No. 98-10-A

OFFICE OF ECONOMICS WORKING PAPER

U.S. International Trade Commission

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Sheila Amin Gutiérrez de Piñeres
University of Texas at Dallas
and
Michael J. Ferrantino
Research Division
Office of Economics
U.S. International Trade Commission

October 28, 1998

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address correspondence to:
Office of Economics
U.S. International Trade Commission
Washington, DC 20436 USA

LATIN AMERICAN EXPORT SECTOR DYNAMICS AND ECONOMIC GROWTH IN INTERNATIONAL COMPARISON[1]

Sheila Amin Gutiérrez de Piñeres and Michael J. Ferrantino

INTRODUCTION

Is there any systematic relationship between export diversification and economic growth in Latin America? If diversification is good for growth, are there any particular policies which encourage it? It is widely believed that excessive specialization in individual primary products, such as coffee, tin, copper, fruit, and petroleum, has harmed Latin American economic growth. Countries dependent on a single primary export are exposed to greater price risk and (for non-extractive exports) agro-climatic risk than are countries with a diversified export portfolio, which may lead to an unstable supply of foreign exchange and constrain investment. Furthermore, if the worldwide distribution of technical advances fluctuates unpredictably from industry to industry over time, it may be that countries which can successfully produce (and export) a wider range of goods are better equipped to exploit a larger share of the expanding technology pool, and may also have more extensive forward and backward linkages to technologically progressive sectors. For all these reasons, some form of export diversification may potentially be helpful to growth. More controversial, but long taken seriously in Latin America, was the Prebisch/Singer hypothesis that the terms of trade turn secularly against primary product exports. All of these arguments may be advanced in support of the notion that export diversification may potentially be beneficial to economic growth. Nonetheless, systematic attempts to assess this hypothesis are difficult to identify. The present effort hopefully provides some modest excuse for submitting economists to yet another "mindless cross-country regression" in the neoclassical tradition.

In previous work (Amin Gutiérrez de Piñeres and Ferrantino, 1997a) we showed that since at

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[1] Forthcoming as Chapter 7 in Sheila Amin Gutiérrez de Piñeres and Michael J. Ferrantino, *Export Dynamics and Economic Growth in Latin America: A Comparative Perspective*, Ashgate Press.

least the early 1960's, there has been a long-run trend toward export diversification in Latin America which has persisted through both inward- and outward-looking policy experiments, and over a variety of macroeconomic conditions. This export diversification has typically consisted more in a diversification among primary-product exports than in an increase in manufacturing exports. A measure of medium-run structural change described below, which captures the rate at which “non-traditional” exports replace “traditional” exports, showed that for most countries, structural change in exports accelerated during the late 1970s, slowed down during the debt crisis years, and reaccelerated during the 1990s. These stylized facts suggest no particular association between economic growth and export diversification. Time-series analysis of individual country growth patterns on annual data yield insights but no broad generalizations. For Chile, decreases in export specialization and acceleration in export structural change are associated with slower export growth, and export specialization is also associated with higher GDP growth. (Amin Gutiérrez de Piñeres and Ferrantino, 1997b). For Colombia, by contrast, accelerated structural change in exports is associated with more rapid GDP growth, and there is no particular relationship between the level of export specialization and GDP growth (Amin Gutiérrez de Piñeres and Ferrantino, forthcoming a).

In this chapter, we examine the specialization/structural change/growth relationship using a larger sample of eighteen Latin American countries, and updating our measures of diversification and structural change through 1995. The empirical framework is of the standard type used for examining the properties of the neoclassical growth model, using an appropriate panel data estimator which allows for country-specific differences in labor productivity (Islam, 1995). However, we are mindful of the fact that estimation over a sample of Latin American countries alone implies a more restricted sample than is commonly used in the cross-country growth regression. To take account of this, we estimate a model without diversification/structural change effects, and test for differences between Latin America, sub-

