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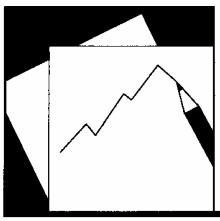

IMF Working Paper

How Much Do Trading Partners Matter for Economic Growth?

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How Much Do Trading Partners Matter for Economic Growth?

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Abstract

This paper empirically examines the extent to which a country's economic growth is influenced by its trading partner economies. Panel estimation results based on four decades of data for over 100 countries show that trading partners' growth and relative income levels have a strong effect on domestic growth, even after controlling for the influence of common global and regional trends. One interpretation is that conditional convergence is stronger, the richer are a country's trading partners. A general implication of the results is that industrial countries benefit from trading with developing countries, which grow rapidly, while developing countries benefit from trading with industrial countries, which have relatively high incomes.

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Contents Page

I. INTRODUCTION

How much does a country's long-term economic growth depend on economic conditions in the rest of the world? Barring some notable objections, the general conclusion in the literature is that trade openness has a positive impact on growth.[2] In addition, a view is commonly held that with growing economic integration across countries, economic developments in a country are significantly influenced by developments abroad.[3] However, something that has been relatively neglected in the literature is a quantification of the relationship between foreign economic conditions and domestic economic growth.

This paper shows empirically that economic conditions in trading partner countries matter for growth. In particular, a country's economic growth is positively influenced by both the relative income level and the growth rate of its trading partners, after controlling for other growth determinants. The implications are that developing countries benefit from trading with industrial countries, which have relatively higher income levels; and, in turn, industrial countries benefit from trading with fast-growing developing countries. The paper tries to capture the strength of this impact over the longer run rather than over the short-run business-cycle horizon.

An analysis using panel data for the period 1960–99 for 101 industrial and developing economies suggests that a 1 percentage point increase in economic growth among a country's trading partners, keeping all else equal, is correlated with an increase in domestic growth of as much as 0.8 percentage points. The positive sign of the relationship is consistent with the conclusions of the trade and growth literature, as well as with those of a few recent papers that have tried to quantify the impact of cross-country growth spillovers.[4] However, its estimated size is larger than one might have expected.

In addition, the level of foreign income relative to domestic income matters, in the sense that the ratio of the average per capita GDP of trading partners relative to a country's own per capita GDP is positively correlated with growth. One interpretation of this result is that conditional convergence is stronger, the richer are a country's trading partners. The results seem to be stronger for more open economies and for more recent decades (1980–99), although this is sensitive to model specification. They remain robust when we control for global and regional growth trends.

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[2] See Baldwin (2003) for a review of the literature.

[3] See, for example, The Economist (2002).

[4] For example, Arora and Vamvakidis (2002) find a positive relationship between long-run growth in the United States and in the rest of the world, which they attribute to the importance of the United States as a global trading partner; and Ahmed and Loungani (1999) find that the short-run impact of foreign output shocks on domestic output in emerging market economies is roughly one for one.

There is some debate in the growth-openness literature as to whether trade with less developed countries is beneficial for growth. Some models suggest that growth is positively influenced by trade with less developed countries, since it leads to specialization in relatively advanced sectors.[5] But Spilimbergo (2000) shows that this conclusion depends on specific assumptions, in particular homothetic preferences and only two goods with respect to learning by doing, and that, in principle, a rich country could be worse off by trading with a poor country if the demand pattern of the poor country is biased toward sectors that have weak learning-by-doing effects. The present paper argues that, in practice, the net impact on a country's growth of trading with relatively less developed countries is an empirical question: it is negative if the relative income effect dominates and positive if the relative growth effect dominates.

An important element in empirical analyses of trading partner data is the use of appropriate trade weights. In particular, if the relative importance of a country's trading partners changes over time, then it will not be captured accurately by trade weights based on a fixed point in time. With this in mind, a time series of trade weights was estimated for each country in the sample for the period 1960–99 and was used in the analysis.[6] In terms of key global trading partners, as of the late 1990s, the United States was among the 10 most important partners for 90 countries, while other important trading partners included the United Kingdom, Germany, the Netherlands, France, Italy, and Japan.

The paper proceeds as follows: Section II briefly discusses the literature on the growth-openness connection; Section III presents some stylized facts about the relative importance of countries' trading partners during 1960–99; Section IV presents the empirical methodology, the results, and robustness tests; and Section V concludes the paper.

