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Trade and the Rate of Income Convergence

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Discussion Paper No. 10-97

November 1997

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TRADE AND THE RATE OF INCOME CONVERGENCE

ABSTRACT

To the extent that trade policy affects trade flows between countries, the ramifications can be far-reaching from an economic growth perspective. This paper examines one aspect of these ramifications, namely the impact of changes in the extent of trade between countries on changes in the size of the income gap that exists between them. Over 100 pairs of countries are examined. We find that an increase in trade between major trade partners – and in particular, increased exports by poorer countries to their wealthier partners – is related to an increase in the rate of convergence between the countries.

I. INTRODUCTION

In a world that exhibits non-decreasing income gaps (and in many cases, increasing gaps) between most of the countries, there is nonetheless a small minority of countries exhibiting income convergence. Not all of these instances of convergence are among the wealthy countries, nor is it the case that all of the wealthy countries exhibit convergence.

In contrast to the conventional wisdom, convergence among the relatively developed countries is far from a robust phenomenon (Ben-David, 1995). Some countries converge with others, but not with the remainder. Other countries converge with yet different countries, but also not with most. In short, a random grouping of the more developed countries will not yield income convergence in more instances than it will yield non-convergence.

Thus, if one focuses on the non-poor countries, can a thread be found that ties together the groups of converging countries in a manner that distinguishes them from the larger array of non-convergence groups? This paper explores the contribution of international trade to the convergence process.

Why should greater openness between countries be related to income convergence between them? It is probably not unreasonable to assume that greater openness is related to increased competition, both at home and abroad, for domestic firms. The resultant sink or swim environment makes it crucial for affected firms to absorb foreign knowledge and ideas. Hence, greater openness could presumably be tied to increased knowledge spillovers between countries. To the extent that knowledge levels among countries converge to a common level, then intuition suggests that this might lead to a convergence in the developmental levels of countries as well. Ben-David and Loewy (1997) incorporate this intuition into a model that details both the

transitional, as well as the steady state, impact of trade policy on convergence and growth in per capita output.

This paper focuses on the empirical facets of this issue by examining 127 country pairs created on the basis of exports, and 134 country pairs created on the basis of imports. In each case there will be a source country that is paired with one of its major trade partners. The goal will be to examine how *changes* in trade relationships over time can lead to *changes* in the degree of income disparity among countries.

The following section provides some background and discusses related studies. Section three details the relationship between changes in trade and changes in the rate of convergence within trade-based groups of countries. Section four focuses on the trade-convergence relationship within a bilateral setting. Section five concludes.

II. Background and Motivation

The upsurge in growth-related research in the past decade has included a number of important contributions that have focused on the relationship between international trade and output growth and convergence. Work that is directly related to the analysis below includes Coe and Helpman (1995), for example, who focus on the impact of R&D spillovers on productivity growth. They find that a country's productivity levels are affected not only by its own investments in R&D, but also on the investments made by its trade partners. Keller (1996) disputes the importance of the bilateral trade relationships in the Coe and Helpman study, though his other work (Keller, 1997) also concludes that there does appear to be a general spillover effect emanating from foreign R&D. Dollar (1992), Edwards (1993), Harrison (1995), Sachs

and Warner (1995), and Henrekson, Torstensson and Torstensson (1996) focus directly on the impact of trade openness on economic growth and find a positive relationship between the two.

This study extends past research by Ben-David on the relationship between international trade and income convergence. The initial phase of the research was aimed at establishing evidence on the existence of the link between trade reforms and convergence. By choosing a small number of countries that decided to formally liberalize trade, Ben-David (1993) was able to examine the degree of disparity prior to, during, and following the implementation of the trade reforms. In each of these instances, no income convergence was apparent during the decades prior to the reduction of trade barriers. As the countries began their liberalization, income gaps began to fall, and they continued to remain below the pre-liberalization levels in the years following the end of the reform process.

To the extent that these agreements to liberalize trade are viewed as exogenous events, this result is important, for it provides support for the hypothesis that it is the movement towards freer trade that led to the convergence and not the other way around. Different groups that embarked on liberalization at different times began to converge during their respective time frames and not earlier or later.

This research on the impact of trade liberalization on incomes also showed a strong positive relationship between the degree of openness and the volume of trade. For example, the United States and Canada instituted a series of major trade reform measures between 1965 and 1973. These began with the implementation of the auto agreement between the two countries in 1965 and continued with much broader reforms during the years 1968 through 1973 as the Kennedy Round agreements were implemented (Preeg, 1970).

As is indicated in Figure 1, the liberalization of trade between the two countries had a marked effect on trade between the two.[1] The figure plots the ratio of bilateral trade to total GDP of the two countries between 1948 and 1988 as well as the average trade-output ratio for the pre-reform period (1948-1965) and the average trade-output ratio for the post-reform period, (1974-1988). Trade grew at roughly the same rate as output prior to the reductions in trade barriers. The liberalization was accompanied by a substantial increase in trade. Upon completion of the Kennedy Round reforms, the trade ratio stabilized once again – at a level nearly twice the pre-reform level.

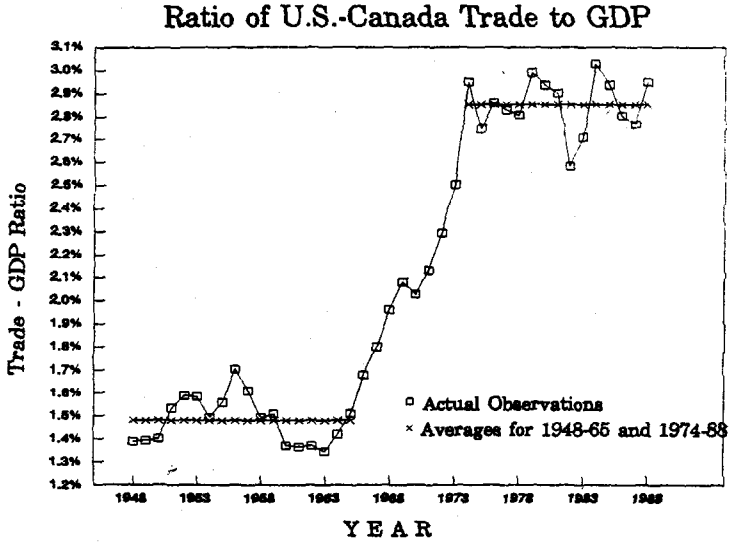

Figure 1

The formation of the European Economic Community (EEC) in the late 1950's and its expansion in the early 1970's provides another example of the impact that trade reforms may have on the volume of trade. The six founding countries of the EEC began to liberalize trade with one another over a decade before the Community was actually formalized.[2] Marshall Plan aid in the late 1940's was tied to the implementation of trade reforms. The reforms continued throughout the 1950s with the signing of the additional agreements between the six original EEC countries and culminated in the formation of the Economic Community which implemented a

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[1] *Data sources*: IMF Direction of Trade and International Financial Statistics data.