Saharan Africa and developing Asia in rates of convergence and long-run determinants of productivity. This in effect permits the parameters of both the aggregate production function and the sub-function determining levels of labor productivity to be region-specific, a result for which there is some empirical support.[1]

We find that for Latin America as a whole over the last 35 years, episodes of export diversification have indeed been associated with more rapid economic growth. This effect is economically sizable but poorly determined statistically in OLS, but becomes larger and statistically significant using a fixed-effects estimator. These estimates imply that a relatively diversified exporter such as Argentina enjoys an advantage of 0.6 percent (OLS) to nearly 3 percent (fixed effects) per year in per capita income growth relative to a relatively specialized exporter such as Venezuela. A negative relationship between export structural change and economic growth is found in both samples, but does not pass statistical significance, nor, in our preferred specification, does it achieve economic importance. This result, combined with the results of our earlier time-series analysis, suggests that the mechanisms by which structural change in the pattern of exports accelerates or decelerates are likely to be country- and situation-specific and bear no regular relationship to the business cycle.

We also find evidence for significant differences between regional production functions. Intra-regional convergence of income is stronger in Latin America than in either sub-Saharan Africa or developing Asia. The productivity effects of investment are highest in Latin America and lowest in sub-Saharan Africa. The additional productivity boost derived from foreign direct investment is also higher in Latin America than in sub-Saharan Africa. The effects of open economic policies on economic growth, using the measure of Sachs and Warner (1995), are easier to detect in the sample including all three regions. Comparisons between developing Asia and the other two regions are sensitive to the inclusion or exclusion of country-specific productivity effects.

PATTERNS OF DIVERSIFICATION AND GROWTH IN LATIN AMERICA

As in earlier work, we define an index of export specialization for country i in time t as

$$SPECL_{i,t} = \sum_{j=1}^{N} (s_{j,t})^2$$

where j ∈ (1,N) indexes export sectors at the two-digit SITC level. The variable for export specialization operates essentially like a Herfindahl-Hirschmann index, taking values which approach 1 for a completely specialized exporter and which approach 0 otherwise.

Figure 7.1 graphs the export specialization index for the nineteen countries in our sample, taken as a simple average over 1962-1994. As can be seen, export diversification for the typical Latin American country has increased steadily over time, from about 0.42 in the early 1960s (corresponding to two or three equal-sized 2-digit SITC export industries, with nothing else) to about 0.2 in the mid-1990s (corresponding to about five equal-sized export industries).

While relatively little diversification took place from about 1975-1990, the trend toward diversification may have accelerated in the 1990s. Otherwise, diversification appears to persist over periods of import substitution and trade liberalization, of expansion and recession, of debt crisis and open capital markets.

Table 7.1 looks at export specialization and growth for the nineteen countries in our sample individually, showing average export specialization over 1961-65 and 1991-95; annualized per capita income growth over the 35-year period from 1960-95 and over the more recent 10-year period of 1985-95. While there is some coincidence between increasing diversification and strong or improving growth performance, there are exceptions to the rule as well. Chile, Colombia, Uruguay, Costa Rica, El Salvador, Paraguay and Bolivia have experienced significant diversification and relatively strong growth performance. Venezuela, Trinidad and Tobago, and Ecuador, all oil exporters, have remained relatively specialized and experienced weaker growth. Other slow-growth or negative-growth economies began relatively diversified in the early 1960s but did not diversify much further, or moved in the direction of specialization (Mexico, Peru, Nicaragua). Jamaica and Panama are examples of countries which have bucked the trend; Jamaica showing strong growth performance while specializing and Panama combining deteriorating growth with diversification. Jamaica and Panama are also unusual in their commodity pattern of exports, showing sharp swings in their patterns of specialization which are dissimilar to other countries in the region (Amin Gutiérrez de Piñeres and Ferrantino, forthcoming b).

