The Incidence of Convergence among Close Trading Partners: A Robust Finding?

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Abstract

The diffusion of technology from advanced to lagging economies is facilitated by international trade. Thus, we ought to observe a greater incidence of income convergence among groups of countries closely related by international trade. Ben-David (1996) finds that this is indeed the case. This paper asks two related questions. First, is there a greater incidence of convergence among groups of countries closely related by international trade? Second, can the apparent finding of a greater incidence of convergence among trade-related groups of countries be alternatively explained by a failure to control for steady-state levels of income? The results of the paper suggest that the answer to the first question is inconclusive and that the answer to the second question is affirmative.

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1 Introduction

The growth experience of the East Asian Tigers over the last four decades has been a source of inspiration for policymakers throughout the developing world. The impact of such rapid rates of growth sustained over long periods is indeed staggering. As Lucas (1988) has so eloquently put it, when one thinks of the possibility and consequences of replicating the East Asian miracles for the rest of the developing world, it is hard to think of anything else. It is perhaps this realization that has led to an obsession among economists for coming up with explanations of the rapid growth experience in East Asia.

While there is much debate about the factors driving rapid growth in East Asia, it is undeniable that the income differentials between the East Asian tigers and the developed countries have been much reduced. There are a number of different explanations in the theory for this 'catch-up' or convergence phenomenon. In the neoclassical growth model, convergence is a result of the diminishing marginal product of capital. Countries which are farther below their respective steady-state levels of income will have a higher marginal product of capital and, therefore, experience a faster rate of growth. On the other hand, in models of growth with endogenous technological change, convergence results from the fact that more wealthy countries have higher levels of technology. The diffusion of this advanced technology to poorer countries allows them to grow faster because imitation and adaptation of technology are cheaper than innovation[1]. Such models often incorporate a significant role for international trade in facilitating the diffusion of technology.

If technological diffusion through international trade is indeed the source of convergence, we ought to observe a greater incidence of convergence among groups of trade related countries than among random groupings of potentially isolated countries. In-

[1] See Grossman and Helpman (1991, chapters 11 & 12) and Barro and Sala-i-Martin (1995).

deed, by selecting 25 wealthy countries and forming groups of each with its major trading partners, Ben-David (1996) finds that there is a greater tendency toward reduced income dispersion within these trade groups than among random groupings of the same countries. Ben-David presents this as evidence that international trade facilitates income convergence, thus pointing to technological diffusion as the explanation for convergence.

This paper revisits the work of Ben-David (1996). The fundamental question being explored is the same: Is there a greater incidence of convergence among groups of countries closely related by international trade? In particular, however, the paper investigates whether the apparent finding of a higher incidence of convergence among trade-related groups can be alternatively explained by a failure to control for steady-state levels of income. According to the neoclassical growth model, if countries within trade-related groups have more similar steady-state levels of income, we could well find a greater incidence of convergence among such groups if we fail to control for the determinants of the steady-state. In investigating this issue, our paper features the following innovations. First, rather than confining itself to the trading groups of a number of wealthy countries, it also considers the trading groups of a random selection of countries from a wider pool. Since the wealthy countries tend to trade primarily with each other, considering the trading groups of a more varied set of countries should introduce greater variation in steady-state income levels within the trade-related groups. In addition, if technological diffusion (from advanced to lagging countries) does indeed lead to a higher incidence of convergence among trade-related groups, this finding should be reinforced for groups of dissimilar countries–i.e. where the technology gaps are greater.

Second, this paper uses panel data to test for *conditional* convergence rather than simply testing for reduced income dispersion. In view of the potential problems with groups of trade-related countries having more similar steady-state income levels, it is useful to also test for conditional convergence. The use of panel data–as opposed to a pure cross-section–provides us with a sufficient number of observations to test for conditional convergence, given that the number of countries within a trading group is small. The innovations of this paper should allow us to provide a more conclusive answer to the question of whether there is a greater incidence of convergence among groups of major trading partners.

2 Previous Work and Theoretical Background

One of the pervasive findings of the growth empirical literature is that it provides firm support to the neoclassical growth model.[2] As Barro (1997) points out: "It is surely an irony that one of the lasting contributions of endogenous growth theory is that it stimulated empirical work that demonstrated the explanatory power of the neoclassical growth model." In particular, according to this body of work, the commonly observed income convergence phenomenon can be explained by neoclassical diminishing returns.[3]

In the neoclassical growth model of Solow (1956), the rate of technological progress is exogenously given. Thus, greater openness to international trade can only raise the *level* of technology, $A(t)$. This can be motivated very simply by the fact that international trade allows an economy to more efficiently allocate its resources to the production of those goods in which it has a comparative advantage. The long-run

[2] Examples of such work include Barro and Sala-i-Martin (1992), Mankiw, Romer, and Weil (1992), Islam (1995), and Caselli, Esquivel, and Lefort (1996).

[3] Another strand of work attempts to evaluate what has happened to the cross-country distribution of income over time. Quah (1996) argues that this distribution has evolved from being unimodal in the 1960s to being bimodal in the 1980s, Pritchett (1997) attempts to estimate the magnitude of divergence over time, and Jones (1997) argues that if country incomes per worker are weighted by population, there seems to have been a great deal of convergence over the last three decades.

rate of technological progress, however, remains unaffected[4]. If so, there is no clear and precise reason why we should expect to find a higher incidence of convergence among groups of trade-related countries.

On the other hand, models of endogenous technological progress postulate that greater openness to international trade ought to facilitate the diffusion of technology from more advanced to less advanced economies. As a result, the latter experiences a higher rate of technological progress. To the extent that the level of technology is correlated with the level of income–which is quite a plausible assumption–openness and trade become a direct source of income convergence.[5]

Ben-David (1996) uses a direct methodology to test for the effect of trade on convergence. Ben-David starts off by selecting 25 wealthy "source countries"–all countries with at least 25% of U.S. GDP per capita in 1960. For each of these source countries, he forms a "trade group" by grouping the country with its major trading partners. He then tests whether income dispersion is rising or falling in each of these 25 trade groups and in 5000 random groupings of the 25 source countries. Whereas the estimate is in the direction of reduced dispersion for all but one of the 25 trading groups, it is statistically significant for 17 out these 25 trade groups. On the other hand, for the 5000 random groupings, more than half of the estimates are in the direction of rising income dispersion[6]. This is taken to indicate that there is a much greater incidence of convergence among groups of countries that trade heavily with each other. Ben-David's paper, therefore, is based on the premise that technological diffusion

[4]Nevertheless, in the neoclassical model, openness to trade can indeed have an effect on economic growth. The higher level of technology $A(t)$ raises the steady-state level of income. Since countries do not instantaneously converge to the higher steady-state level, the transitory impact on the growth rate can be prolonged over several years. Even with a fairly high rate of convergence of 7%, we get a half-life of 10 years.

[5]See Barro and Sala-i-Martin (1995) and Ventura (1997).

[6]Ben-David does not say anything about the statistical significance of the estimates for these 5000 random groupings.

through international trade is the source of income convergence.

There are a number of problems with Ben-David's methodology. First, the paper considers the trading groups of only a selection of wealthy countries. This implies that the countries under consideration have similar steady-state levels of income and hence biases the results in favor of finding evidence for reduced income dispersion (if the neoclassical model is true). Moreover, if technological diffusion through international trade is indeed the source of convergence, there is no reason to limit the analysis to a selection of wealthy, similar countries. On the contrary, since larger technology gaps ought to facilitate more rapid technology diffusion, the finding of a higher incidence of convergence among trade-related groups should be more pronounced if we consider a wider and more varied pool of countries.