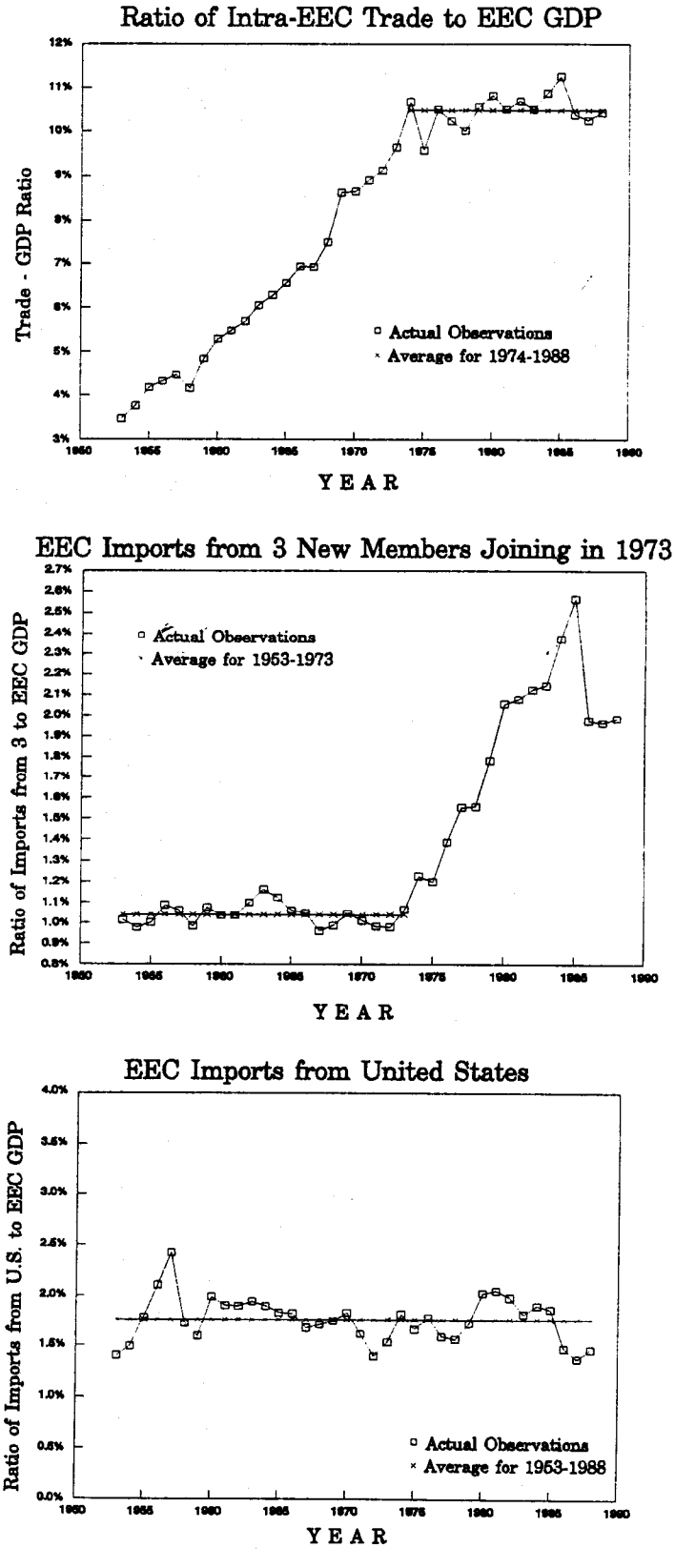
[2] The first EEC members were France, Germany, Belgium, Luxembourg, the Netherlands and Italy.

series of further tariff and quota reductions. By the early 1970s, most trade barriers between the countries were gone, and as the top panel in Figure 2 shows, the trade-output ratio – which rose substantially until then – leveled off.

In 1973, the Community expanded with the inclusion of three new members.[3] EEC imports from the three countries prior to their inclusion into the Community (shown in the middle panel of Figure 2) was relatively constant. The import-output ratio rose steadily following membership in 1973.

And finally, for comparison purposes, the United States, which was not a partner to the Community's liberalization measures, did not display the kind

Figure 2: Behavior of Trade-Output Ratios for 6 Original EEC Members



[3] Denmark, Ireland and the United Kingdom.

of trade effects that the liberalizations rendered the partner countries. The bottom panel in Figure 2 shows that EEC imports from the U.S. remained fairly stable throughout the postwar period.

While there are clearly many other factors that effect the extent of trade between countries, trade liberalization appears to be a primary contributor in this regard. As the above examples indicate, prior to, following, and in lieu of trade reforms, there is very little evidence of substantial change in the extent of trade between countries. On the other hand, as countries become more open, the extent of openness is reflected in the extent of trade between them. This relationship will be utilized within the context of the following question: what kind of an effect can the extent of openness, which will be proxied for here by the extent of trade, have on the degree of income disparity between countries?