II. Empirical Literature on the Growth–Openness Connection

A large number of studies have documented a positive relationship between openness and growth.[7] Barro and Sala-i-Martin (1995), Dollar (1992), Edwards (1998), Greenaway, Morgan and Wright (1998), Sachs and Warner (1995), and Vamvakidis (1998) report cross-country regression results showing that trade protection reduces growth rates.[8] Ben-David

[5] See Spilimbergo (2000) for a discussion of these models.

[6] The estimates are based on trade flow data from the IMF's *Direction of Trade Statistics* (IMF, 2002). It turns out that trade weights are highly correlated over time for both developing and industrial countries, which suggests that countries do not change their trading partners often. However, it is still more meaningful to use current weights rather than weights that are based on trade flows during a dated, and possibly arbitrary, base period.

[7] For a discussion of the early empirical and theoretical trade and growth literature, see Bhagwati and Srinivasan (1985). For more recent literature reviews, see Greenaway, Morgan, and Wright (1998), Bhagwati and Srinivasan (2002), and Baldwin (2003).

[8] Barro and Sala-i-Martin find that tariff rates have a significant negative impact on growth, although the impact of non-tariff barriers is not statistically significant.

(1993) and Sachs and Warner (1995) show that only open economies experience unconditional convergence. Coe and Helpman (1995) and Coe, Helpman, and Hoffmaister (1997) provide evidence of positive spillover effects on growth from R&D activities in trading partners. Frankel and Romer (1999) provide instrumental-variable estimates, using geographic characteristics, that confirm a significant and robust positive impact of trade on growth. Brunner (2003) extends the cross-country Frankel and Romer methodology to a panel estimation and finds a significant positive impact of trade on income. Vamvakidis (1999) and Harrison (1996) report fixed-effects estimation results similar to those from the cross-country regressions above.

There is an ongoing debate about some of the results reported previously in the literature. Rodriguez and Rodrik (1999) challenge the robustness of the openness-growth correlation found by Ben-David (1993), Dollar (1992), Edwards (1998), and Sachs and Warner (1995), arguing that some of these studies do not control for other important growth determinants and that there are shortcomings in the openness measures that are used. However, Warner (2002) questions the Rodriguez and Rodrik (1999) approach and presents results that reestablish the positive growth-openness link.[9] Williamson and Clemens (2002) and Vamvakidis (2002) examine longer-period historical data and find that the correlation between openness and growth becomes significant only in recent decades, which could suggest that a relatively open world economy is required in order for trade to have a positive impact on growth.

This paper addresses a question that is relatively unexplored in the growth-openness literature. It focuses on how much economic conditions in trading partners matter for growth rather than on whether and how much openness in general matters. Economic conditions abroad, including both growth rates and income levels, could be expected to have an impact on growth through channels such as aggregate demand effects and technological spillovers.

III. Trading Partners

The first step in attempting to quantify the impact of economic conditions in trading partners on growth is to construct trade weights that can be used to calculate weighted average growth rates and income levels of each country's trading partners. The analysis below uses export weights—that is, the share of each trading partner in the country's total exports[10]—for which a time series is constructed using data from the IMF Direction of Trade Statistics (IMF, 2002) for the period 1960–99.

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[9] Specifically, Sachs and Warner use a composite measure of openness, while Rodriguez and Rodrik disaggregate the measure and find that only the component relating to the black-market premium is significant in a growth regression. They claim that this premium has to do with macroeconomic stability rather than with trade protection. However, Warner argues that the black-market premium may in fact reflect trade distortions, and argues more generally that most powerful tests of the growth-openness connection come from aggregating different measures of protection.

[10] The average share over a five-year period is used, since annual shares tend to be volatile.

The data reveal a few interesting facts. First, the relative importance of a country's trading partners tends not to change much, as reflected in a high correlation of trade weights across time. Specifically, during 1960–99, the correlation between trade weights in successive five-year periods is 0.93, and it is 0.88 for successive ten-year periods.[11] Second, for most countries the set of the most important trading partners remains relatively stable over time.[12] One half of the countries that were among the ten most important trading partners for all other countries in the early 1960s were also on this list in the late 1990s (Table 1).

