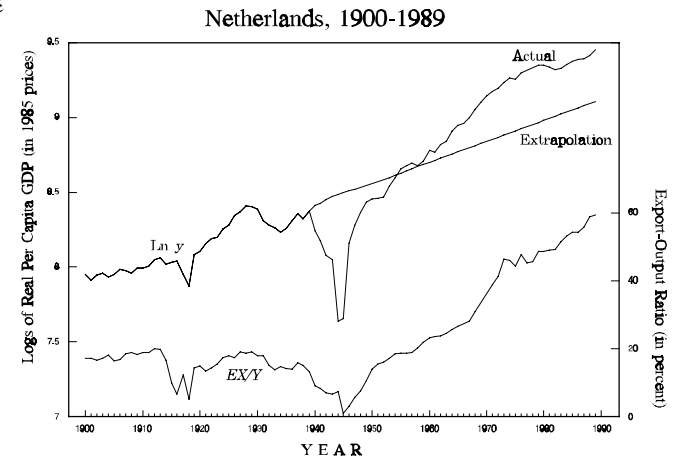
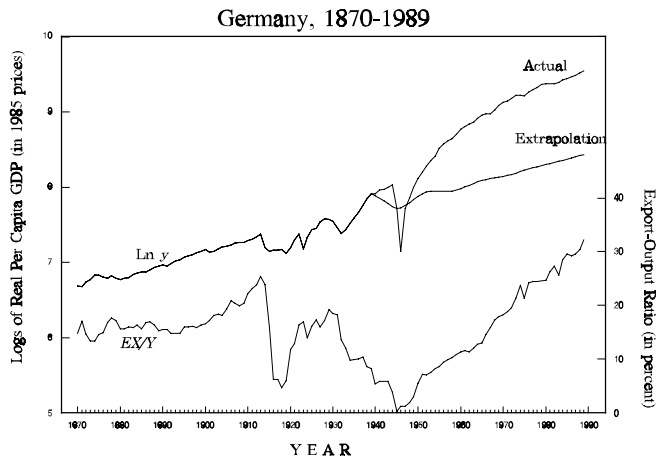
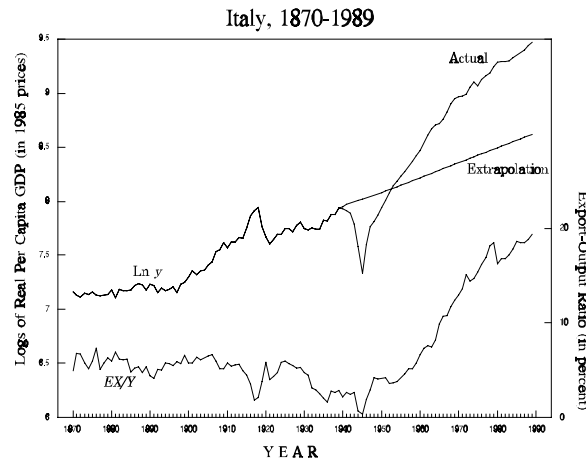
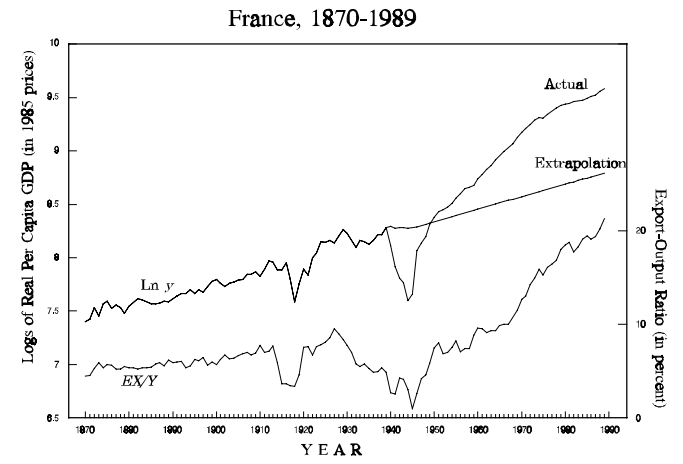
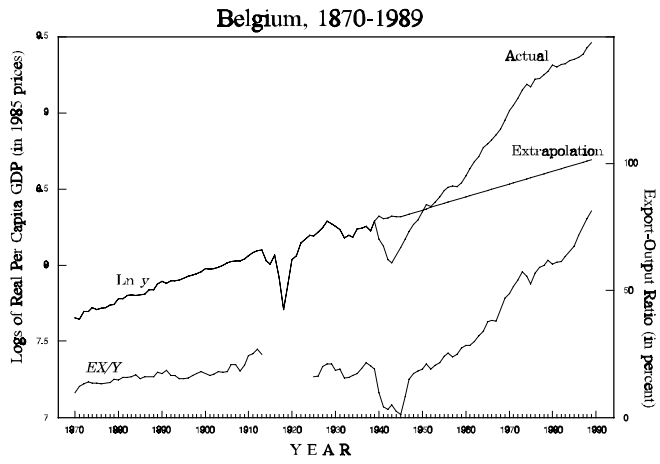
World War were steady, while the export-output ratio of the country was also fairly stable. The outbreak of WWI resulted in a severe drop in levels of GDP per person. In the years following the war, while the export-output ratio continued to remain at its pre-war level, the country experienced a transition back to its original multi-decade growth path – just as predicted by the neoclassical growth model. However, the aftermath of World War II reflects another story altogether. While the export-output ratio increased throughout the postwar period, the country not only rebounded to its earlier path, it eclipsed it altogether and kept right on growing. The postwar slowdown, when it occurred, did not signal a return to the old growth path levels. It did not even signal a return to the old growth rates.