Second, the choice of using the concept of reduced income dispersion to test for convergence is problematic. Reduced dispersion is an implicit test for absolute convergence– the belief that poor countries unconditionally grow faster than wealthy countries. However, while absolute convergence does tend to lead to reduced income dispersion among countries, random disturbances to economies tend to raise dispersion. In fact, even if absolute convergence holds, it is possible to observe rising income dispersion[7]. However, if we do observe falling income dispersion, we have reason to believe that absolute convergence holds.

A much greater problem with using the concept of reduced dispersion is that if the neoclassical growth model is true, then the finding of a greater incidence of reduced dispersion among trade-related groups may simply be spurious–i.e. if trade-related groups are made up of more similar countries than random groups. The prediction of absolute convergence is itself a misinterpretation of neoclassical growth theory. Since countries vary substantially with respect to their saving rates, technology levels, and other determinants of the steady-state, there is no reason to expect that a poorer

[7]This problem is similar to Galton's fallacy. See Quah (1993).

country will necessarily grow faster: this need be the case only after we have controlled for the determinants of the steady-state. In fact, the finding of absolute convergence has often been taken to indicate that the countries or regions under consideration have similar steady state income levels. In order to rule out the possibility that Ben-David's finding is spurious, one would need to control for the determinants of the steady state when testing for convergence among trade-related and random groups. This can be done using the test for conditional convergence.

While the conditional convergence test may rule out the possibility of a spurious finding, we need to explain why we would expect to find a greater incidence of *conditional* convergence among trade-related groups. The test for conditional convergence involves testing for the partial correlation between income growth and initial income, after holding fixed savings rates, population growth rates, and country fixed effects (when using panel data). The country fixed effects can be interpreted as the average levels of technology for each country. The finding of a greater incidence of convergence among trade-related groups suggests that some part of the convergence is due to technological diffusion (through trade). If some part of convergence (poorer countries growing faster) is due to technological diffusion, then that part must be because poorer countries have lower technology levels and because lower technology countries experience faster technological progress. Why then would we expect to find faster growth among poorer countries after holding fixed the level of technology?

Note that while country fixed effects do control for the average level of technology for each country, that still allows the level of technology in each country at the beginning of each 5-year period (when using panel data with 5-year averages) to vary relative to the average country level of technology.

In a number of North-South models of technology diffusion, the level of technology in the South relative to that in the North settles at a constant ratio in the steady-state equilibrium.[8] In addition, the steady-state technology levels of both regions are growing at the same rate. Figure 1 provides a visual representation of the steady-state time paths of technology in the two regions. Then, if a country's level of technology at the beginning of any time period is farther below its steady-state path (compared to the gap between current level of technology and steady-state level of technology in the other country), then the former country will experience faster growth. As depicted in figure 1, at time t_0, the lagging country will grow faster than the leading country.

If a country's initial level of techology relative to its average technology level is correlated with its initial level of income relative to its average technology level, then the conditional convergence finding can very well be explained by such a model of technology diffusion. While we cannot say whether the conditional convergence finding per se is due to such a model of technology diffusion (as opposed to the neoclassical growth model), if we observe a greater incidence of conditional convergence among trade-related groups, that would give us reason to believe that some part of the conditional convergence is due to the type of technology diffusion described above.

3 Empirical Methodology

Our discussion in the previous section suggests that in comparing the incidence of convergence among trade-related country groups with that among random groups, it is necessary to choose: (i) a concept of convergence and (ii) a selection of "source countries". By forming trading groups for each of the source countries, one would test for the chosen concept of convergence among the trading groups and among random groupings of the source countries. For each selection of source countries, this paper tests for two different concepts of convergence: reduced dispersion and conditional

[8] Examples include Grossman and Helpman (1991), Helpman (1993), and Khan (2003).

convergence. The paper also considers two different selections of source countries: a selection of wealthy countries as in Ben-David (1996) and a selection of countries from a wider, more varied pool. In other words, the paper proceeds in four different steps.

In the first step, it compares the incidence of *reduced dispersion* among trading groups of the *wealthy countries* with that among random groupings of these wealthy countries. In the last step, it compares the incidence of *conditional convergence* among trading groups of the *wider selection of countries* with that among random groupings of this wider selection of countries. The two other steps are simply the other two combinations. By comparing the results from the four different steps, this paper is attempts to: (i) provide a more conclusive answer to the fundamental question of whether there is a greater incidence of convergence among groups of countries closely related by international trade; (ii) shed light on whether Ben-David's finding of a greater incidence of convergence among trade-related groups can be alternatively explained by a failure to control for the determinants of the steady-state level of income.

3.1 What is a Trading Group?

Before proceeding to explain the method of testing for each concept of convergence, let us describe how the "trading groups" were created. Before the trade groups could be created, however, some criteria (random or otherwise) was used to select a number of "source countries".

The wealthy source countries were selected as follows. All countries whose output is heavily dependent on oil and all formerly Communist countries were dropped from the sample. Of the remaining countries (numbering 138), all countries having at least 25% of the U.S. GDP per capita level in 1960 were included in the selection of wealthy source countries.[9] This selection consists of a total of 29 countries. It differs slightly from the list of source countries in Ben-David (1996) in that it now includes Barbados, Israel, Mauritius, Trinidad and Tobago, and Venezuela but excludes South Africa.[10] Note that since the IMF's trade data for Belgium and Luxembourg are listed together under a single entry, we have also put these two countries together.

The wider, more varied selection of source countries was made by randomly selecting 25 countries from the list of 138 non-oil, non-Communist countries.

In creating a trading group for each source country, the following criteria was used. For each source country i, the trading group included i and all countries from which i imported more than 4% of its total imports. The use of 4% is not arbitrary–it was chosen such that: (i) each trading group did include more than just two countries; and (ii) the size of the trading groups was limited in order to ensure that the source country did actually trade heavily with each country in its trading group. In fact, all trading groups created using this criteria consisted of between three and nine countries. The bilateral trade data was obtained from the IMF's *Direction of Trade Statistics Yearbook*.

The criteria for forming the trading groups was formulated in terms of imports, rather than exports or total trade since the transfer of technology to "follower" countries often takes place in the form of capital imports. In any case, exports and imports are highly correlated and in fact, using exports or total trade does not affect the conclusions of the paper.

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[9] The data used in this study comes from the Penn World Tables, version 5.6. See Summers and Heston (1991) for a description of this data.

[10] This difference stems perhaps from the fact that Ben-David used an earlier version of the Summers and Heston data.

3.2 The Test for Reduced Dispersion

The test for reduced dispersion in this study provides us with a benchmark against which to compare the tests for conditional convergence. In addition, since the reduced dispersion test does not control for the determinants of the steady-state level of income, it should be interesting to compare the results of this test for the selection of wealthy source countries with those for the more varied selection of source countries.

The framework used to test for declining dispersion in income levels within a group of countries is the following:

$$(y_{i,t} - \overline{y}_t) = \phi \left(y_{i,t-1} - \overline{y}_{t-1}\right) + \varepsilon_{i,t} \tag{1}$$

where $y_{i,t}$ is the natural log of real GDP per capita in country i at time t and $\overline{y}_t$ is the mean log GDP per capita at time t of all countries in the group under consideration. Under this framework, an estimated $\phi < 1$ indicates reduced dispersion of real GDP per capita over time within the group of countries under consideration. On the other hand, $\phi > 1$ indicates increased dispersion over time within the country group.

Equation (1) was estimated using the following augmented Dickey-Fuller (ADF) specification:

$$d_{i,t} = \phi d_{i,t-1} + \sum_{j=1}^{k} \rho_j \Delta d_{i,t-j} + \varepsilon_{i,t} \tag{2}$$

where $d_{i,t} = y_{i,t} - \overline{y}_t$ and $\Delta d_{i,t-j} = d_{i,t} - d_{i,t-1}$. The estimation was carried out for each group of countries by pooling together annual data for the countries in the group under consideration. Note that this ADF specification contains neither a constant nor a trend term. Since we are using pooled data on deviations from the group mean, the constant term is equal to zero.