Ben-David (1996) generalized upon the liberalization-convergence link found among countries that formally liberalized trade by focusing on non-poor countries (which were defined as countries with per capita incomes of at least 25% of the United States, the lead country in 1960). For each of the resultant 25 *source countries* – as they will be referred to here – an export-based group was created that included all countries that imported at least 4% of the source country's exports. Similarly, a 4% cutoff point was used to determine each source country's import-based group.[4]

By grouping together countries that are major trade partners of one another, the study showed a very high incidence of income convergence within the trade-based groups. As a

[4] Ben-David (1996) provides more information on the construction of the trade-based groups of countries.

reference point for determining the uniqueness of the trade-based convergence results, the same countries comprising the trade-based groups were grouped and regrouped repeatedly on a random basis and did not exhibit a prevalence of convergence outcomes – supporting the earlier results that, while convergence may be found among the more developed countries, it is more of an infrequent finding than a frequent one.

These earlier studies by Ben-David established that grouping countries according to cross-sectional trade criteria (at a given point in time) produces convergence results considerably more often than do random grouping of countries. What is still not clear, however, is why some trade groups converged faster than others. That issue is the focus of this paper. It delves deeper into the trade-convergence relationship by asking whether *changes* in the extent of trade over time between any set of countries are related to *changes* in the extent of income convergence over time between these countries. In other words, did trade-based groups of countries that substantially increased their trade over a 26 year period also experience faster rates of convergence than those trade-based groups that only marginally increased their trade?

III. INTRA-GROUP CONVERGENCE

One possible way to examine this question is to calculate the ratio of each group's total internal trade to the group's total GDP and determine whether this ratio is related to the group's convergence coefficient. A negative relationship might be interpreted as an indication that heightened trade coincides with income convergence.

The main problem with a test of this kind is that small countries tend to trade a much larger fraction of their incomes than do large countries. Therefore, any cross-sectional

relationship between a group's trade ratio and its convergence coefficient might reflect the preponderance of small countries within groups rather than a trade-convergence relationship.

An alternative way to examine the magnitude of trade's impact on convergence would be to look at each group individually and examine the behavior of its intra-group trade as well as the behavior of its intra-group income differentials *over time*, and then to determine the extent of the relationship between the two.

The total volume of intra-group trade was calculated for each of the 25 export-based and 25 import-based trade groups, for each of the years between 1960 and 1985.[5] To get a measure of how intra-group trade grew (if at all) relative to the group's total output, the total intra-group trade was divided by the group's aggregate GDPs.[6] This ratio, represented by the variable $R^k_{i,t}$ (where i is the group's source country and k identifies the group as being import-based or export-based) was calculated for each of the 50 groups for each of the 26 years.

In Equation (1), each group i's trade ratio at time t is regressed on trend (T_t).

$$R^k_{i,t} = \alpha^k_{1,i} + \alpha^k_{2,i} T_t + \varepsilon^k_{i,t} \qquad (1)$$

As is evident from the results in Table 1, these ratios were found to have increased significantly over time for every one of the groups. The question is, were these increases larger for the groups that converged the fastest?

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[5] *Data source:* IMF Direction of Trade data.

[6] *Data source:* IMF International Financial Statistics data.

Groups exhibiting convergence would be expected to have declining standard deviations of log real GDP per worker ($\sigma_{i,t}^k$) while diverging groups should have increasing standard deviations. These are in fact the results from an estimation of Equation (2),

$$\sigma_{i,t}^k = \beta_{1,i}^k + \beta_{2,i}^k T_t + u_{i,t}^k \qquad (2)$$

where each of those groups found to be converging in Ben-David (1996) display significantly negative trend coefficients in Table 2.

The trend coefficients on the trade ratios ($\alpha_{2,i}^k$) and the trend coefficients on the income differentials ($\beta_{2,i}^k$) provide an indication of the magnitude of the change in each variable during the specified time period. A relationship between the two variables, in the form of

$$\beta_{2,i}^k = \lambda_1^k + \lambda_2^k \alpha_{2,i}^k \quad , \qquad (3)$$

should provide some evidence of whether groups that had the largest increases in trade (that is, the largest $\alpha_{2,i}^k$) were also those that converged the most (*i.e.* had the most negative $\beta_{2,i}^k$).

Isolating $\alpha_{2,i}^k$ in Equation (1) and $\beta_{2,i}^k$ in Equation (2) and then substituting these values into Equation (3) yields

$$\sigma_{i,t}^k = \mu^k + \lambda_1^k T_t + \lambda_2^k R_{i,t}^k + \xi_{i,t}^k \qquad (4)$$

where $\mu^k = \beta_1^k - \alpha_1^k \lambda_2^k$. To eliminate the need to explicitly account for fixed effects, Equation (4) is differenced, yielding

$$D\sigma_{i,t}^k = \lambda_1^k + \lambda_2^k DR_{i,t-2}^k + \nu_{i,t}^k \qquad (5)$$

where $Dx^k_{i,t}$ is the log difference between $x^k_{i,t}$ and $x^k_{i,t-1}$ for $x = \{\sigma, R\}$. The sign of λ^k_1, which was the trend coefficient in Equation (4), indicates income convergence (if negative) or divergence (if positive) within the groups. Since aggregate output appears in the numerator used in calculating $\sigma^k_{i,t}$ and in the denominator of the trade ratios, $R^k_{i,t}$, the differenced lagged variable, $DR^k_{i,t-2}$ is used instead to avoid an overlap of the periods.[7]

The data for the 25 trade-based groups is pooled (once for the exports and once for the imports) and Equation (5) is estimated. The results appear in Table 3. The significantly negative intercept, for both the export and the import estimations, indicates that the trade groups exhibit income convergence – which is consistent with the convergence results from Ben-David (1996). The addition here is λ_2 the estimated coefficient for the variable *DR* which measures the contribution of changes in intra-group trade towards changes in intra-group disparity. These estimated coefficients for the trade ratios are significantly negative for both exports and imports. The implication of a negative λ_2 is that increases in the extent of trade lead to further reductions in the income differentials among the trade group members.