Figure 6.3



Source: Ben-David, Dan, Robin Lumsdaine, and David H. Papell (1999), "Unit Roots, Postwar Slowdowns and Long-Run Growth: Evidence From Two Structural Breaks," unpublished working paper.

Figure 6.4: Comparisons of 1940-89 Growth Paths With 1870-1939 Paths



In France, WWI and its aftermath also fit the Solow model prediction. But, as in the Belgian case, WWII and its aftermath do not. In short, each one of the other original EEC countries ended up on higher growth paths in the latter decades of the sample.

The removal of trade barriers between these countries led to substantial increases in trade, with the average ratio of exports to GDP in five of the six original member countries (Belgium, France, Germany, Italy, and the Netherlands – no data for Luxembourg, the sixth country) during the postwar years exceeding the average ratio for these countries in the seven decades preceding World War II by a factor of 2.11. Although the increased openness of the postwar period is accompanied by higher growth rates, it would be presumptuous to attribute all of the faster growth following World War II to increased trade.

Nevertheless, it is still useful to compare results between the relatively free trade years prior to World War I (1870-1913) and the years following the onset of the postwar slowdown (1973-1989). The average export-output ratio across the five countries for the post-slowdown period exceeds the pre-World War I ratio by a factor of 2.83. Likewise, the five country average growth rate of per capita real GDP for the post-slowdown period is also higher, exceeding the pre-World War I rate by a factor of 1.63. So, not only did the degree of income disparity among the EEC countries decline significantly, they all grew faster as well.

What happened after WWII to some of the other countries for whom we have historical data? In general, in each of 16 OECD countries examined over the long run, the average ratio of postwar to prewar growth rates (with the postwar period not including the very high-growth first few years following WWII) was greater than one (Table 6.1). Postwar growth rates for the group as a whole were 142% higher in the 4 decades following WWII than they were in the 7 decades preceding it.

Average levels of export-output ratios were higher for all but one of the countries.⁷ For the group as a whole, these averages were nearly twice as high following the war. Figure 6.5 displays the relationship between the changes in trade and the changes in growth and suggests – with the exception of Australia (AUL in the diagram) – a somewhat positive relationship between the two.

The positive relationship between trade openness economic growth is shown in a number of

studies (for example: Harberger, 1984; Dollar, 1992; Gould, Ruffin and Woodbridge, 1993; Henrekson, Torstensson and Torstensson, 1996; Harrison, 1995) though a recent paper by Rodriguez and Rodrik (1999) challenges some of these results.⁸

⁷ The lone exception, Australia, experienced large migration inflows rather than trade inflows following the Second World War.

⁸ Michaely (1977) and Feder (1982) provide evidence on the positive relationship between exports and output growth, while Ram (1990) finds a positive link between imports and growth. Baldwin and Seghezza (1996) emphasize the impact of trade-induced investment-led growth and find that openness spurs investment, which in turn stimulates economic growth. A general survey of the relationship between openness and growth is provided in Edwards (1993).