In estimating (2), the number of lags was chosen as follows. An upper bound of $k_{max} = 4$ was chosen and the equation was estimated. If the last lag was not significant, the number of lags was reduced by one and the procedure was repeated. The choice of the upper bound, k_{max}, was not too high in order to avoid significantly reducing the number of years within the time series.

3.3 The Test for Conditional Convergence

Ben-David's primary motivation in using the concept of reduced income dispersion to test for convergence was that each trading group consists of only a small number of countries. Since in the pure cross-sectional growth regression, the number of observations is equal to the number of countries, Ben-David dismisses the possibility of testing for conditional convergence. In addition, he argues that the conventional cross-country growth regression wastes a great deal of information by only using the data points for the initial and final years. By using panel data consisting of six 5-year averages between 1960 and 1990, this paper is able to avoid both of these problems: the number of observations is essentially multiplied by six and much of the data for the intervening years is utilized.

The framework that will be used to test for conditional convergence in this study is essentially that developed by Mankiw, Romer, and Weil (1992), as augmented by Islam (1995) for panel data estimation. It has become a fairly well-documented fact that time-varying human capital variables are mostly insignificant in explaining growth in a panel data framework.[11] Thus, we will be using a simple version of the model with only physical capital.

[11]Some authors have attributed this to the lag between the accumulation of human capital and its productive use in the marketplace. See, for example, Islam (1995) and Knight, Loayza, and Villaneuva (1993).

While we will be using the neoclassical growth model to motivate our conditional convergence test, we have discussed previously how a model of technology diffusion might alternatively explain the conditional convergence finding. Importantly, as we pointed out, if there exists a greater incidence of conditional convergence among trade-related groups of countries, that would give us reason to believe that some part of the conditional convergence can be explained by trade-induced technology diffusion.

Starting with the basic Cobb-Douglas production function with diminishing returns to capital, the equation of motion for physical capital can be used to derive the steady-state level of output per worker. Then, taking a log-linear approximation around the steady-state, we get the following equation describing the out-of-steady-state transitional dynamics:

$$\begin{aligned}\ln y\left(t_2\right) - \ln y\left(t_1\right) = & \left(1 - e^{-\lambda\tau}\right)\frac{\alpha}{1-\alpha}\ln\left(s_k\right) - \left(1 - e^{-\lambda\tau}\right)\frac{\alpha}{1-\alpha}\ln\left(n+g+\delta\right) \\ & - \left(1 - e^{-\lambda\tau}\right)\ln y\left(t_1\right) + \left(1 - e^{-\lambda\tau}\right)\ln A\left(0\right) \\ & + g\left(t_2 - e^{-\lambda\tau}t_1\right)\end{aligned} \tag{3}$$

where $\tau = (t_2 - t_1)$, y is output per worker, λ is the rate of convergence toward the steady state, s_k is the rate of accumulation of physical capital (i.e. the investment rate), n is the rate of population growth, g is the rate of technological progress, A is the level of labor-augmenting technology, and α is the capital share.

Equation (3) suggests that a natural specification can be used to test for conditional convergence. In a pure cross-sectional framework, since there is only one observation per country, in order to employ the OLS method, one is forced to assume that the initial level of technology, $A(0)$, is uncorrelated with all explanatory variables. This is a rather implausible assumption–the initial level of technology is almost certainly correlated with the initial level of income–and hence generates a serious omitted variable bias problem. The problem can be dealt with in a panel framework, where it is possible to control for time-invariant country-effects. Thus, the specification that will be used in this study to test for conditional convergence is the following:

$$\begin{aligned} \ln y_{it} - \ln y_{i,t-1} &= \beta_1 \ln (s_{k,it}) + \beta_1 \ln (n_{it} + g + \delta) \\ &\quad + \gamma \ln y_{i,t-1} + \mu_i + \xi_t + \nu_{it} \end{aligned} \tag{4}$$

where μ_i represents the time-invariant country-specific effects (which can now vary systematically across countries), ξ_t represents any time-specific effects (such as across-the-board shocks to technology), and ν_{it} is a random error term assumed to be uncorrelated with any of the explanatory variables.

4 Results and Interpretation

The results will be presented in four parts corresponding to the four different combinations of: reduced dispersion/conditional convergence & wealthy source countries/more varied selection of source countries.

4.1 Reduced Dispersion: Wealthy Source Countries

The estimates of equation (2) for the trading groups corresponding to each of the wealthy source countries are presented in Table 1.[12] The table lists only the source country and the size of its trading group. Thus, it may prove interesting to inspect the results along with the composition of the trading groups listed in Table A.1.

Since we are using pooled data to estimate equation (2), the relevant Augmented Dickey-Fuller τ-statistic in testing whether the estimated ϕ coefficient is significantly

[12]The list of wealthy source countries, along with the composition of their trading groups, is presented in Table A.1 in the appendix.

different from unity is the following: $\tau = \left(\widehat{\phi} - 1\right) / \widehat{\sigma}_{\phi}$, where $\widehat{\sigma}_{\phi}$ is the standard error of the estimated coefficient.[13] Given that equation (2) includes neither a constant nor a trend term, the critical values for this τ-statistic are very similar to the critical values of the t-distribution and are given in Hamilton (1994).

Table 1 also lists the number of lags (k) that were used in estimating equation (2) for each trading group. The procedure that was used in determining the optimal number of lags for each estimation is described in section 3.2. In addition, table 1 lists the half-life of the convergence process, given the estimated coefficient. The half-life is given by $\ln(0.5) / \ln\left(\widehat{\phi}\right)$ and is equal to the number of years taken to close half of the income gap between y_i and $\overline{y}$.

The results in table 1 show that out of the 29 trading groups considered, there is evidence of significant (at the 5% level) reduced income dispersion for 19 trading groups. The estimated coefficient is in the direction of reduced income dispersion $\left(\widehat{\phi} < 1\right)$ for 25 out of 29 trading groups. However, it is significant for only 19 trading groups. These results are similar to those obtained by Ben-David (1996), who found evidence of significant reduced income dispersion for 17 out of the 25 trading groups corresponding to his selection of wealthy source countries.

Given that we observe a good number of cases of reduced dispersion among the trading groups corresponding to our wealthy source countries, it is necessary to ask whether this result is particular to groups of countries closely related by international trade or whether we would observe the same among random groupings of countries. In doing so, however, we need to determine the pool of countries from which we will form random groups. Note that the wealthy source countries trade mostly with each other. Thus, the relevant pool of countries consists of the 29 wealthy source countries themselves. Note also that the average size of the trading groups was six countries. Thus, we created 5000 random groups consisting of six countries each from our list

[13] This has been shown by Quah (1994).

of 29 wealthy source countries.[14] Equation (2) was estimated for each of these 5000 groups.

The distribution of the 5000 estimated reduced dispersion coefficients $\left(\widehat{\phi} < 1\right)$ is presented in Table 3 and the associated cumulative frequency graph. As table 3 tells us, the probability of finding evidence of significant (at the 5% level) reduced dispersion $\left(\widehat{\phi} < 1 \text{ \& } \tau\text{-stat} < -1.96\right)$ is 0.161. This would imply that if there was no special tendency toward reduced dispersion among the trading groups, we would have found evidence of significant reduced dispersion for $0.161 * 29 \approx 5$ trading groups only. However, as discussed above, we found significant reduced dispersion for 19 trading groups.