We also generate a measure of export structural change over seven-year periods. That is, export structural change for 1975 is calculated using the seven years of data from 1972-78, and so on. This measure is generated in three steps. First, we calculate the cumulative export function for each export sector for each year in the seven-year period, e.g.

$$c_{it} = \frac{\sum_{i=t_0}^{t} e_{it}}{\sum_{i=t_0}^{t_1} e_{it}}$$

where t_o and t_1 represent the initial and terminal years of the seven-year period. Second, we calculate the mean of c_{it} for each export sector as that sector's "traditionality index"; sectors with a higher mean have more of their exports front-loaded in the time period and so are more "traditional" within that time frame, while sectors with a lower-mean have more of their exports back-loaded and so are less "traditional." Finally, we take the variance of the observed traditionality indices to be our measure of export structural change (Amin Gutiérrez de Piñeres and Ferrantino, 1997b).

Intuitively, we identify export structural change with periods in which some exports grow more rapidly than others over a given period, while slow structural change takes place in periods in which exports grow approximately at the same rate.[2] It should be noted that while some degree of export structural change is necessary for export diversification to take place, the two are not always identical; for example, there can be a good deal of medium-run churning in export structure without substantial diversification taking place.

Figure 7.2 illustrates the average performance of our measure of export structural change over time for the 19 countries in our sample, while Figure 7.3 shows per capita income growth for the Latin America/Caribbean region as a whole, drawn from World Bank data. Structural transformation in a typical country's exports exhibits three peaks; in 1965-67, 1977-78, and 1991-92. (Note that because of the necessity of observing several years of data on either side of the year in question, the series on structural change is truncated at both ends, and these include our peaks). Each of these periods showed relatively strong economic growth. The troughs in structural change occurred in 1970-75, at about the time of the first oil crisis, and 1985-88, during the period of retrenchment from the debt crisis. The debt crisis episode itself featured a marked deceleration of the rate of export structural change, from an average value of .0379 in 1978 to .0207 in 1988. At first glance, this pattern is suggestive of Schumpeterian structural change taking place during good times, while periods of external shock and internal adjustment require a retrenchment and refocus on the principal primary commodity.

In short, perusal of the raw data suggests an apparent lack of any relationship between export specialization/diversification and economic growth, while export structural change appears to be positively related to economic growth. As we shall see, neither one of these conclusions persists when other likely determinants of growth are controlled for.

EMPIRICAL SPECIFICATION

The theoretical foundations behind the empirical exploration of the causes of economic growth in cross-country regression are by now familiar; a widely accessible exposition is Barro and Sala-i-Martin, 1995, particularly chapters 5 and 12. A generalized expression for the rate of per capita income growth takes the form

$$Dy_t = F(y_{t-1}, h_{t-1} \mid A)$$

in which $Dy_t \equiv dy_t/y_t$ represents the growth rate of per capita income measured over a suitably long period, y_{t-1} is the initial level of per capita income, h_t is the initial level of human capital, and A is a vector of control variables. A negative relationship between initial per capita income and the growth rate of per capita income arises in the Solow-Swan model of neoclasssical growth when income is below its long-run equilibrium value; lower incomes imply low capital-labor ratios, which imply a higher marginal product of capital, and thus higher returns to a given rate of savings.

A more negative coefficient on y_t (higher in absolute value) implies a more rapid rate of convergence between low- and high-income countries which are identical in other attributes. When Dy_t is expressed in percentage points, and y_t in logarithms, the absolute value of the coefficient on y_t gives the estimated annual percentage decrease in the income gap between the two countries. A positive relationship between human capital and economic growth emerges from expanded models of growth which include physical and human capital; in these models, the growth rate is generally increasing in the ratio of human to physical capital, with the empirical implication that Dy_t should be increasing in h_t, controlling for y_t.