IV. BILATERAL CONVERGENCE

Rather than focus on the trade groups in their entirety, it is possible to add a measure of precision to the analysis by focusing on the *bilateral* relationships between each of the source countries with each of their primary trade partners. The volume of bilateral trade between each source country *i* and each of its primary trade partners (*j*) is divided by the source country's total GDP. The log of this ratio, $R^k_{ij,t}$, is calculated for each of the 127 export-based pairs of

[7] Specifically, since $D\sigma^k_{i,t}$ includes $\sigma^k_{i,t-1}$ and $DR^k_{i,t-1}$ includes $R^k_{i,t-1}$, then an overlap would exist for period $t-1$. Hence $DR^k_{i,t-2}$ is used in Equation (5).

countries and each of the 134 import-based pairs for each of the 25 years. The income gaps, $G^k_{ij,t}$ (which now replace $\sigma^k_{i,t}$ in the analysis), measure the annual differences of the logs of real GDP per worker between each source country and each of their main partners. In the event that the source country is wealthier, then $G^k_{ij,t}$ is positive. Otherwise, it is negative. Pairs exhibiting convergence would be expected to have declining income gaps (in absolute terms) while diverging groups should have increasing gaps.

Note that, while country j might be one of country i's primary import partners, it is also possible that country i is a primary import partner of country j (with a similar type of overlap possible for export pairs as well). There are 25 such instances of overlap in the import case and 27 in the export case. In these instances of overlap, the numerator of $R^k_{ij,t}$ will be the same as the numerator of $R^k_{ji,t}$. Not so the denominator, which reflects the source country's aggregate output level. Hence, $R^k_{ij,t} \neq R^k_{ji,t}$ and in the analysis that follows, all of the import and export-based pairs are used. However, to the extent that the inclusion of all pairs leads to any bias in the outcomes, each of the following tests was rerun twice more: once with just one-half of the overlapping pairs, and then again with the other half of the overlapping pairs. None of the results reported below are sensitive to these omissions, hence only the overall results are reported.

The version of Equation (5) estimated in the bilateral case is

$$DG^k_{ij,t} = \lambda^k_1 + \eta^k_1 DUM^k_{ij} + \lambda^k_2 DR^k_{ij,t-2} + \eta^k_2 DUM^k_{ij} DR^k_{ij,t-2} + \nu^k_{ij,t} \qquad (6)$$

where the variable DUM^k_{ij} equals unity if the initial level of income of the source country is greater than that of its partner country, *i.e* the income gap is positive. DUM^k_{ij} equals zero when the initial income gap is negative.

Equation (6) is estimated for all of the 127 country pairs based on exports and all of the 134 pairs based on imports. The results are reported in lines 1 and 4 of Table 4. Since there are a sizable number of pairs that are characterized by income gaps that are always positive – or always negative – throughout the entire sample period, it is possible to re-estimate Equation (6) for each of these groups separately in both the export and import cases. The results of these estimations in the export case are reported in lines 2 and 3, while the import results appear in lines 5 and 6.

For both exports and imports, the intercepts (λ_1) are significantly positive for negative income gaps and significantly negative ($\lambda_1+\eta_1$) for pairs of countries with positive income gaps – which implies that the bilateral income gaps between the trade partners are falling over time. These results are also evident in the only-negative-gaps cases as well as in the only-positive-gap cases, for both exports and imports.

The impact of an increase in exports, as reflected by λ_2, is significantly positive in the mixed gaps estimation reported in line 1, indicating that an increase in exports from the poorer source country to the wealthier partner leads to a further reduction in the gap between the two. This is also the case in line 2 when the source country remains poorer throughout the sample period. While the mixed gap import estimations are not conclusive as far as the impact of heightened imports on increased convergence is concerned, the import estimation for just those pairs that have a wealthier source country (line 6) appear to support the outcome from the export estimations reported in line 2. Specifically, the results in line 6 indicate that when the wealthier country increases its imports from the poorer country, this acts to further reduce the bilateral income differentials.

While increased trade flows from the poorer country to the wealthier country appear to be conducive for increased income convergence between the two, flows in the other direction do not appear to be as conclusive. On the one hand, there are the results from line 3 indicating that increased exports by the wealthier partner in fact widen the income gap, or at least act to diminish the convergence that is reflected in the intercept. On the other hand, the results in line 5 provide weak evidence (they are not significant) that when the poorer partner increases its imports, the income gap falls further. These two outcomes are not consistent with one another. Furthermore, an examination of the mixed gap estimations in lines 1 and 4 also do not suggest a significant contribution of trade flowing from the wealthier country to the poorer country.

There is a problem, however, with the above estimations of Equation (6) and it has to do with the independence of the observations. Specifically, each source country has more than one major trade partner and many of the major partners of one country are also major trade partners of additional countries. Since $G_{ij,t} = y_{i,t} - y_{j,t}$, where $y_{i,t}$ is the log output per worker in country i, then any two error terms such as $v_{ij,t}$ and $v_{ik,t}$, which are both related to country i, might be correlated. In the event that the error terms are correlated, then the estimated standard errors of the coefficients are inconsistent – though the estimated coefficients themselves are consistent. One way to avoid this problem would be to estimate Equation (6) using a subsample of country pairs in which each country would appear no more than once. The question is: which country pairs should be chosen and how might it be possible to determine whether the results of the overall estimation described in Table 4 are really representative of the bilateral convergence process?

The country selection algorithm adopted here is as follows. The first source country, i, is chosen randomly from the list of 25 source countries. A partner country, j, is then chosen

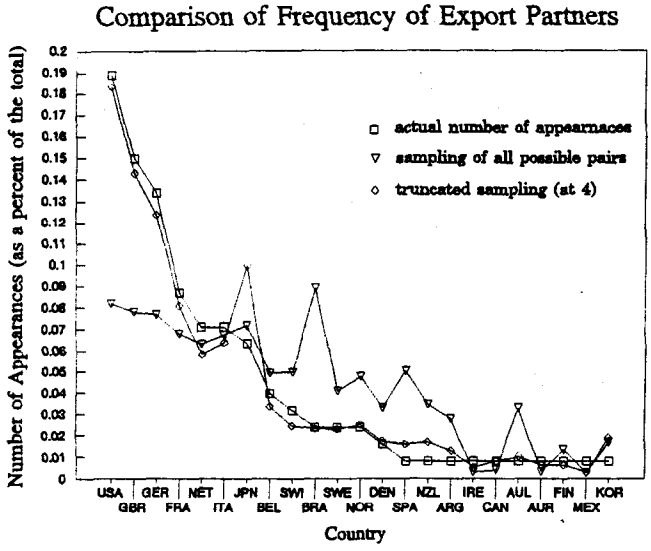
randomly from the list of *i*'s major trade partners. Having selected the first pair, countries *i* and *j* are removed from the list of available countries (for future selections). The selection process is then repeated for the next pair of countries. As the list of selected pairs begins to grow, some source countries may be chosen for whom all of the trade partners have already been selected. These countries are then also omitted from the sample of available source countries. This process continues until the last source country – for whom there remains at least one available partner country – is chosen.