If there was no special tendency toward reduced dispersion among the trading groups, we could imagine each estimated coefficient in table 1 as being drawn from the distribution indicated in table 3. This would allow us to assess how special each estimated coefficient actually is. For example, the estimated coefficient for the trading group corresponding to Finland is 0.949 and is significant at the 5% level. The second column of table 3 tells us that there is less than a 5% chance that so low an estimate (significant at the 5% level) would have been found in a random group of the 29 wealthy source countries.

Our tests for reduced dispersion on various trade-based and random groups of the 29 wealthy source countries seem to suggest that there is a much greater incidence of reduced income dispersion among groups of countries related by international trade.

[14]There are $25!/(6!23!) = 475{,}020$ possible groups of size 6 that can be formed from a list of 29 countries. Note that while we consider only one set of random groups (of size 6), an improvement on our procedure would be to form a set of random groups for each trading group size and test for convergence within each set of random groups.

4.2 Reduced Dispersion: Varied Selection of Source Countries

It is interesting to note the composition of the trading groups for which we found no evidence of reduced income dispersion in Table 1. Most of these trading groups included at least one country with a real GDP per capita that was at the lowest end of the income spectrum of our wealthy source countries. For example, the trading groups corresponding to Spain and the United States–both without a significant reduced dispersion result–both included Mexico. In addition, no evidence of reduced dispersion was found for the trading groups corresponding to Barbados, Mauritius, Venezuela, Mexico, Uruguay, Trinidad and Tobago, Argentina, and Chile–all countries with relatively low incomes within the list of wealthy source countries.[15] This observation in itself leads us to suspect that finding evidence of reduced income dispersion within our trading groups is conditional upon the members of a group having similar steady-state levels of income.[16] Let us see whether this is indeed the case by testing for reduced dispersion among the trading groups of a more varied selection of source countries.

As explained in section 3.1, the more varied list of source countries was picked by randomly selecting 25 countries from all 138 non-oil, non-Communist countries. These 25 varied source countries, along with the composition of their trading groups are listed in Table A.2 of the appendix. In addition, Table A.3 provides the list of country names corresponding to the country codes used elsewhere.

The estimates of equation (2) for the trading groups corresponding to the 25 varied source countries are presented in Table 2. The results show that there is a much lower

[15]It is very likely that countries with substantially lower income levels also have lower steady-state levels of income among the list of wealthy countries.

[16]On the other hand, if reduced dispersion were the result of technology diffusion, we would expect it to be found particularly among groups of dissimilar countries.

incidence of reduced dispersion among the trading groups of our more varied selection of source countries. There is evidence of reduced income dispersion (significant at the 5% level) for 5 out of the 25 trading groups listed in Table 2. In addition, when compared to Table 1, there are also many more cases where the estimated coefficient points in the direction of increased income dispersion, although only 3 out of these 9 cases are significant at the 5% level.

Let us examine whether the incidence of convergence among the trading groups of our varied source countries is any different from random groupings of these countries. Once again, we need to first determine the pool of countries from which we will form random groups. A look at Table A.2 reflects that most of the trading groups include a number of major, recurring trading partners: United States, Japan, Germany, U.K., France, and Italy. Thus, using *only* the pool of 25 varied *source* countries to form random groups would not constitute a valid point of reference against which to compare the estimates for the trading groups. Note that the objective is to create random groups of countries which resemble the trading groups in all respects other than the fact that the member countries are closely related by trade. Thus, we will use the 25 varied source countries plus their 6 major, recurring trading partners as the pool of countries from which to create random groups.

Equation (2) was estimated for each of 5000 random groups consisting of 6 countries each drawn from the pool of 25 source countries plus 6 recurring trading partners. The distribution of the 5000 estimated reduced dispersion coefficients is presented in Table 4 and the associated cumulative frequency graph. The probability of finding an estimated coefficient that is less than 1 and significant at the 5% level is 0.022 or 2.2%. This indicates that if there were no special tendency toward reduced income dispersion among trade-based groups, we would expect to find evidence of reduced dispersion (significant at the 5% level) in only 1 out of the 25 trading groups. The number of trading groups for which we *did* find evidence of reduced dispersion is 5.

This still suggests that the incidence of reduced dispersion among trading groups is somewhat higher than that among random groups. However, much of the relation between trade-based groups and a greater incidence of convergence (in the reduced dispersion sense) that was detected for the wealthy source countries seems to have disappeared after using a more varied selection of source countries.

Nevertheless, there still seems to be a somewhat higher incidence of convergence among the trading groups. To understand why this is the case, compare the composition of the trading groups to that of the random groups. Almost all trading groups include a high content of developed countries–some of the 6 recurrent trading partners–with similar steady-state levels of income. On the other hand, the 25 source countries are very varied with respect to their steady-state levels of income. Thus, since we are drawing random groups from the 25 source countries plus 6 trading partners, the countries within these random groups must be more varied with respect to their steady-state levels of income compared to the trading groups. This biases the results in favor of finding a greater incidence of reduced income dispersion among the trading groups.

4.3 Conditional Convergence: Wealthy Source Countries

A recurrent point made by our assessment of the reduced dispersion estimates was that the finding of reduced dispersion among groups of countries was greatly influenced by how similar the countries were with respect to their steady-state levels of income. By testing for conditional convergence, however, we can control for the determinants of the steady-state and then examine whether there is any greater tendency toward convergence among groups of countries related by trade.

In order to test for conditional convergence, we will estimate equation (4) using panel data. The panel consists of six non-overlapping 5-year averages between 1960 and

1990. In equation (4), t and $t-1$ refer to the final and initial years, respectively, of each of the 5-year periods. The term $g+\delta$ is assumed to equal a uniform 0.05 for all countries and time periods. The data is processed to eliminate the time effects by subtracting out the period averages for the group under consideration from each variable. The model is then estimated using fixed country effects.

The estimates for the trading groups of the wealthy source countries are presented in Table 5. The table presents the estimated conditional convergence coefficient ($\widehat{\gamma}$) and its associated t-statistic. If the estimated coefficient is negative and significant, we take this as evidence of convergence. The implied rate of convergence is given by the following: $\lambda = [\ln(1+\widehat{\gamma})\,/\,(-5)]$. This simply comes from the coefficient on the initial level of income in equation (3). The half life is computed as: $\ln(2)/\lambda$.

According to the estimates, 25 out of the 29 trading groups corresponding to the wealthy source countries display evidence of conditional convergence at the 5% level of significance. This is greater than the 19 cases for which we found evidence of reduced dispersion among the trading groups of the wealthy source countries (see table 1). In addition, note that whereas reduced dispersion was *not* found mainly for trading groups containing countries whose incomes were at the lower end of the income spectrum of the wealthy countries, there is no such systematic tendency in the conditional convergence results. This seems to indicate that the failure to find evidence of reduced dispersion for a number of trading groups is because of the failure to control for the larger differences in the steady-state level of income.

Let us examine whether the high incidence of conditional convergence is something particular to trading groups or whether it would also show up in random groups of countries. To accomplish this, equation (4) was estimated for each of 5000 random groups of size 6 drawn from the pool of 29 wealthy source countries. The distribution of the 5000 estimated convergence coefficients ($\widehat{\gamma}$) is presented in table 7. The probability of finding a convergence coefficient that is negative and significant at the

5% level is 0.742. This indicates that if there is no special tendency toward conditional convergence among the trading groups, we should expect to find evidence of conditional convergence in $0.742 * 29 \approx 22$ trading groups. This is not too far from the 25 out of 29 cases for which we *did* find evidence of conditional convergence, thus indicating no special tendency toward convergence among trade-based groups once we control for determinants of the steady-state level of income. Contrast this with our tests of reduced dispersion in which we found 19 cases of reduced dispersion among the trading groups of the wealthy source countries, against the 4 cases predicted by the distribution of the estimated coefficients for the random groups.