Table 6.1

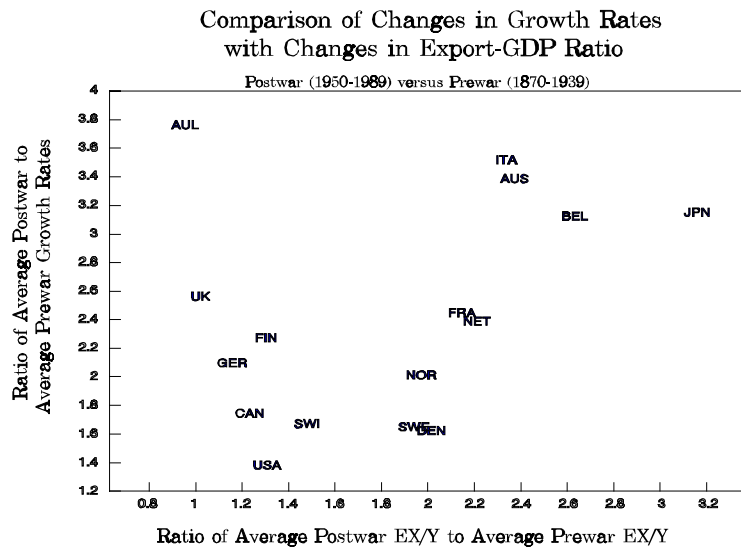
Changes in Export-GDP Ratios and Changes in Rates of Growth for 16 OECD Countries

Postwar (1950-1989) versus Prewar (1870-1939)

Country	Ratio of Postwar Average to Prewar Average	
	Growth Rates	EX/Y
Australia	3.75	0.96
Austria	3.38	2.37
Belgium	3.12	2.63
Canada	1.74	1.24
Denmark	1.62	2.02
Finland	2.26	1.31
France	2.44	2.15
Germany	2.09	1.16
Italy	3.51	2.34
Japan	3.14	3.15
Netherlands	2.38	2.21
Norway	2.00	1.97
Sweden	1.64	1.94
Switzerland	1.66	1.48
U.K.	2.55	1.03
U.S.	1.38	1.31
Average	2.42	1.83

Source: Ben-David, Dan and Michael B. Loewy (2000), "Knowledge Dissemination, Capital Accumulation, Trade and Endogenous Growth," forthcoming *Oxford Economic Papers*.

Figure 6.5



Source: Ben-David, Dan, *Free Trade and Economic Growth*, MIT Press, forthcoming.

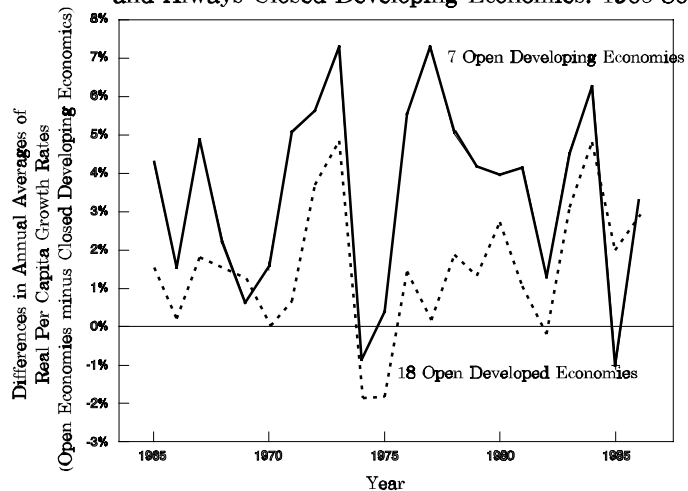
Sachs and Warner (1995)

find a positive relationship between countries that removed trade barriers and countries that exhibited faster growth. Focusing on developing countries, for example, Sachs and Warner classify 34 developing countries as having been relatively closed to trade during the entire period

between 1965 and 1986. They classify another 7 developing countries as having been open to trade during this period. For comparison purposes, we will also look at 18 developed countries, that are also classified by Sachs and Warner as open economies.

It is interesting to compare between the growth rates of these 3 groups of countries (Figure 6.6). In particular, the group of open developing countries grew by an average of 3.5 percentage points faster than the group of closed developing countries. By comparison, the group of open

Figure 6.6
Average Growth Differences Between Always Open Economies and Always Closed Developing Economies: 1965-86



Source of graph: Ben-David, Dan, *Free Trade and Economic Growth*, forthcoming MIT Press.