This selection algorithm yields a sample size of between 8 and 13 pairs of countries, each of them different. If the selection process is repeated often enough, and Equation (6) is estimated each time, it then becomes possible to examine the distribution of each coefficient and determine the degree of accuracy of the findings reported in Table 4.

Herein lies another issue. How closely do draws averaging 11 pairs per sample reflect the 100+ import and export pairs that represent all of the major bilateral trade relationships between the non-poor countries? In other words, a country like the United States, which is a major export partner in 24 out of the 127 export-based pairs (or 19% of the pairs) can only appear once in each sample, either as a partner, or alternatively, as a source country. Thus, it will appear in only one of the roughly 11 trade pairs that are randomly drawn. On the other hand, a country like New Zealand, which is a major export partner of only one other country (Australia) has a higher probability of being included in the random samplings than in the overall group of pairs.

This is illustrated in Figure 3, which provides a comparison between the squares (which represent the actual number of appearances as a percentage of the total number of pairs, 127) and the triangles (which represent the number of appearances in 1000 sample draws of all

Figure 3



possible pairs). Countries that appear often as major trade partners are under-represented in the random sampling while countries that appear less frequently as major trade partners tend to get over-represented in the sample draws. By truncating the random sampling process at 4 pairs per sample (represented by the diamonds in the figure), it is possible to get pairings that more closely resemble the actual frequency of appearance.

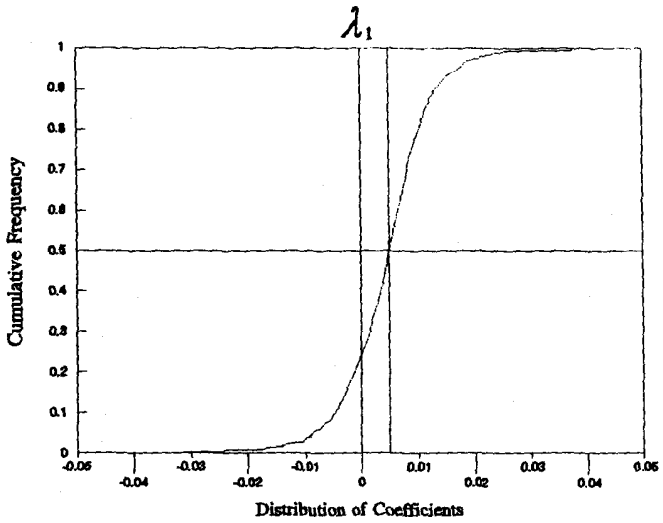
Thus, Equation (6) is estimated for each of 1000 random truncated samplings of four pairs. The cumulative distribution of each of the estimated coefficients for the export-based pairs appears in the four panels of Figure 4. The non-zero vertical lines are drawn at the values of the overall export estimation that appear in line 1 in Table 4. As is evident in the figures, the estimated coefficients in Table 4 are fairly close to the median of the plotted distributions. This is also the case for imports in Figure 5.

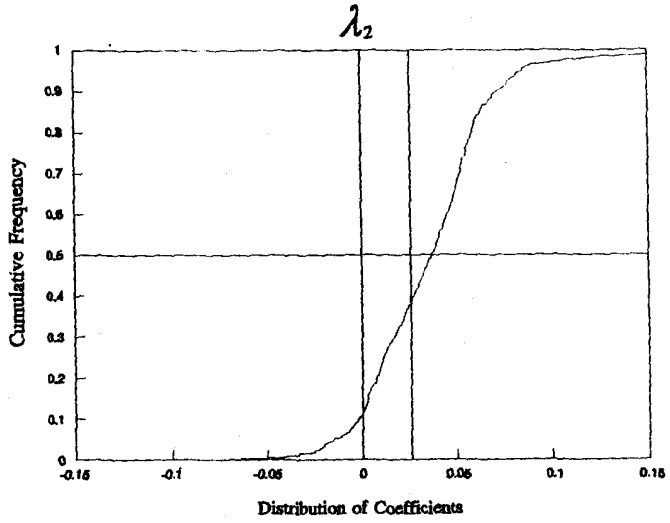
Moreover, the number of coefficients that are significantly different from zero at the 10 percent level – listed in Table 4 in the two lines below each of the Equation (6) estimations – also tends to corroborate the overall estimation results. In the case of exports, for example, 343 of the estimated λ_1's are significantly positive while only 37 are significantly negative. The estimated η_1's on the other hand, are mainly negative. The results are similar for the similar-gap estimations of lines 2 and 3 as well as for the three import estimations. Where the overall

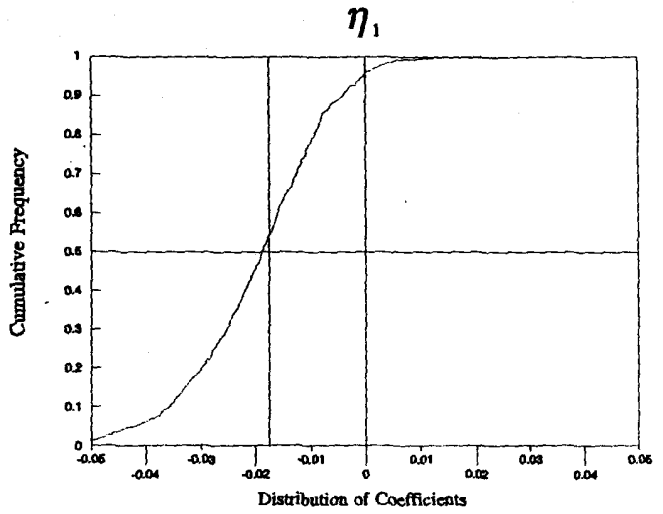
Figure 4

Distribution of Estimated Coefficients: EXPORTS

(1000 random samplings with truncation at 4 pairs)