If we think of each of the estimated convergence coefficients for the trading groups as coming from the distribution of $\widehat{\gamma}$ for the random groups given in table 7, none of the coefficient estimates seem very extraordinary. Consider the estimate (for the trading group corresponding to Spain) with the largest negative value: $\widehat{\gamma} = -0.666$. Table 7 tells us that the chance of finding a coefficient less than or equal to -0.666 among the estimates for the random groups is between 20% and 30%. Thus, it is very likely that the estimated coefficients for the trading groups are coming from the distribution of $\widehat{\gamma}$ for the random groups. In other words, the estimated convergence coefficients for the trading groups are not significantly different from the estimates for the random groups.

4.4 Conditional Convergence: Varied Selection of Source Countries

Estimates of equation (4) for the trading groups corresponding to the 25 varied source countries are presented in Table 6. The results show that 21 out of the 25 trading groups display evidence of conditional convergence, significant at the 5% level. As expected, the estimated conditional convergence coefficients are very similar to those obtained for the trading groups of the wealthy source countries (see table 5).

Once again, in order to assess whether the incidence of convergence in table 6 is particular to trading groups, we estimate equation (4) for 5000 random groups consisting of 6 countries each, drawn from the pool of 25 varied source countries plus the 6 recurring trading partners (see section 4.2). The distribution of the 5000 estimated conditional convergence coefficients is presented in Table 8. The probability of finding an estimated coefficient that is negative and significant at the 5% level is 0.668. This implies that if there is no difference in the incidence of convergence among trading groups and random groups, we should expect to find evidence of conditional convergence in $0.668 * 25 \approx 17$ trading groups. This number is not too far from the 21 trading groups in which we *did* find evidence of conditional convergence, thus indicating that the incidence of conditional convergence among trading groups is not significantly different from that among random groups.

Note the big difference between the incidence of reduced dispersion and that of conditional convergence among trading groups of the 25 varied source countries. Only 5 out of the 25 trading groups displayed evidence of convergence in the reduced dispersion sense. However, after controlling for the determinants of the steady-state, 21 out the 25 trading groups display evidence of conditional convergence. This is yet another indication that the success or failure of finding reduced dispersion is simply dependent on whether the countries within a group have similar steady-state levels of income.

5 Concluding Comments

This paper began by asking two related questions: (i) Is there a greater incidence of convergence among groups of countries closely related by international trade? (ii) Can the apparent finding of a greater incidence of convergence (in the reduced income dispersion sense) among trade-related groups of countries be alternatively explained by a failure to control for steady-state levels of income? The results of this paper suggest that the answer to the first question is inconclusive and that the answer to the second question is affirmative.

The following are some of the salient findings that back up our answers to the questions above. First, even when testing for reduced dispersion among the trading groups of wealthy countries, the finding of reduced dispersion seems to be limited to groups of countries with similar steady-state levels of income.

Second, when we consider a varied selection of source countries, the incidence of convergence–in the reduced dispersion sense–falls greatly among both trading and random groups. In addition, the effect of a greater incidence of convergence among trade-based groups compared to random groups is much diminished once we use a varied selection of source countries.

Third, once we use panel data to control for the determinants of the steady-state level of income, there remains no significant difference between the incidence of convergence among trade-based groups and that among random groups. Finally, in all cases considered, there is a much greater incidence of conditional convergence than of reduced income dispersion. This result in itself indicates that the finding of reduced income dispersion is conditional upon countries having similar steady-state levels of income. Reduced dispersion seems to be *not* found whenever the group concerned contains one or more "spoiler" countries, where a "spoiler" country is one with a dissimilar steady state.

Why then is the answer to our first question inconclusive? While we have discussed how a model of North-South technology diffusion can explain the *conditional* convergence finding, it is true that by controlling for country fixed effects in our conditional convergence tests, we are taking out a large component of the cross-country variation in levels of technology. By doing so, if the technology diffusion explanation of convergence is correct, we are biasing our conditional convergence results against finding a greater incidence of convergence among trade-related groups. Thus, while our results suggest that the apparent finding of a greater incidence of reduced income dispersion among trade-related groups of countries can be alternatively explained by a failure to control for steady-state income levels, we are unable to conclusively answer whether there exists a greater incidence of convergence among groups of countries closely related by international trade.

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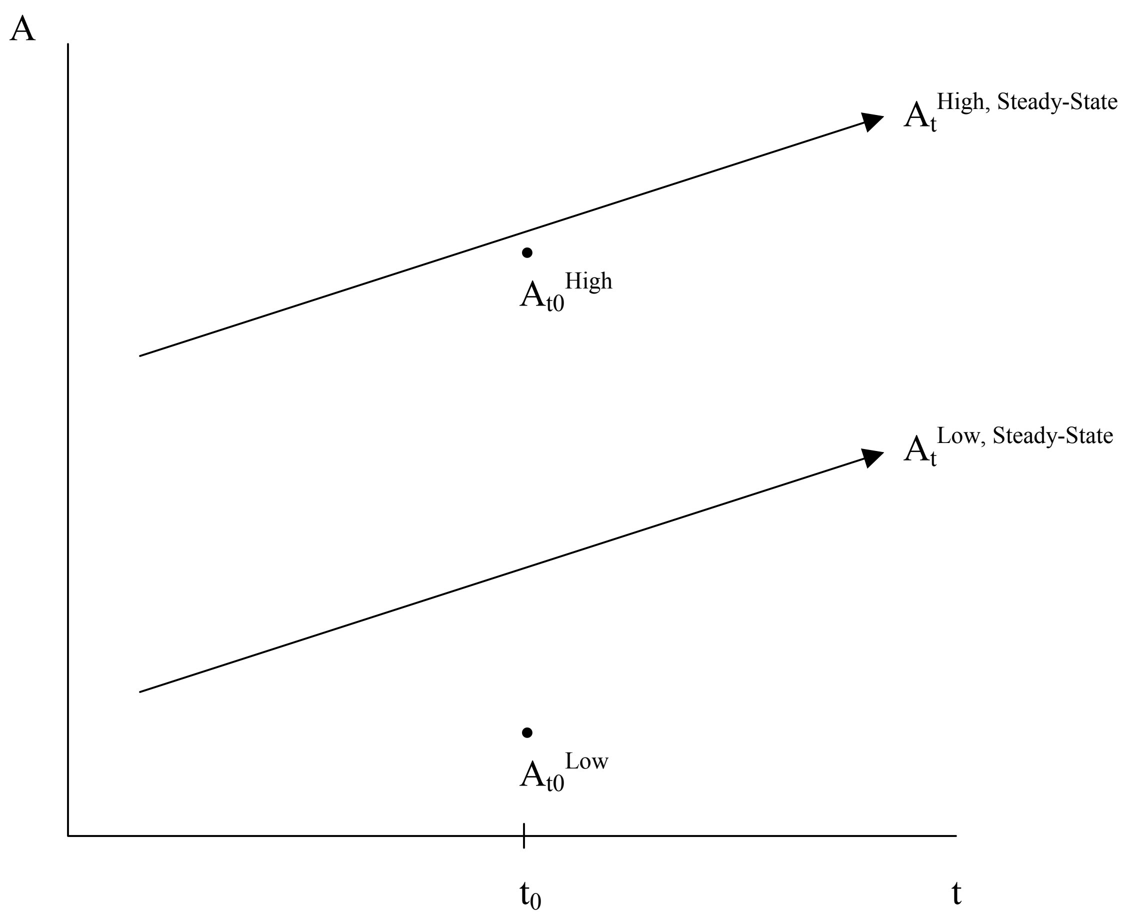
A
$A_t^{High, Steady-State}$
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$A_t^{Low, Steady-State}$
A_{t0}^{Low}
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Figure 1