The various control variables in the vector A can be interpreted as influences on either the level of technology or the rate of technological change. A wide variety of variables have been proposed for A. In an early and influential test of robustness, Levine and Renelt (1992) find that the investment-GDP ratio, the level of human capital (as measured by secondary school enrollment) and the initial level of per capita income are robust determinants of economic growth. Since then, a large number of other potential influence on economic growth have been identified, using broader criteria for robustness (Sala-i-Martin (1997), USITC (1997)). Of these, we focus on two. Many studies have identified a measure of economic policy conducive to market activity, such as an index of the "rule of law," "institutional quality," "economic freedom," or "openness," to be positively correlated with economic growth. There appears to be substantial overlap among these concepts. We utilize the measure of openness to international economic activity developed by Sachs and Warner (1995), cumulated over intervals of time. Additionally, there is some evidence that the share of foreign direct investment (FDI) in GDP is positively associated with economic growth (Balasubramanyan et al. (1996)), suggesting that a dollar of FDI is on the margin more beneficial than a dollar of domestically financed investment. This finding is consistent with the idea that FDI generally comes bundled with imported technology which is superior to domestic technology, thus providing the rationale for foreign investment in the first place. We include a measure of net FDI/GDP in our sample.[3]

This gives us our primary empirical specification as

$$Dy_{i,t} = \alpha + \beta_0 \ln(y_{i,t-1}) + \beta_1 h_{i,t} + \beta_2 I/Y_{i,t} + \beta_3 FDI/Y_{i,t} + \beta_4 OPEN_{i,t} + \epsilon_{i,t}$$

in which i indexes countries, t indexes time, and α and the β's are coefficients to be estimated. The marginal effect of either export specialization (SPECL) or export structural change is then examined by adding one or the other of these variables in a linear fashion to the above specification.

Our data consist of observations on countries over five-year intervals, beginning in 1961-65 and ending in 1991-95. Observations for most of the variables are averaged over these 5-year intervals. The initial level of income, $\ln(y_{i,t-1})$, for, e.g. 1991-95 is measured in 1990, and the corresponding $Dy_{i,t}$ is the annualized 5-year growth rate calculated using 1990 and 1995 as reference points.[4] We use secondary school enrollment, as per World Bank data, and with some interpolation, as our measure of human capital. Dy, h, I/Y and FDI/Y are expressed in percentage terms for convenience. OPEN is the sum of the Sachs-Warner variable over 5-year intervals, so that a value of 0 indicates that the country pursued closed policies throughout the interval while a value of 5 indicates that the country was consistently open. Since episodes of opening and closing take place mid-interval, OPEN exhibits sufficient variation to be usable in a fixed-effects specification.

The use of panel data for estimation of the canonical growth equation has been explored by Islam (1995). The case for using panel data consists primarily in the fact that the simplest neoclassical specification assumes constant labor productivity across countries, with per capita income varying only due to differences in the capital/labor ratio, whereas in reality levels of productivity vary widely across countries. These variations in productivity can be captured by permitting α to vary across countries. The most common techniques for doing this are the fixed-effects, or least-squares dummy variables, estimator, and the random-effects estimator. Expressing $Dy_{i,t}$ as $\ln(y_{i,t}) - \ln(y_{i,t-1})$, and rearranging terms, the above regression can be rewritten as a regression of $\ln(y_{i,t})$ on $\ln(y_{i,t-1})$ and other variables, and the fixed-effects estimator unfortunately is inconsistent asymptotically as $N \rightarrow \infty$ (but fortunately consistent as $T \rightarrow \infty$). The random-effects estimator suffers the more serious drawback that the country productivity effects must be assumed uncorrelated with the other variables in the model, and this appears highly unlikely. Thus, we proceed on the basis of the fixed-effects estimator.[5]

In order to investigate the possibility that our results on Latin American export specialization and structural changed may be influenced by anomalies in the other parameters of a growth equation estimated solely on Latin American data, we also took subsamples of data for sub-Saharan Africa and developing Asia, for which we had measures of all the variables of interest except export specialization and export structural change. Each of these samples was selected on countries classified by the World