Third, countries that trade with relatively rich countries (in terms of GDP per capita) in one decade also trade with relatively rich countries in the next decade; similarly for relatively poor countries. The difference between the average level of trading partners' GDP per capita for industrial and for developing countries during this period is very small.[13] The list of the top and bottom performers in terms of trading partners' growth changes over time (Table 2), although trading partners' growth performance is roughly the same for industrial and developing countries. Fourth, the data indicate that the most important trading partners for other countries have been the United States, followed by the United Kingdom, Germany, the Netherlands, France, Italy, and Japan.[14]

IV. Empirical Approach and Results

A. Methodology

The impact of trading partners' growth on domestic growth can be quantified by estimating a fixed-effects panel regression, which allows an analysis of a cross-section of countries over time. The fixed-effects estimator allows the constant term to differ across cross-section units and it captures the time series dimension of the trading partners' growth effect after controlling for other growth determinants. The robustness of the results can be tested by excluding the fixed effects in a pooled panel estimation. Also, unlike in the case of a cross-country regression using long period average data, the use of a panel provides additional information. Furthermore, with a fixed-effects panel approach, it is possible to control for other explanatory variables and changes in them over time, and to test the

[11] The correlation for the whole period, that is between trade weights in the first half of the 1960s and the second half of the 1990s, is 0.70. It is somewhat higher for industrial than for developing countries (0.88 and 0.66, respectively).

[12] This is somewhat surprising given the increase in international integration during this period.

[13] It is only US$283 higher in 1995 constant values for industrial countries.

[14] The United States has been the most important trading partner during the last four decades. It was among the ten most important trading partners for 90 countries in the late 1990s, an increase from 84 in the early 1960s.

robustness of the estimated trading partners' growth impact to changes in model specification.

While a fixed-effects panel approach is preferable for analyzing long-run growth, a few recent studies use alternative methodologies to analyze the impact of foreign output fluctuations on domestic business cycles. Ahmed and Loungani (1999) use a vector-error-correction model to estimate the impact of foreign output shocks on domestic output for several emerging market economies. They find the impact to be roughly one-for-one, after controlling for other shocks. Agenor, McDermott, and Prasad (1999) estimate cross correlations using seasonally-adjusted and de-trended quarterly data to determine the stylized facts of business cycles in developing countries and find that output fluctuations in industrial countries are transmitted with near-zero lag to most developing countries.

B. Estimation

The empirical framework is a growth regression with a specification that is standard in the literature:[15]

$$\textit{(Real GDP per capita growth)}_i = c_i + \beta X_i + u, \qquad \textit{for country } i = 1, \ldots, n \tag{1}$$

The dependent variable is the average per capita real GDP growth rate; $\mathbf{c_i}$ is the matrix of constant terms for each country i; $\boldsymbol{\beta}$ is the matrix of parameters to be estimated and $\mathbf{u}$ is the error term. $\mathbf{X_i}$ is the matrix of independent variables that includes the standard variables in growth regressions:

- Convergence (the logarithm of per capita real GDP in the initial year of the period under consideration);[16]
- Demographic developments (population growth);
- Investment in physical capital (gross domestic investment as a percent of GDP);
- Human capital (secondary school enrollment);
- Macroeconomic stability (inflation); and
- Trade openness (the share of external trade in GDP).[17]

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[15] See, for example, Barro and Sala-i-Martin (1995).

[16] Caselli, Esquivel, and Lefort (1996) have argued that the initial GDP per capita is endogenous. However, excluding it from the regressions in the present analysis did not change the conclusions.

In addition, $\mathbf{X_i}$ includes:

- trading partners' real per capita GDP growth;
- the ratio of domestic real per capita GDP to trading partners' real per capita GDP, and, in an alternative specification, simply trading partners' real per capita GDP;
- interaction terms with openness, to test if more open economies benefit more from economic conditions in their trading partners.

Finally, in order to test if results are driven by global or regional trends rather than by trends only in trading partners, $\mathbf{X_i}$ also includes:

- world real per capita GDP growth;
- non-trading partners' real per capita GDP growth;
- distance-weighted real per capita GDP growth.

The distance-weighted growth variable is intended to capture the suggestion of the "gravity" model of trade that the amount of trade between two countries depends significantly on their distance from each other.

All data are from the *World Development Indicators* (World Bank, 2002), except if indicated otherwise. All countries with available data (101 countries) are included in the regressions. The time period is 1960–99. Each observation is a five-year average, except the initial GDP per capita, which takes the value of the first year of each five-year period. The use of a fixed rather than a random-effects model is justified by a Hausman test, which rejects the hypothesis that the individual effects are uncorrelated with the other repressors for most specifications. The trading partners were determined by estimating weights based on the Directions of Trade Statistics (DOTS, IMF, 2002), although all of the results are robust to the use of alternative fixed-period weights based on the early 1990s. The advantage of the DOTS weights is that they change annually to reflect evolving trade patterns.