Table 1.
Reduced Dispersion Coefficients for Trading Groups
29 Wealthy Source Countries

	Source Country	Size	Convergence Coefficient (ϕ)	τ−stat	No. of lags	Half-life
1	Japan	3	0.932	-3.984 ***	4	10
2	Canada	3	0.941	-4.084 ***	4	11
3	Norway	9	0.948	-5.559 ***	2	13
4	Sweden	9	0.948	-5.559 ***	2	13
5	Finland	6	0.949	-5.075 ***	2	13
6	Iceland	9	0.953	-4.244 ***	3	14
7	Austria	4	0.954	-4.527 ***	4	15
8	Australia	6	0.958	-4.188 ***	1	16
9	New Zealand	6	0.958	-4.188 ***	1	16
10	Denmark	9	0.958	-4.999 ***	1	16
11	Germany	8	0.961	-4.710 ***	1	17
12	U. K.	9	0.963	-4.488 ***	1	18
13	Switzerland	8	0.971	-3.726 ***	2	24
14	Italy	6	0.974	-2.812 ***	2	26
15	France	7	0.974	-2.856 ***	2	26
16	Israel	7	0.974	-3.675 ***	2	26
17	Bel-Lux	6	0.979	-2.089 **	2	33
18	Netherlands	6	0.979	-2.089 **	2	33
19	Ireland	5	0.983	-2.848 ***	2	40
20	Barbados	7	0.991	-0.924	2	77
21	Spain	7	0.991	-1.663 *	2	77
22	Mauritius	9	0.991	-1.417	1	77
23	U. S. A.	6	0.993	-1.358	1	99
24	Venezuela	6	0.994	-1.206	3	115
25	Mexico	3	0.995	-0.765	1	138
26	Uruguay	5	1.002	0.403	1	-
27	Trinidad & Tobago	6	1.002	-0.220	3	-
28	Argentina	8	1.002	0.675	3	-
29	Chile	6	1.009	1.422 **	1	-

***Significantly different from 1 at the 1% level
** Significantly different from 1 at the 5% level
* Significantly different from 1 at the 10% level

Table 2.
Reduced Dispersion Coefficients for Trading Groups
25 Varied Source Countries

	Source Country	Size	Convergence Coefficient (ϕ)	τ-stat	No. of Lags	Half-life
1	Norway	9	0.948	-5.559 ***	2	13
2	Australia	6	0.958	-4.188 ***	1	16
3	Greece	6	0.969	-5.375 ***	0	22
4	Portugal	7	0.987	-2.408 **	3	53
5	Gabon	6	0.989	-1.304	1	63
6	Korea	4	0.989	-2.152 **	3	63
7	Barbados	7	0.991	-0.924	2	77
8	Mauritius	9	0.991	-1.417	1	77
9	Spain	7	0.991	-1.663 *	2	77
10	Venezuela	6	0.994	-1.206	3	115
11	Indonesia	6	0.995	-1.849 *	2	138
12	Mexico	3	0.995	-0.765	1	138
13	Pakistan	6	0.998	-0.721	3	346
14	Turkey	7	0.998	-0.595	3	346
15	Bangladesh	4	0.999	-0.174	2	693
16	Nigeria	6	0.999	-0.082	2	693
17	Brazil	5	1.000	0.011	2	-
18	South Africa	6	1.002	0.427	3	-
19	Guatemala	7	1.003	1.076 *	3	-
20	Nepal	7	1.003	0.840	1	-
21	Senegal	8	1.003	0.861	4	-
22	Peru	6	1.004	0.796	3	-
23	Tanzania	5	1.004	1.701 **	4	-
24	Guinea	7	1.005	2.758 ***	1	-
25	Zaire	8	1.007	3.015 ***	4	-

***Significantly different from 1 at the 1% level
** Significantly different from 1 at the 5% level
* Significantly different from 1 at the 10% level

Table 3. Distribution of Reduced Dispersion Coefficients: 5000 Random Groups of size 6 from 29 Wealthy Source Countries

Probability that:	Coefficient less than entry	Coeff. < Entry & τ-stat < -1.95	Coeff.< Entry & τ-stat < -1.60
1%	0.9417	0.9417	0.9417
5%	0.9683	0.9690	0.9687
10%	0.9768	0.9784	0.9773
20%	0.9864	n/a	0.9900
30%	0.9938	n/a	n/a
40%	0.9980	n/a	n/a
50%	1.0012	n/a	n/a

Prob ($\phi < 1$ & τ–stat < -1.95): 0.161
Prob ($\phi < 1$ & τ–stat < -1.60): 0.203

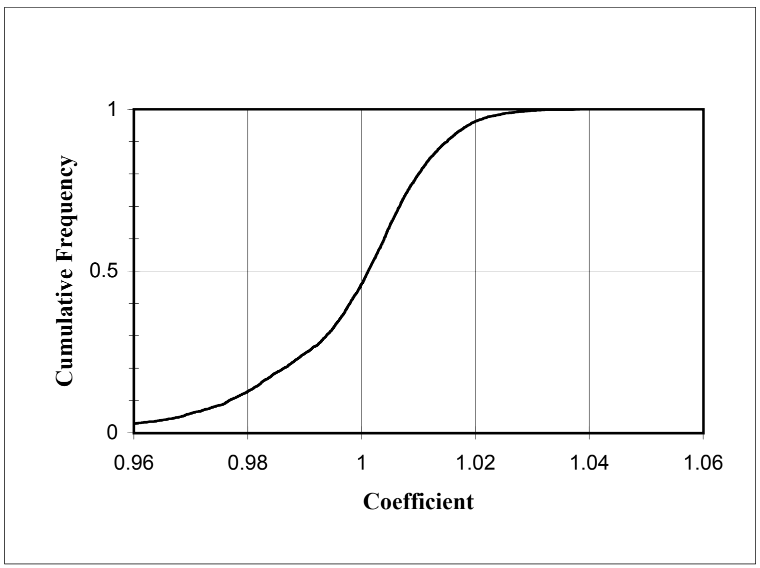

Table 4. Distribution of Reduced Dispersion Coefficients: 5000 Random Groups of size 6 from 25 Varied Source Countries plus 6 Major Recurring Trading Partners

Probability that:	Coefficient less than entry	Coeff. < Entry & τ-stat < -1.95	Coeff.< Entry & τ-stat < -1.60
1%	0.9868	0.9877	0.9871
5%	0.9931	n/a	n/a
10%	0.9953	n/a	n/a
20%	0.9979	n/a	n/a
30%	0.9997	n/a	n/a
40%	1.0009	n/a	n/a
50%	1.0020	n/a	n/a

Prob ($\phi < 1$ & τ–stat < -1.95): 0.022
Prob ($\phi < 1$ & τ–stat < -1.60): 0.038

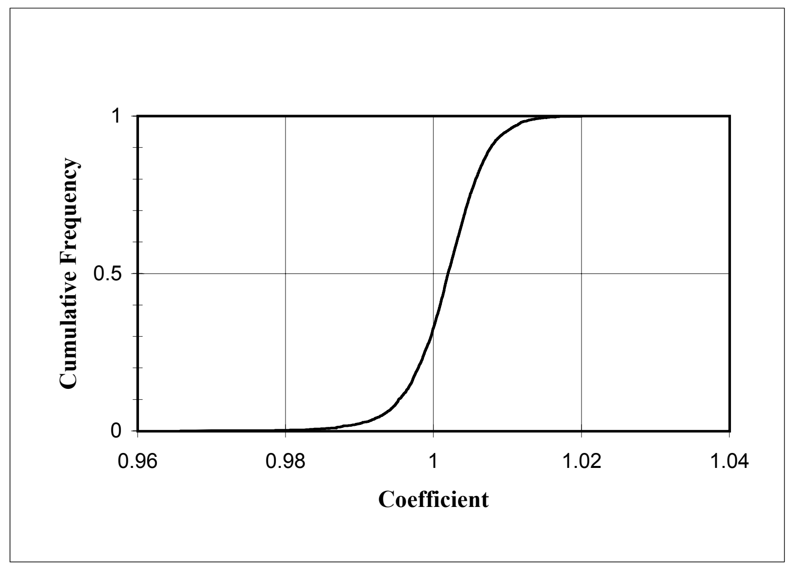

Table 5.
Conditional Convergence Coefficients for Trading Groups
29 Wealthy Source Countries