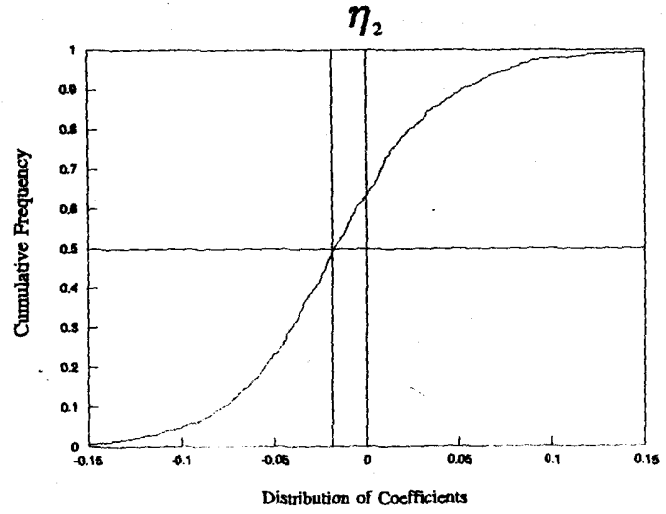
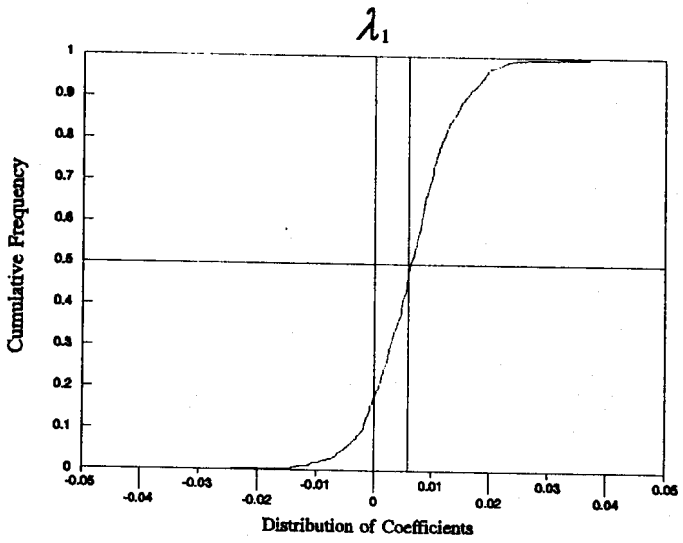
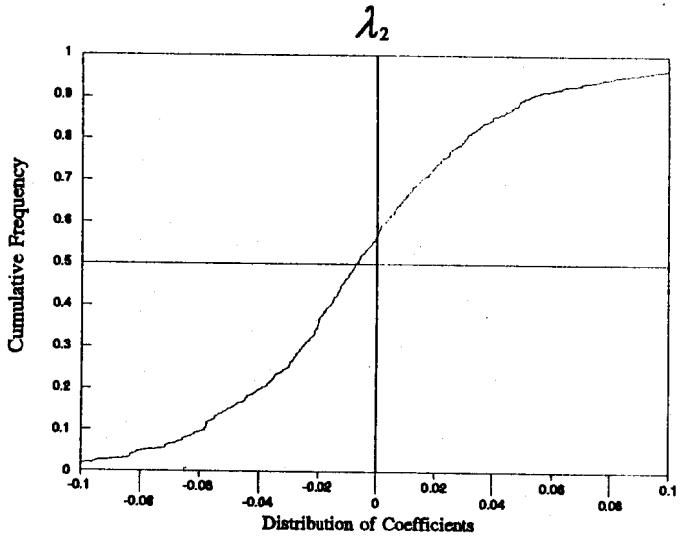


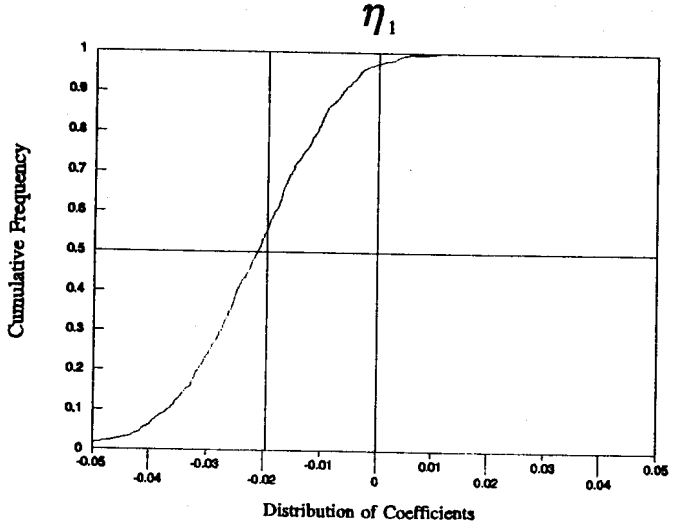
Figure 5

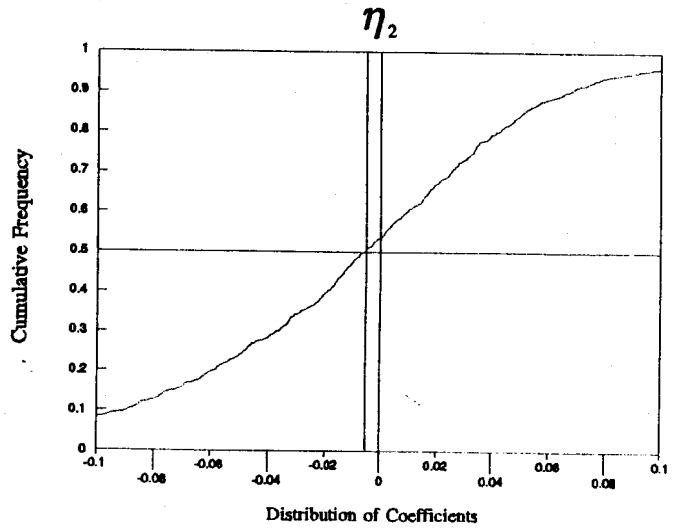
Distribution of Estimated Coefficients: IMPORTS

(1000 random samplings with truncation at 4 pairs)









export coefficients differ from the import coefficients is in the impact of trade increases on convergence. This difference is also borne out by the differences in the relative numbers of significantly positive and negative λ_2's and η_2's.