C. Results

The first and second regressions in Table 3 show that, even after controlling for other growth determinants, higher growth in a country's trading partners by 1 percent is correlated with higher domestic growth by as much as 0.8 percent. It pays to trade with countries that grow fast. The third, fourth and fifth regressions show that this result is not driven by common global shocks, since the coefficient remains sizable (0.7) and significant even after

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[17] Although it has its share of drawbacks, the trade share is one of the most broadly used measures of openness in the literature and among the most robust (see Levine and Renelt, 1992). One of its strong advantages is that it varies over time.

controlling for world growth, for a time trend, and for growth in countries that are not trading partners. The last regression adds an interaction term of trading partners' growth with the trade share. The results imply that the positive impact on growth from faster growth in trading partners increases with openness, although the estimate of the interaction term is very small.[18] These results are robust if the regression excludes the fixed effects and instead takes the form of a pooled panel estimation. The results are also robust in a cross-section estimation that uses averages for the sample period.[19]

An interaction term of trading partners' growth with home GDP per capita turns out not to be statistically significant, suggesting that both rich and poor countries benefit from trading with fast-growing trading partners. An interaction term of trading partners' growth with the level of domestic GDP also turns out not to be statistically significant, which is surprising since it may be reasonable to expect economic conditions abroad to have a larger impact on small than on large countries.

Does the level of per capita GDP in a country's trading partners matter for its growth? The empirical evidence suggests that it does. The first regression in Table 4 controls for the average GDP per capita of trading partners, whose coefficient is positive but not statistically significant. However, the second regression controls for the ratio of a country's GDP per capita to the average GDP per capita of its trading partners, and finds the coefficient to be negative and statistically significant. In particular, a rise in trading partner GDP that lowers the ratio of domestic to foreign GDP by 10 percentage points is correlated with an increase in domestic growth of 0.13 percentage points. This suggests that what matters for a country's growth is not how rich its trading partners are but rather how rich they are relative to the country itself. One interpretation of the result is that a country's speed of conditional convergence depends positively on how advanced its trading partners are relative to itself. As a country closes the income gap with its trading partners, it grows more slowly; alternatively, trade with relatively richer countries is positively correlated with growth.

The last two regressions in Table 4 add interaction terms with the trade share. The interaction term with trading partners' growth has a positive and statistically significant estimate. The interaction term with relative GDP per capita is not statistically significant, which is surprising since more open countries may have been expected to benefit more from higher relative income among their trading partners.[20] An interaction term with GDP, rather than GDP per capita, was also not statistically significant.

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[18] Specifically, with every 10 percent increase in the trade share, the impact of a 1 percent increase in trading partners' growth on home growth increases by 0.1 percentage points.

[19] All of the robustness results referred to in the paper are available from the authors upon request.

[20] Small countries might be expected to be more open than large countries, and therefore to be affected more by their trading partners. In addition, since the interaction term of openness with

(continued…)

The results in Table 4 are consistent with the argument that trade fosters growth through spillover effects. The growth and R&D literature has shown that spillover effects are larger for developing countries that are open to trade, since they benefit from the large knowledge stock of their more developed trading partners.[21] Since the analysis in this paper uses export weights, the results suggest that countries that export to relatively more advanced countries grow faster, controlling for other growth determinants. This may be driven by specialization in technologically more advanced sectors when exporting to a more advanced country, which may also result in positive spillovers to other sectors in the economy. Furthermore, such sectors have a relatively high import content of relatively technologically advanced inputs, in particular in developing countries, which may also result in spillover effects.[22]

Interestingly, the estimates of the trade share are statistically significant only when the interaction terms are excluded from the regression. This would suggest that the impact of openness on growth depends entirely on how fast the trading partners of a country are growing. However, such a claim would warrant the qualifications that the trade share is only one measure of openness among several, and that, when the regression is estimated for more recent decades (discussed below), the trade share alone does become statistically significant.

A question that could be raised about the results is whether the significant impact of trading partners' growth on domestic growth simply reflects trends in the regional or global economy that affect all countries. In particular, since a key determinant of trade in empirical gravity-equation models is distance (controlling for all other trade determinants, countries trade more with others that are close by rather than far away) this raises the possibility that the results may capture regional growth trends that may or may not have to do with trade. If the results are indeed driven by regional trends that do not have to do with trade, then only countries that are near by should matter for a country's growth. After controlling for regional growth, the growth of trading partners should not matter. However, if the results are driven by trade, then growth in both regional and other trading partners should matter for growth.