	Source Country	Size	Convergence Coefficient	t-stat	Implied Rate of Convergence: λ	Half-life
1	Spain	7	-0.666	-5.261 ***	0.219	3
2	Bel-Lux	6	-0.644	-4.810 ***	0.207	3
3	Netherlands	6	-0.644	-4.810 ***	0.207	3
4	Italy	6	-0.595	-4.458 ***	0.181	4
5	Ireland	5	-0.592	-3.674 ***	0.179	4
6	Chile	6	-0.585	-2.591 **	0.176	4
7	France	7	-0.582	-4.709 ***	0.174	4
8	Israel	7	-0.576	-5.128 ***	0.172	4
9	Switzerland	8	-0.546	-4.922 ***	0.158	4
10	Iceland	9	-0.468	-4.197 ***	0.126	5
11	U. K.	9	-0.435	-4.677 ***	0.114	6
12	Germany	8	-0.432	-4.960 ***	0.113	6
13	U. S. A.	6	-0.431	-3.830 ***	0.113	6
14	Australia	6	-0.415	-4.883 ***	0.107	6
15	New Zealand	6	-0.415	-4.883 ***	0.107	6
16	Denmark	9	-0.413	-4.248 ***	0.107	7
17	Finland	6	-0.402	-3.593 ***	0.103	7
18	Trinidad & Tobago	6	-0.397	-2.914 ***	0.101	7
19	Mexico	3	-0.390	-2.325 **	0.099	7
20	Norway	9	-0.371	-3.711 ***	0.093	7
21	Sweden	9	-0.371	-3.711 ***	0.093	7
22	Austria	4	-0.353	-2.753 ***	0.087	8
23	Argentina	8	-0.313	-2.849 ***	0.075	9
24	Mauritius	9	-0.302	-3.092 ***	0.072	10
25	Canada	3	-0.300	-1.880 *	0.071	10
26	Uruguay	5	-0.264	-1.407	0.061	11
27	Barbados	7	-0.242	-1.997 **	0.055	13
28	Venezuela	6	-0.197	-1.576	0.044	16
29	Japan	3	-0.081	-0.702	0.017	41

***Significantly different from 1 at the 1% level
** Significantly different from 1 at the 5% level
* Significantly different from 1 at the 10% level

Table 6.
Conditional Convergence Coefficients for Trading Groups
25 Varied Source Countries

	Source Country	Size	Convergence Coefficient	t-stat	Implied Rate of Convergence: λ	Half-life
1	Spain	7	-0.666	-5.261 ***	0.219	3
2	Zaire	8	-0.591	-4.424 ***	0.179	4
3	Pakistan	6	-0.558	-5.385 ***	0.163	4
4	Portugal	7	-0.496	-3.691 ***	0.137	5
5	Nigeria	6	-0.490	-2.909 ***	0.135	5
6	Bangladesh	4	-0.488	-3.564 ***	0.134	5
7	Senegal	8	-0.488	-3.541 ***	0.134	5
8	Turkey	7	-0.471	-4.952 ***	0.127	5
9	Brazil	5	-0.469	-2.559 **	0.127	5
10	Korea	4	-0.466	-3.703 ***	0.125	6
11	Indonesia	6	-0.464	-7.062 ***	0.125	6
12	Australia	6	-0.415	-4.883 ***	0.107	6
13	Mexico	3	-0.390	-2.325 **	0.099	7
14	Norway	9	-0.371	-3.711 ***	0.093	7
15	Tanzania	5	-0.332	-2.858 ***	0.081	9
16	Nepal	7	-0.325	-4.179 ***	0.079	9
17	Guinea	7	-0.319	-2.765 ***	0.077	9
18	Gabon	6	-0.315	-2.518 **	0.076	9
19	Mauritius	9	-0.302	-3.092 ***	0.072	10
20	South Africa	6	-0.299	-3.147 ***	0.071	10
21	Greece	6	-0.259	-1.898 *	0.060	12
22	Barbados	7	-0.242	-1.997 **	0.055	13
23	Peru	6	-0.238	-1.815 *	0.054	13
24	Venezuela	6	-0.197	-1.576	0.044	16
25	Guatemala	7	-0.185	-1.741 *	0.041	17

***Significantly different from 1 at the 1% level
** Significantly different from 1 at the 5% level
* Significantly different from 1 at the 10% level

Table 7. Distribution of Conditional Convergence Coefficients: 5000 Random Groups of size 6 from 29 Wealthy Source Countries

Probability that:	Coefficient less than entry	Coeff. < Entry & t-stat < -1.96	Coeff.< Entry & t-stat < -1.645
1%	-1.0748	-1.0748	-1.0748
5%	-0.9288	-0.9288	-0.9288
10%	-0.8480	-0.8480	-0.8480
20%	-0.7201	-0.7201	-0.7201
30%	-0.6237	-0.6236	-0.6237
40%	-0.5545	-0.5541	-0.5545
50%	-0.4925	-0.4914	-0.4924

Prob (coeff < 0 & t–stat < -1.96): 0.742
Prob(coeff < 0 & t–stat < -1.645): 0.803

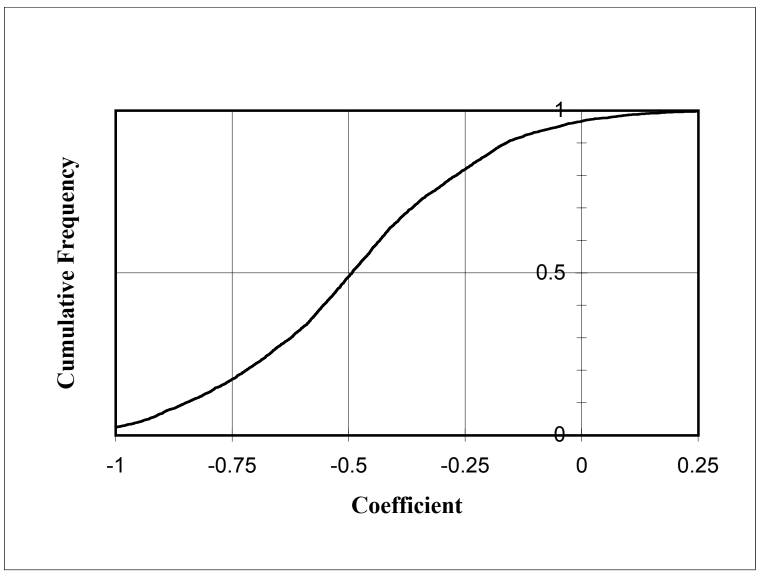

Table 8. Distribution of Conditional Convergence Coefficients: 5000 Random Groups of Size 6 from 25 Randomly Selected Source Countries + 6 Major Recurring Trading Partners

Probability that:	Coefficient less than entry	Coeff. < Entry & t-stat < -1.96	Coeff.< Entry & t-stat < -1.645
1%	-0.9563	-0.9563	-0.9563
5%	-0.7742	-0.7742	-0.7742
10%	-0.6760	-0.6757	-0.6760
20%	-0.5669	-0.5665	-0.5669
30%	-0.4915	-0.4910	-0.4915
40%	-0.4302	-0.4264	-0.4299
50%	-0.3779	-0.3674	-0.3762