Bank as "developing" in both the initial and terminal year; the practical effect of this is that the developing Asia example excludes Hong Kong, likely an outlier in any event. The characteristics of these three subsamples, and of the pooled sample, are described in Table 7.2. There are only about half as many observations for developing Asia as for the other two regions. Measured at the mean, the developing Asia subsample exhibits the highest rate of per capita GDP growth, of investment/GDP, of secondary school enrollment/GDP, and of openness. The sub-Saharan Africa sample shows the slowest growth, and lowest levels of secondary school enrollment, openness, and initial per capita income. The ratio of FDI to GDP is similar in all three samples, and the aggregate rate of investment is only moderately higher in aggregate in developing Asia than in Latin America, where it is the lowest. Of the three subsamples, the Latin American subsample is most nearly similar to the pooled total sample, except for higher initial levels of per capita income, and would be expected to show features similar to a standard cross-country analysis of developing countries

RESULTS

The results of initial OLS estimation on the full sample and on the three subsamples, using the common set of variables, are reported in Table 7.3, with the corresponding fixed-effects estimates in Table 7.4. Estimates are presented both with and without secondary school enrollment; omission of secondary school enrollment increases somewhat the available degrees of freedom due to missing observations on the variable. The coefficients on secondary school enrollment are in the main insignificant or perversely negative, both in OLS and in the fixed-effects specifications. This result, though seemingly unusual, replicates that in Islam (1995, Table V), with different subsamples, and using the human capital measure of Barro and Lee (1993). Similar results on the growth effects of human capital over multiple time periods are found by De Gregorio (1992). While human capital is usually a positive determinant of growth in a single cross section, in which the dependent variable is an annualized growth rate over 25 - 40 years, it ceases to appear as so in a panel sample, where each country is observed over several time periods, whether or not the panel aspect of the data is specifically treated econometrically. An intuition behind this result is that while education indeed does matter, observed levels of school enrollment or other measures of human capital have tended gradually upwards over time in most countries. Thus, a finding of a positive coefficient of human capital on per capita income growth in a panel sample would imply that per capita income growth tends to accelerate over time, which it does not.

Otherwise, the standard results are fairly robust across regions in terms of sign, though the magnitudes of the coefficients varies across regions. Employing an appropriate panel estimator increases the estimated rate of convergence in the pooled sample and in all regions except developing Asia, and increases the estimated growth effects of investment in the pooled sample and in all regions except sub-Saharan Africa, while the estimated effects of FDI are lower under fixed effects. Given that a dollar's worth of FDI increases both FDI/GDP and investment/GDP, the significant positive sign for FDI in the fixed-effects estimates for the pooled sample, Latin America, and developing Asia reinforces the idea that the growth effects of a dollar of FDI exceed those of a dollar of domestically financed investment. The coefficient for openness is modestly lower in the pooled sample estimated under fixed effects than in the same sample estimated under OLS, and varies markedly across regions, presumably because of differences in the distribution of the openness variable. The effects of openness are easiest to detect within sub-Saharan Africa, where relatively few countries are open, and in the pooled sample including sub-Saharan Africa.

Table 7.5 summarizes the differences in estimates across regions, comparing the coefficients using a standard difference-of-means test for samples with unequal variances (Hogg and Tanis (1977), p. 252), and using the specifications excluding secondary-school enrollment. The effect of investment on economic growth is highest in the Latin America subsample, middling in the developing Asia subsample, and lowest in the sub-Saharan Africa subsample, implying a similar ranking of the marginal product of capital in the three regions. The growth effect of FDI is unambiguously higher in Latin America than in sub-Saharan Africa. In the OLS specification the returns to FDI are overall highest in Latin America, while introduction of country-specific fixed effects yields the largest FDI returns in developing Asia. The rate of convergence is unambiguously highest (i.e. the sign of the coefficient on initial per capita income is unambiguously lowest) in Latin America, again suggesting that the regional marginal product of capital is higher in Latin America than in the other two regions. Convergence appears slowest in sub-Saharan Africa under the OLS estimates, while under fixed effects Asian convergence appears slowest. Here the fixed-effects result, preferable on econometric grounds, is also consistent with the idea that high rates of savings and investment in Asia would have led to lower returns on the margin, though the coefficient on the investment/GDP ratio does not provide the same result.