However, the sign and significance of the coefficients of trading partners' growth and relative income are robust to the inclusion of common regional and global effects, which suggests that trading partners have an impact on growth that goes beyond these effects. Regional trends can be captured by the distance-weighted average growth rate of the rest of the world, with the inverse of the distance between the home country and each of the foreign countries as

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trading partners' growth is significant, it is surprising that the interaction term of openness with size is not significant.

[21] See Navaretti and Tarr (2000) for a review of the literature on growth and R&D.

[22] While the analysis relies on export weights, in practice export weights and import weights are often highly correlated because of factors such as regional trade agreements and geography.

weights (the closer the foreign country, the larger the weight).[23] The results from this test are presented in Table 5. Distance-weighted growth in the rest of the world has a positive and statistically significant coefficient of about 0.5 in all specifications. This says that a country's growth is positively correlated with growth in countries that are close to it. The coefficient of trading partners' growth is now smaller than before (equal to about 0.4, compared with 0.8 previously) but this should be expected: because countries trade more with countries in close proximity, part of the growth impact from trading partners is now captured by the distance-weighted growth rate. The relative income of trading partners remains statistically significant and its estimate does not change. In addition, world growth is not statistically significant when it is added, implying that, once regional and trading partner growth are taken into account, global economic trends do not matter for growth.[24]

D. Robustness Tests

Considering only the period 1980–99, shown in the first two regressions of Table 6, results in larger estimated coefficients for both trading partners' growth and relative GDP per capita, although only when the interaction terms are included. The impact of economic conditions in trading partners would indeed be expected to be larger as a result of greater global integration during the last two decades. The world trade share increased from an average of 26 percent in the 1960s to 42 percent in the 1990s, and this greater openness could be expected to have a positive influence on spillover effects from trading partners. In contrast with the full period estimation, the interaction term of the trade share with relative GDP per capita becomes statistically significant, while the interaction term with trading partners' growth is not significant. The trade share alone is significant, at the 10 percent level, when the interaction terms are included.

An alternative approach to test whether the impact of economic conditions in trading partners on growth differs according to the degree of openness of the economy is to separate the sample into "open" and "closed" economies, as done in the last two regressions of Table 5.[25] In

[23] The distance between two countries is measured by the distance between their capitals, as reported by the Centre D'Etudes Prospectives et D'Informations Internationales (CEPII). The results are very similar if regional growth trends are instead captured by the average growth rate in the continent to which each country belongs.

[24] In addition, the results are not driven by growth only in particular regions. For example, the results do not change if east Asia is excluded from the sample. (Details are available upon request from the authors.)

[25] Sachs and Warner (1995) define an economy as "open" if all of the following five conditions hold: *(1)* the average tariff rate is less than 40 percent, *(2)* the average non-tariff barriers are less than 40 percent, *(3)* the black-market premium is equivalent to less than 20 percent of the official exchange rate, *(4)* the government is not communist, and *(5)* there is no state monopoly on major exports. As noted in the literature review section, Rodriguez and Rodrik (1999) have criticized this approach. However, Warner (2002) has answered their criticism with evidence in support of this approach.

these regressions, economies that meet the Sachs-Warner definition of openness for at least two decades during 1960-99 are characterized as open (31 countries), and the rest are characterized as closed (70 countries). The estimate for trading partners' growth is positive and statistically significant for both groups of economies. It is 0.7 for open economies and 0.8 for closed economies, although the difference between the two estimates is not statistically significant. However, the estimated coefficient for relative GDP per capita is significant only for open economies.

V. CONCLUSIONS

This paper asks a somewhat different question from what is typical in the growth-openness literature. Specifically, the paper examines whether economic conditions in a country's trading partners matter for its growth. The estimates imply that the impact on a country's growth of changing its trading partners depends on how fast the new trading partners are growing and what their incomes are relative to the country's income. The results, based on a fixed-effects panel estimation using data for 101 countries during 1960–99, suggest that a country's growth is positively associated with both the growth rate and relative income of its trading partners.

A general implication of the results is that industrial countries benefit from trading with developing countries, which can be expected to grow rapidly because of convergence effects; and at the same time, developing countries benefit from trading with industrial countries, which have higher relative incomes. These results are not driven by common global trends, since they hold even after controlling for world growth and for growth in non-trading-partner countries, and are not driven by regional shocks, since they hold after controlling for a distance-weighted growth of the rest of the world. Moreover, the results seem to be stronger for open economies and for more recent decades.