Prob (coeff < 0 & t–stat < -1.96): 0.668
Prob(coeff < 0 & t–stat < -1.645): 0.764

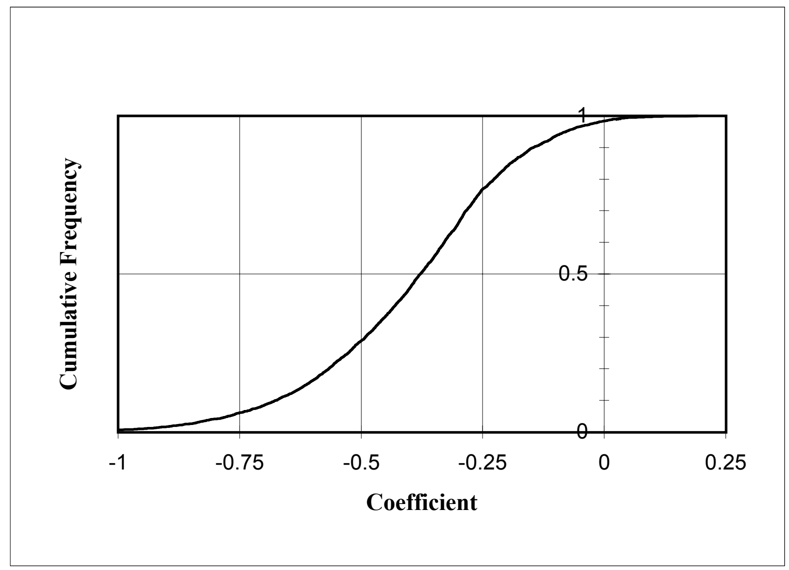

Table A.1

List of Trading Groups for the 29 Wealthy Countries

	Source Country	Major Trading Partners							
1	ARG	BOL	BRA	FRA	DEU	ITA	JPN	USA	
2	AUS	DEU	JPN	NZL	GBR	USA			
3	AUT	DEU	ITA	CHE					
4	BRB	USA	CAN	JPN	GBR	TTO	VEN		
5	BLX	FRA	DEU	NLD	GBR	USA			
6	CAN	JPN	USA						
7	CHL	BRA	DEU	GUY	JPN	USA			
8	DNK	FRA	DEU	JPN	NLD	NOR	SWE	GBR	USA
9	FIN	DEU	JPN	SWE	GBR	USA			
10	FRA	BLX	DEU	ITA	NLD	GBR	USA		
11	DEU	BLX	FRA	ITA	JPN	NLD	GBR	USA	
12	ISL	DNK	DEU	JPN	NLD	NOR	SWE	GBR	USA
13	IRL	FRA	DEU	GBR	USA				
14	ISR	USA	BLX	DEU	ITA	CHE	GBR		
15	ITA	FRA	DEU	NLD	GBR	USA			
16	JPN	AUS	USA						
17	MUS	AUS	JPN	FRA	DEU	GBR	ZAF	CHN	HKG
18	MEX	JPN	USA						
19	NLD	BLX	FRA	DEU	GBR	USA			
20	NZL	AUS	DEU	JPN	GBR	USA			
21	NOR	DNK	FIN	FRA	DEU	JPN	SWE	GBR	USA
22	ESP	FRA	DEU	ITA	MEX	GBR	USA		
23	SWE	DNK	FIN	FRA	DEU	JPN	NOR	GBR	USA
24	CHE	BLX	FRA	DEU	ITA	NLD	GBR	USA	
25	TTO	USA	CAN	JPN	GBR	ARG			
26	GBR	BLX	FRA	DEU	ITA	JPN	NLD	NOR	USA
27	USA	CAN	DEU	JPN	MEX	GBR			
28	URY	ARG	BRA	DEU	USA				
29	VEN	USA	JPN	DEU	ITA	BRA			

Note: Refer to Table A.3 for list of country names corresponding to country codes.

Table A.2

List of Trading Groups for the 25 Randomly Selected Countries

	Source Country	Major Trading Partners							
1	AUS	USA	JPN	DEU	GBR	NZL			
2	BGD	USA	JPN	SGP					
3	BRB	USA	CAN	JPN	GBR	TTO	VEN		
4	BRA	USA	JPN	DEU	NGA				
5	GAB	USA	JPN	FRA	DEU	GBR			
6	GRC	JPN	FRA	DEU	ITA	NLD			
7	GTM	USA	JPN	DEU	SLV	MEX	VEN		
8	GIN	USA	BLX	FRA	DEU	ITA	BRA		
9	IDN	USA	AUS	JPN	DEU	SGP			
10	KOR	USA	JPN	MYS					
11	MUS	AUS	JPN	FRA	DEU	GBR	ZAF	CHN	HKG
12	MEX	USA	JPN						
13	NPL	JPN	DEU	CHN	IND	KOR	SGP		
14	NGA	USA	JPN	FRA	DEU	BRA			
15	NOR	DNK	FIN	FRA	DEU	JPN	SWE	GBR	USA
16	PAK	USA	JPN	DEU	GBR	MYS			
17	PER	USA	JPN	DEU	ARG	BRA			
18	PRT	USA	FRA	DEU	ITA	ESP	GBR		
19	SEN	USA	FRA	DEU	ESP	DZA	CIV	BRA	
20	ZAF	USA	JPN	FRA	DEU	GBR			
21	ESP	USA	DEU	FRA	ITA	MEX	GBR		
22	TZA	JPN	DEU	ITA	GBR				
23	TUR	USA	JPN	FRA	DEU	ITA	GBR		
24	VEN	USA	JPN	DEU	ITA	BRA			
25	ZAR	USA	BLX	FRA	DEU	CHE	GBR	ZAF	

Table A.3
List of Countries and Country Codes

	Code	Country
1	ARG	ARGENTINA
2	AUS	AUSTRALIA
3	AUT	AUSTRIA
4	BGD	BANGLADESH
5	BLX	BEL-LUX
6	BOL	BOLIVIA
7	BRA	BRAZIL
8	BRB	BARBADOS
9	CAN	CANADA
10	CHE	SWITZERLAND
11	CHL	CHILE
12	CHN	CHINA
13	CIV	IVORY COAST
14	DEU	GERMANY_WEST
15	DNK	DENMARK
16	DZA	ALGERIA
17	ESP	SPAIN
18	FIN	FINLAND
19	FRA	FRANCE
20	GAB	GABON
21	GBR	U.K.
22	GIN	GUINEA
23	GRC	GREECE
24	GTM	GUATEMALA
25	GUY	GUYANA
26	HKG	HONG KONG
27	IDN	INDONESIA
28	IND	INDIA
29	IRL	IRELAND

	Code	Country
30	ISL	ICELAND
31	ISR	ISRAEL
32	ITA	ITALY
33	JPN	JAPAN
34	KOR	KOREA_REP.
35	MEX	MEXICO
36	MUS	MAURITIUS
37	MYS	MALAYSIA
38	NGA	NIGERIA
39	NLD	NETHERLANDS
40	NOR	NORWAY
41	NPL	NEPAL
42	NZL	NEWZEALAND
43	PAK	PAKISTAN
44	PER	PERU
45	PRT	PORTUGAL
46	SEN	SENEGAL
47	SGP	SINGAPORE
48	SLV	EL SALVADOR
49	SWE	SWEDEN
50	TTO	TRINIDAD & TOBAG
51	TUR	TURKEY
52	TZA	TANZANIA
53	URY	URUGUAY
54	USA	U.S.A.
55	VEN	VENEZUELA
56	ZAF	SOUTH AFRICA
57	ZAR	ZAIRE