V. CONCLUSION

This paper focused on the relationship between trade and income convergence over time. Changes in the extent of trade (among heavy traders) appear to have an effect on the degree of income disparity among countries. Increases in intra-group trade intensified the rate of convergence among the group members.

Breaking up the groups into the individual pairings of source and partner countries serves to sharpen the findings. The bilateral pairs continue to exhibit significant convergence -- be they export-based or import-based pairs. Increased trade by the countries appears to further strengthen the convergence when the flow being increased is from the poorer partner to the wealthier partner. This result holds irrespective of whether the source country is the wealthier or poorer trade partner. Increased trade flows in the other direction, however, do not appear to be conclusively related to changes in income convergence.

One final issue, while not the emphasis of this paper, should nonetheless be noted in a discussion of the implications of trade-related convergence among countries. Specifically, does trade-related income convergence come at the expense of prosperity in the wealthier countries? Here the evidence from postwar trade liberalization programs is relatively clear (see: Ben-David, 1993; and Ben-David and Papell, 1995). *All* of the original European partners in the creation of the European Economic Community experienced significant convergence and, more

importantly, faster growth along higher growth paths. The same is true for the originating countries of EFTA (the European Free Trade Association).

Trade has been shown to reduce income gaps among countries and has coincided with faster growth by all of the parties concerned. It does not appear to be a zero-sum game.

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... Group Trade-Output Ratios on Trend

$$R_{i,t}^{k} = \alpha_{1,i}^{k} + \alpha_{2,i}^{k} T_{t} + \varepsilon_{i,t}^{k}$$

	Source Country	Export-Based Groups			Import-Based Groups		
		$\hat{\alpha}_{1,i}^{k}$	$\hat{\alpha}_{2,i}^{k}$	R^2	$\hat{\alpha}_{1,i}^{k}$	$\hat{\alpha}_{2,i}^{k}$	R^2
1	ARGN	0.25588 (3.50)	0.05434 (16.94)	0.923	0.98474 (7.21)	0.09704 (16.18)	0.916
2	AUSTL	0.07710 (1.30)	0.05879 (22.53)	0.955	0.89195 (9.48)	0.07764 (18.80)	0.936
3	AUSTR	0.78729 (5.13)	0.08283 (12.28)	0.863	2.13506 (19.11)	0.09690 (19.75)	0.942
4	BELLU	1.08013 (3.17)	0.18259 (12.19)	0.861	0.94581 (3.17)	0.15488 (11.83)	0.854
5	CAN	0.67153 (6.67)	0.09245 (20.91)	0.948	0.77295 (6.37)	0.10172 (19.08)	0.938
6	CHIL	0.88157 (7.53)	0.09141 (17.78)	0.929	0.49118 (6.61)	0.05810 (17.80)	0.930
7	DEN	0.95842 (6.25)	0.09288 (13.79)	0.888	1.42079 (7.58)	0.14249 (17.31)	0.926
8	FIN	0.95221 (7.74)	0.06451 (11.93)	0.856	0.73706 (7.78)	0.08368 (20.11)	0.944
9	FRA	1.31155 (3.53)	0.19417 (11.91)	0.855	1.12411 (3.24)	0.18396 (12.07)	0.859
10	GER	1.40269 (3.61)	0.20238 (11.85)	0.854	1.37010 (5.00)	0.18241 (15.16)	0.905
11	ICE	0.31349 (3.98)	0.07442 (21.51)	0.951	1.28581 (8.40)	0.11535 (17.15)	0.925
12	IRE	0.89571 (2.93)	0.16340 (12.16)	0.860	0.50461 (4.02)	0.08553 (15.51)	0.909
13	ITAL	0.79765 (4.04)	0.11719 (13.50)	0.884	0.79612 (3.27)	0.14689 (13.75)	0.887
14	JAPAN	-0.29410 (-4.95)	0.07175 (27.49)	0.969	0.05770 (0.92)	0.06216 (22.67)	0.955
15	MEX	-0.07610 (-0.93)	0.06667 (18.54)	0.935	-0.08707 (-1.06)	0.06847 (18.95)	0.937
16	NETH	1.08013 (3.17)	0.18259 (12.19)	0.861	0.94581 (3.17)	0.15488 (11.83)	0.854
17	NOR	0.89630 (4.20)	0.12922 (13.78)	0.888	1.25147 (8.88)	0.11809 (19.08)	0.938
18	NZ	0.64190 (8.75)	0.05514 (17.12)	0.924	0.89195 (9.48)	0.07764 (18.80)	0.936
19	SAFR	0.37810 (4.45)	0.05948 (15.95)	0.914	0.79945 (6.99)	0.10314 (20.52)	0.946
20	SPA	0.79284 (3.37)	0.15130 (14.63)	0.899	0.67256 (3.84)	0.12856 (16.73)	0.921
21	SWED	1.23611 (5.12)	0.13657 (12.89)	0.874	1.25147 (8.88)	0.11809 (19.08)	0.938
22	SWIS	0.79765 (4.04)	0.11719 (13.50)	0.884	1.32633 (3.62)	0.19679 (12.25)	0.862
23	UK	1.09522 (3.12)	0.18999 (12.33)	0.864	1.42940 (5.14)	0.18817 (15.42)	0.908
24	URUG	0.59227 (6.91)	0.03950 (10.50)	0.821	0.54184 (10.49)	0.01630 (7.19)	0.683
25	US	1.16762 (10.07)	0.11101 (21.81)	0.952	1.32338 (10.90)	0.12015 (22.54)	0.955