Table 1. Most Important Trading Partners and Number of Countries for Which Each of Them is Among the 10 Most Important Trading Partners

1960s	Countries	1990s	Countries
United States	84	United States	90
United Kingdom	82	Germany	83
Germany	80	United Kingdom	79
Netherlands	78	Netherlands	73
France	65	France	68
Italy	65	Italy	65
Japan	50	Japan	57
Sweden	36	Spain	47
Australia	27	Belgium	39
Canada	27	Korea	24
Spain	22	China, Peoples' Rep. of	20
Argentina	21	Singapore	19
Denmark	21	Hong Kong SAR	18
Switzerland	20	Canada	16
Brazil	19	Portugal	16
Austria	18	Switzerland	15
India	14	India	13
Norway	13	Thailand	13
Benin	12	Malaysia	12
China, Peoples' Rep. of	12	Brazil	11

Source: Direction of Trade Statistics

Table 2. Ranking Economies by Their Trading Partners' Per Capita GDP Growth

1960s	1970s	1980s	1990s
The 10 Economies with the Fastest-Growing Trading Partners			
Malaysia	Guinea-Bissau	China, Peoples' Rep. of	China, Peoples' Rep. of
Guinea-Bissau	Malaysia	Malaysia	Singapore
Saudi Arabia	Indonesia	Indonesia	Malaysia
Philippines	Jordan	Singapore	Japan
Korea	Thailand	Hong Kong SAR	Thailand
Indonesia	Mauritania	Australia	Indonesia
Nicaragua	Syrian Arab Republic	Nepal	Korea
Australia	Saudi Arabia	Philippines	Australia
Mozambique	Singapore	Papua New Guinea	Pakistan
Syrian Arab Republic	Pakistan	Thailand	Jordan
The 10 Economies with the Slowest-Growing Trading Partners			
Grenada	Costa Rica	Bolivia	Burkina Faso
China, Peoples' Rep. of	Dominican Republic	South Africa	Burundi
Malawi	Samoa	Burkina Faso	South Africa
Mauritius	Kenya	Jordan	Niger
Ireland	Bolivia	Guatemala	Zimbabwe
Zimbabwe	Trinidad and Tobago	Mali	Malawi
Barbados	Chad	Paraguay	Austria
Sierra Leone	Malawi	Senegal	Mauritania
Burkina Faso	Ecuador	Cyprus	Syrian Arab Republic
Bolivia	Sierra Leone	Costa Rica	Poland

Source: Direction of Trade Statistics

Table 3. Growth and Trading Partners' Growth: Fixed-Effects Panel Regressions, 1960–99

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
ln (initial GDP per capita)	-1.66 (-4.52)	-3.70 (-7.18)	-3.66 (-7.13)	-3.75 (-7.15)	-3.66 (-6.58)	-3.68 (-7.33)
Population growth		-0.27 (-0.90)	-0.29 (-0.96)	-0.25 (-0.81)	-0.34 (-1.07)	-0.20 (-0.66)
Investment/GDP		0.16 (6.66)	0.17 (6.73)	0.16 (6.71)	0.16 (6.53)	0.16 (6.70)
Inflation rate		-0.001 (-2.14)	-0.001 (-2.24)	-0.001 (-2.17)	-0.001 (-2.16)	-0.001 (-2.17)
Secondary school enrollment		0.03 (2.49)	0.03 (2.62)	0.02 (1.66)	0.03 (2.27)	0.03 (2.40)
Trade/GDP		0.03 (2.78)	0.03 (2.78)	0.02 (2.52)	0.02 (2.65)	0.01 (0.85)
Growth of trading partner countries	0.60 (5.71)	0.82 (7.08)	0.73 (5.51)	0.84 (7.20)	0.69 (5.33)	0.38 (1.93)
World GDP per capita growth			0.19 (1.50)			
Time Dummy				0.06 (0.76)		
Growth of non-trading partner countries					0.17 (1.89)	
Interaction term: Growth of trading partners x Trade/GDP						0.01 (2.49)
Adjusted R-squared	0.31	0.46	0.46	0.46	0.46	0.47

Source: Dependent variable: real GDP per capita growth (1995 constant US$).
Heteroskedasticity-consistent t-statistics in parentheses.