Source of openness classification: Sachs, Jeffrey D. and Andrew Warner (1995), "Economic Reform and the Process of Global Integration," in Brainard, William C. and George L. Perry (eds.), *Brookings Papers on Economic Activity*, 1-95.

developed countries grew by an average of 1.5 percentage points faster than the group of closed developing countries.

Put differently, at the average growth rate of 1.15% exhibited by the closed developing countries, an average person's real income would double after 62 years. Alternatively, an average person in one of the open developing countries would see their real income grow 16 fold during this 62 year span – and an average person in one of the open developed countries would experience a 5-fold increase in their real income. These are not marginal improvements when one considers them from the perspective of an average citizen. They represent substantial progress up the income ladder.

And finally, these results are also supportive of the divergence between relatively open developed and and relatively closed developing countries. They also indicate convergence between the open developing countries with the open developed countries.

7. ONE EXPLANATION FOR THE EMPIRICS

What might be the source of the income convergence described in the earlier sections? From traditional trade theory, the Factor Price Equalization Proposition (Samuelson, 1948; Helpman and Krugman, 1985) can explain how free trade might lead to an equalization of factor prices – but not necessarily the equalization of per capita incomes. From traditional growth theory, the neoclassical growth model (Solow, 1956; Cass, 1965; Koopmans, 1965) model can explain per capita income convergence, but this occurs within a closed economy model in lieu of trade. Furthermore, both models are unable to explain how trade policy might affect steady state growth. This is one of the gaps in the traditional literature that some of the new endogenous growth models have attempted to fill.⁹

How might trade have played a role in the heightened growth and the income convergence that occurred? The competition that trade induces between importers and exporters forces them to learn and utilize ever better technologies in the struggle to survive and grow. In the process, trade acts as a conduit for the dissemination of ideas.¹⁰ Trade barriers, to the extent that these are erected, inhibit the flow of ideas and diminish the ability of countries to develop.

In theoretical models, the level of technology plays an important role in determining a country's output level and growth. From an empirical standpoint however, technology is an intangible that is extremely difficult to quantify analytically. Total factor productivity (TFP) is

⁹ See for example: Romer (1990), Jones and Manuelli (1990), Grossman and Helpman (1991a, 1991b), Rivera-Batiz and Romer (1991a, 1991b), Stokey (1991), Young (1991), Backus, Kehoe, and Kehoe (1992), Easterly, King, Levine, and Rebelo (1994), Feenstra (1996), Connolly (1997), and Frankel and Romer (1999).

¹⁰ Studies showing various channels through which trade acts as a conduit for the dissemination of ideas include: Dollar, Wolff and Baumol (1988); Marin (1995); Coe and Helpman (1995); Coe, Helpman and Hoffmaister (1997); Eaton and Kortum (1996) and Keller (1999). Grossman and Helpman (1995) formalize this relationship and also provide a review of the related literature.

used to get around this problem. Assuming that $Y = AK^\alpha H^\beta L^{1-\alpha-\beta}$, (where Y is the amount of output, L is labor, K is physical capital, and H is human capital) then this may be written in per capita terms as $y = Ak^\alpha h^\beta$. Thus, total factor productivity in this case would be

$$A = \frac{y}{k^\alpha h^\beta}$$

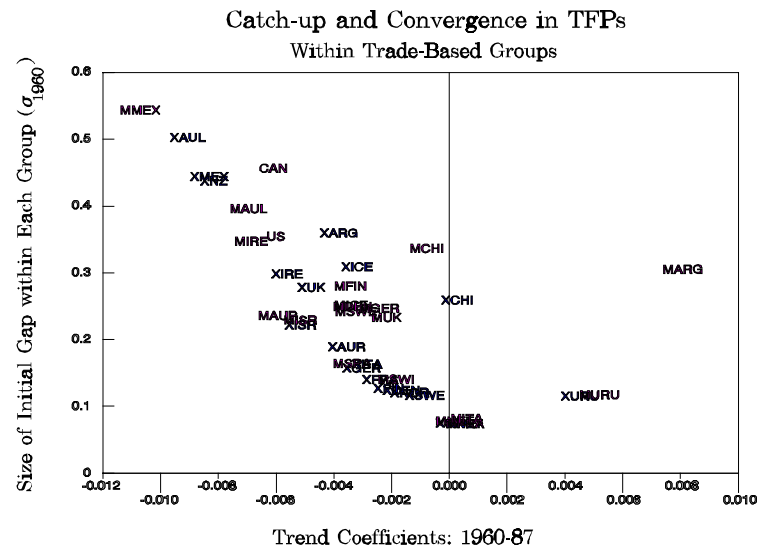
There exists data on y , k , and h . Hence, TFPs may be calculated discounting each country's output per worker by its capital-labor ratios as well as by its stock of human capital, as measured by the years of schooling per person in each country.