$$\sigma_{i,t}^{k} = \beta_{1,i}^{k} + \beta_{2,i}^{k} T_t + u_{i,t}^{k}$$

	Source Country	Export-Based Groups			Import-Based Groups		
		$\hat{\beta}_{1,i}^{k}$	$\hat{\beta}_{2,i}^{k}$	R^2	$\hat{\beta}_{1,i}^{k}$	$\hat{\beta}_{2,i}^{k}$	R^2
1	ARGN	0.68967 (40.55)	-0.00573 (-5.21)	0.530	0.69992 (38.97)	0.00142 (1.22)	0.058
2	AUSTL	0.43507 (22.53)	-0.01215 (-9.72)	0.797	0.33706 (22.52)	-0.00888 (-9.16)	0.777
3	AUSTR	0.32441 (71.06)	-0.00638 (-21.60)	0.951	0.33979 (63.18)	-0.00765 (-21.96)	0.953
4	BELLU	0.23872 (66.01)	-0.00359 (-15.35)	0.908	0.18865 (38.46)	-0.00324 (-10.20)	0.813
5	CAN	0.57913 (33.21)	-0.01867 (-16.53)	0.919	0.57913 (33.21)	-0.01867 (-16.53)	0.919
6	CHIL	0.55286 (43.32)	-0.00420 (-5.08)	0.518	0.70877 (41.57)	0.00352 (3.19)	0.297
7	DEN	0.15151 (34.22)	-0.00158 (-5.51)	0.559	0.27602 (23.51)	-0.00763 (-10.04)	0.808
8	FIN	0.17900 (33.73)	-0.00212 (-6.17)	0.614	0.35673 (30.57)	-0.01055 (-13.97)	0.890
9	FRA	0.26134 (72.59)	-0.00494 (-21.20)	0.949	0.23873 (66.01)	-0.00359 (-15.35)	0.908
10	GER	0.26049 (74.75)	-0.00515 (-22.83)	0.956	0.31277 (36.30)	-0.00769 (-13.78)	0.888
11	ICE	0.38488 (28.57)	-0.01140 (-13.07)	0.877	0.27599 (23.56)	-0.00747 (-9.85)	0.802
12	IRE	0.31771 (104.31)	-0.00193 (-9.77)	0.799	0.38916 (101.87)	-0.00252 (-10.18)	0.812
13	ITAL	0.30152 (76.25)	-0.00551 (-21.53)	0.951	0.26007 (66.54)	-0.00388 (-15.32)	0.907
14	JAPAN	1.28558 (74.50)	-0.02201 (-19.70)	0.942	0.53878 (26.74)	-0.01665 (-12.77)	0.872
15	MEX	0.55361 (47.09)	-0.00516 (-6.78)	0.657	0.66384 (47.38)	-0.00625 (-6.89)	0.664
16	NETH	0.23872 (66.01)	-0.00359 (-15.35)	0.908	0.18865 (38.46)	-0.00324 (-10.20)	0.813
17	NOR	0.15680 (28.05)	-0.00162 (-4.47)	0.455	0.28487 (26.33)	-0.00774 (-11.05)	0.836
18	NZ	0.43923 (27.21)	-0.01291 (-12.35)	0.864	0.38197 (26.23)	-0.01106 (-11.73)	0.851
19	SAFR	1.18147 (160.30)	0.01486 (31.14)	0.976	0.38504 (28.02)	-0.00178 (-2.00)	0.142
20	SPA	0.32188 (49.15)	-0.00478 (-11.26)	0.841	0.42304 (58.39)	-0.00328 (-7.00)	0.671
21	SWED	0.16482 (30.16)	-0.00218 (-6.16)	0.612	0.28487 (26.33)	-0.00774 (-11.05)	0.836
22	SWIS	0.30152 (76.25)	-0.00551 (-21.53)	0.951	0.26135 (72.59)	-0.00494 (-21.20)	0.949
23	UK	0.31690 (100.23)	-0.00231 (-11.27)	0.841	0.29054 (30.03)	-0.00647 (-10.33)	0.817
24	URUG	0.64209 (38.26)	-0.00391 (-3.60)	0.351	0.69824 (39.22)	-0.00454 (-3.94)	0.392
25	US	0.49012	-0.00503	0.716	0.49013	-0.00503	0.716

Table 3

Relationship Between Changes in Trade and Changes in Income Disparity

$$D\sigma_{i,t}^{k} = \lambda_{1}^{k} + \lambda_{2}^{k} DR_{i,t-2}^{k} + v_{i,t}^{k}$$

	λ_1^k	λ_2^k	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.

Table 4

Relationship Between Changes in Bilateral Trade and Changes in Bilateral Income Gaps

$$DG^k_{ij,t} = \lambda^k_1 + \eta^k_1 DUM^k_{ij} + \lambda^k_2 DR^k_{ij,t-2} + \eta^k_2 DUM^k_{ij} DR^k_{ij,t-2} + \nu^k_{ij,t}$$

	λ^k_1	η^k_1	λ^k_2	η^k_2	N	R^2
EXPORTS						
1. All 127 Pairs	0.0050 (5.75)	-0.0175 (-12.85)	0.0256 (6.30)	-0.0182 (-2.99)	2852	0.070
Signif.Pos. Signif.Neg.	343 37	2 708	414 2	23 105		
2. Only Negative Gaps (57 Pairs)	0.0042 (3.96)		0.0243 (5.44)		1311	0.022
Signif.Pos. Signif.Neg.	433 11		532 0			
3. Only Positive Gaps (28 Pairs)	-0.0127 (-10.19)		0.0302 (3.70)		644	0.021
Signif.Pos. Signif.Neg.	0 950		219 67			
IMPORTS						
4. All 134 Pairs	0.0058 (6.39)	-0.0196 (-14.73)	-0.0002 (-0.04)	-0.0051 (-0.74)	2967	0.070
Signif.Pos. Signif.Neg.	405 20	0 764	84 87	42 93		
5. Only Negative Gaps (55 Pairs)	0.0045 (4.21)		0.0059 (0.99)		1265	0.001
Signif.Pos. Signif.Neg.	575 1		111 145			
6. Only Positive Gaps (34 Pairs)	-0.0145 (-11.74)		-0.0112 (-2.05)		782	0.005
Signif.Pos. Signif.Neg.	0 939		60 217			

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