Table 4. Growth and Trading Partners' Income: Fixed-Effects Panel Regressions, 1960–99

Independent Variables	(1)	(2)	(3)	(4)
ln (initial GDP per capita)	-3.82 (-7.25)	-3.33 (-6.31)	-3.34 (-6.48)	-3.34 (-6.29)
Population growth	-0.23 (-0.75)	-0.22 (-0.72)	-0.16 (-0.53)	-0.16 (-0.50)
Investment/GDP	0.16 (6.70)	0.16 (6.69)	0.16 (6.73)	0.16 (6.45)
Inflation rate	-0.001 (-2.07)	-0.001 (-2.05)	-0.001 (-2.08)	-0.001 (-2.08)
Secondary school enrollment	0.02 (1.61)	0.02 (1.91)	0.02 (1.87)	-0.02 (1.87)
Trade/GDP	0.02 (2.48)	0.02 (2.81)	0.01 (0.94)	0.01 (0.92)
Growth of trading partner countries	0.83 (7.27)	0.82 (7.04)	0.40 (2.04)	0.40 (2.05)
GDP per capita of trading partners	0.68 (1.36)			
Ratio of GDP per capita with trading partners' GDP per capita		-1.45 (-3.87)	-1.29 (-3.45)	-1.28 (-2.73)
Interaction term: Growth of trading partners x Trade/GDP			0.01 (2.34)	0.01 (2.34)
Interaction term: GDP per capita ratio x Trade/GDP				-0.00 (-0.02)
Adjusted R-squared	0.46	0.46	0.47	0.47

Source: Dependent variable: real GDP per capita growth (1995 constant US$).
Heteroskedasticity-consistent t-statistics in parentheses.

Table 5. Growth and Trading Partner Growth: Fixed-Effects Panel Regressions, Controlling for Regional Trends, 1960–99

Independent Variables	(1)	(2)	(3)
ln (initial GDP per capita)	-3.67 (-7.23)	-3.35 (-6.48)	-3.31 (-6.41)
Population growth	-0.22 (-0.72)	-0.18 (-0.58)	-0.19 (-0.63)
Investment/GDP	0.15 (5.97)	0.15 (6.00)	0.15 (6.04)
Inflation rate	-0.001 (-2.35)	-0.001 (-2.26)	-0.001 (-2.33)
Secondary school enrollment	0.03 (3.05)	0.03 (2.49)	0.03 (2.57)
Trade/GDP	0.03 (2.78)	0.03 (2.80)	0.03 (2.80)
Growth of trading partner countries	0.43 (2.71)	0.44 (2.77)	0.38 (2.30)
Ratio of GDP per capita with trading partners' GDP per capita		-1.24 (-3.12)	-1.26 (-3.18)
Distance-weighted GDP per capita growth in the rest of the world	0.57 (3.61)	0.55 (3.49)	0.54 (3.37)
World GDP per capita growth			0.14 (1.14)
Adjusted R-squared	0.47	0.48	0.48

Source: Dependent variable: real GDP per capita growth (1995 constant US$).
Heteroskedasticity-consistent t-statistics in parentheses.

Table 6. Growth and Trading Partners: Fixed-Effects Panel Regressions, Robustness Tests

Independent Variables	1980–99		1960–99	
	All economies		Open economies	Closed economies
ln (initial GDP per capita)	-4.92 (-5.78)	-5.16 (-6.10)	-3.75 (-6.25)	-3.31 (-4.05)
Population growth	-0.48 (-1.71)	-0.62 (-2.27)	-0.51 (-1.27)	-0.12 (-0.30)
Investment/GDP	0.15 (3.66)	0.16 (4.02)	0.22 (6.08)	0.14 (4.32)
Inflation rate	-0.001 (-2.39)	-0.001 (-2.47)	-0.01 (-2.09)	-0.001 (-1.56)
Secondary school enrollment	0.05 (4.13)	0.05 (4.01)	0.05 (4.86)	0.00 (0.02)
Trade/GDP	0.03 (2.68)	0.02 (1.59)	0.005 (0.59)	0.04 (3.02)
Growth of trading partner countries	0.69 (5.27)	0.64 (2.91)	0.72 (4.43)	0.80 (5.31)
Ratio of GDP per capita with trading partners' GDP per capita	-0.98 (-1.90)	-4.15 (-3.95)	-1.20 (-3.65)	-1.28 (-0.30)
Interaction term: Growth of trading partners x Trade/GDP		0.00 (0.24)		
Interaction term: GDP per capita ratio x Trade/GDP		0.04 (3.85)		
Number of economies	101	101	31	70
Adjusted R-squared	0.50	0.51	0.63	0.37

Source: Dependent variable: real GDP per capita growth (1995 constant US$).
Heteroskedasticity-consistent t-statistics in parentheses.