The "catch-up hypothesis" (Veblen, 1915; Gerschenkron, 1952; Abramovitz, 1979, 1986; and others), while not directly related to trade, suggests that the larger the technology gap between countries, the faster the laggard country should be expected to grow as it catches up to the leaders. But as Figures 2.2 and 2.3 indicate, the groups with the largest initial income gap do not exhibit the fastest convergence. In fact, they are not even converging at all.

What happens when we look at the TFP levels of the countries in the trade-based groups discussed earlier? As the discussion above indicated, the majority of these exhibited income convergence. Did they also exhibit technological convergence?

Convergence will be estimated by regressing σ , the TFP gap, on trend. A negative trend coefficient implies convergence. As is indicated in Figure 7.1,

Figure 7.1



Source: Ben-David, Dan (2000), "Catch-Up, Trade and Technological Diffusion," unpublished working paper.

most of the trade-based groups exhibited TFP convergence (*i.e.* 77% had significantly negative trend coefficients – 82% export and 71% import). In addition, the trade groups with the highest initial technological gap were also the groups that tended to exhibit the fastest technological convergence. The correlation coefficient between the initial gap size and the speed of convergence in the export case is -0.83 , while for imports it is -0.60 with the Argentinean import group and -0.82 without it.

And finally, the speed of the TFP convergence appears to be fairly closely related to the speed of the income convergence. Groups that exhibit faster rates of TFP convergence tend to exhibit faster rates of convergence in output per worker as well. The correlation between the speed of output convergence and the speed of TFP convergence is 0.77 for exports and 0.68 for imports.

8. CONCLUSION

Before closing, let's put this all into perspective. There is very little evidence that countries, in general, are converging towards one another. In fact, income gaps between the majority of countries appear to be growing over time.

Among those countries that are nonetheless converging, an important thread that appears to tie together many of them is international trade. Countries that formally enacted trade liberalization policies exhibited income convergence once they implemented trade reforms. The trade reform programs examined here were performed according to specific timetables that varied from group to group. Although no intra-group income convergence was evident prior to the inception of the individual trade reforms, significant convergence, together with significant increases in the volume of trade, began to occur simultaneously with the removal of the trade barriers.

In a generalization of this finding, it is shown that countries that trade extensively with one another tend to exhibit a relatively high incidence of income convergence. An increase in the extent of trade by these countries is associated with even faster rates of convergence.

The trade-related convergence does not appear to have come at the expense of the wealthier countries. In fact, not only have the relatively poorer liberalizing countries been able to move to higher and steeper growth paths, so have their wealthier trade partners. When put in a long-run perspective, the postwar slowdowns were to growth rates that were nonetheless higher than the growth rates along the multi-decade prewar paths. In summation, the results shown in this paper suggest that international trade provides an important contribution toward the

economic growth of nations – in particular, for those countries that are lagging behind their trade partners.

That said, it should be noted that the results of this paper in no way imply that trade policy is the most important policy from a long-run growth perspective. Other aspects of openness such as foreign investments were not examined here and there are several studies that report the contribution of these. More importantly perhaps, is the fact that data limitations precluded the analysis of poor countries here – and it is far from obvious (at least to this author) that the impact of trade liberalization on incomes in the middle and high income countries could also be found in the poorest countries in the world.

In this regard, the contribution of several critical institutions in providing the overall environment for openness to contribute to growth is extremely important. Although trade can serve as a conduit for knowledge spillovers, the capacity of each country to absorb these trade-induced spillovers is different. If a country wishes to develop and compete, then exposure to technology must be accompanied by a serious investment in domestic education – as well as in infrastructure, telecommunication, preservation of property rights, and all of the other essential ingredients so important in enabling a country to enjoy the fruits of openness to the rest of the world.

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