References

Agénor, Pierre-Richard, John McDermott, and Eswar Prasad, 1999, "Macroeconomic Fluctuations in Developing Countries: Some Stylized Facts," IMF Working Paper, WP/99/35.

Ahmed, Shaghil, and Prakash Loungani, 1999, "Business Cycles in Emerging Market Economies," *Monetaria*, Volume XXII, Number 4, October-December, Centro de Estudios Monetarios Latinoamericanos (CEMLA).

Arora, Vivek and Athanasios Vamvakidis, 2003, "The Impact of U.S. Economic Growth on the Rest of the World: How Much Does it Matter?" Journal of Economic Integration, forthcoming.

Baldwin, Robert E., 2003, "Openness and Growth: What's the Empirical Relationship?," NBER Working Paper 9578.

Barro, Robert, and Xavier Sala-i-Martin, 1995, "Economic Growth," New York: McGraw Hill.

Ben-David, Dan, 1993, "Equalizing Exchange: Trade Liberalization and Income Convergence," The Quarterly Journal of Economics 108, 653-679.

Bhagwati, Jagdish N., and T. N. Srinivasan, 1985, "Trade Policy and Development," in Dependence and Interdependence, Edited by Gene Grossman, Essays in Development Economics, Series 2, Cambridge, Mass.: MIT Press.

———, 2002, "Trade and Poverty in Poor Countries," American Economic Review 92, 180-83

Brunner, Allan D., 2003, "The Long-Run Effects of Trade on Income and Income Growth," IMF Working Paper, WP/03/37.

Caselli, Francesco, Gerardo Esquivel. and Fernando Lefort, 1996, "Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics," Journal of Economic Growth 1, 363-89.

Coe, David, and Elhanan Helpman, 1995, "International R&D spillovers," European Economic Review 39, 859-887.

———, and Alexander Hoffmaister, 1997, "North-South R&D Spillovers," The Economic Journal 107, 134-149.

Dollar, David, 1992, "Outward-Oriented Developing Economies Really do Grow More Rapidly: Evidence from 95 LDCs, 1976-1985," Economic Development and Cultural Change 40, 523-544.

Economist, 2002, "United We Fall," September 26.

Edwards, Sebastian, 1998, "Openness, Productivity and Growth: What Do we Really Know?" Economic Journal 108, 383-398.

Frankel, Jeffrey A., and David Romer, 1999, "Does Trade Cause Growth?" American Economic Review, 89, 379-399.

Greenaway, David, Wyn Morgan, and Peter Wright, 1998, "Trade Reform, Adjustment and Growth: What does the Evidence Tell us?" Economic Journal, 108, 1547-1561.

Harrison, Ann, 1996, "Openness and Growth: A Time-series, Cross-Country Analysis for Developing Countries," Journal of Development Economics, 48, 419–447.

Levine, Ross, and David Renelt, 1992, "A Sensitivity Analysis of Cross-Country Growth Regressions," American Economic Review, September, 82, 942–63.

Navaretti, Giorgio Barba, and David Tarr, "International Knowledge Flows and Economic Performance: A Review of the Evidence," World Bank Economic Review 14, 1-15.

Rodriguez, Francisco, and Dani Rodrik, 1999, "Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence," NBER Working Paper 7081.

Sachs, Jeffrey D., and Andrew Warner, 1995, "Economic Reform and the Process of Global Integration," Brooking Papers of Economic Activity, 1-95.

Spilimbergo, Antonio, 2000, "Growth and Trade: The North Can Lose," Journal of Economic Growth 5, 131-46.

Vamvakidis, Athanasios, 1998, "Regional Integration and Economic Growth," World Bank Economic Review 12 (2), 251-270.

———, 1999, "Regional Trade Agreements or Broad Liberalization: Which Path Leads to Faster Growth?," IMF Staff Papers, No. 46 (March), p. 42-68.

———, 2002, "How Robust is the Growth-Openness Connection? Historical Evidence," Journal of Economic Growth, 7:1, 57-80.

Warner, Andrew, 2002, "Once More into the Breach: Economic Growth and Global Integration," Harvard University, unpublished manuscript.

Williamson, Jeffrey and Michael Clemens, 2002, "Why did the Tariff-Growth Correlation Reverse After 1950?," NBER Working Paper 9181.