On openness, while the OLS results indicate significant differences across regions in the effects of openness on growth, the fixed-effects estimates fail to reject the null hypothesis that the coefficient in the three subsamples is equal.

From this exercise we can conclude that although the parameters of the aggregate production function probably do differ across regions, particularly the parameters of variables shifting the A(.) function for labor productivity, the determinants of growth in Latin America are sufficiently typical that examination of the growth effects of export specialization and export structural change in a sample restricted to Latin America may not be unduly influenced by peculiarities of the Latin American growth process in general. Table 7.6, then, adds to the specification the variables for export specialization and export structural change, one at a time. In the preferred fixed-effects specification, export specialization is significantly negatively correlated with per capita income growth (i.e. export *diversification* is positively correlated with growth, after controlling for other likely determinants of economic growth. The cautions voice by McCloskey (1985, chapter 9) on the uses of statistical significance in economic rhetoric are of particular relevance here. (In fact, they have been relevant throughout the discussion, but it is particularly handy to introduce these here, at the climax of our argument). First, we are dealing with a sample of 19 countries that represent well over 90 percent of Latin American economic activity; there is no "universe" of thousands of hypothetical Latin American countries which is sampled here. Thus, the estimates obtained by the regression model really do characterize economic activity in Latin America over 1960-95 regardless of whether any individual coefficient is "significant" in the sense of the Neymann-Pearson classical sampling paradigm, which is the sense in which t-statistics and their p-values are to be taken, if taken literally. What is of primary interest is whether the coefficients are economically "important" in the sense that interesting-sized movements in the independent variables produce movements of equally practical interest in the dependent variable.

The estimated coefficient on export specialization is in this sense both statistically significant and economically important. The fixed-effects estimate, of -3.96, implies that the difference in annual per capita income growth between a highly diversified exporter (e.g. Argentina in the early 1990s, as per Table 7.1) and a highly specialized exporter (e.g. Venezuela, in the same period) is on the order of $(3.96)(0.725-0.021) \approx 2.8$ percent per year, a very substantial amount.

Even the smaller and not conventionally significant estimate from OLS implies a difference in growth rates of $(0.911)(0.725-0.021) \approx 0.65$ percent per year, still a fairly striking amount.

The negative sign for our export structural change variable suggests that structural change is, *ceteris paribus*, associated with weaker economic growth; however, in neither the OLS nor the fixed-effects estimates does the result achieve standard levels of statistical significance. Recall that in earlier work on annual time series data, referenced above, we obtained a similar result for Chile but obtained the reverse result for Colombia, and that in eyeballing the long-run relationship between export structural change and growth, structural change appeared to be positively, if weakly, associated with stronger economic growth. The regression results might be given some weight in resolving this ambiguity, even failing the standard As a measure of economic importance, one can use the difference between the peak country average structural change value of 0.0379 centered on 1978 and the low country average value of 0.0207 centered on 1988 to exemplify the difference between periods of rapid and slow export structural change. Using the OLS estimates, a period of more rapid structural change is associated with a slowdown of (18.3)(0.0379-0.0207) ≈ 0.3 percent per annum in per capita economic growth, not trivial, but not big enough to associate with recession or deep crisis in general. Using the presumably preferable estimates from the fixed effects procedure, one finds the difference between rapid and low structural change associated with a reduction of (0.251)(0.0379-0.0286) ≈ 0.004 percent per annum, which is negligible. This result leads us to fall back on the insight arising from comparing the country studies, namely that an acceleration of export structural change can be associated in practice with either economic expansion or contraction, with the mechanisms underlying periods of structural change being country-specific. A strengthened emphasis on the traditional primary product can be associated either with health or stagnation, and a search for new products with either Schumpeterian crisis or Schumpeterian renewal.[6]

CONCLUSION

The primary points arising from the foregoing analysis, and immediate inferences from these points, are as follows:

- There has been a long-run trend toward export diversification in Latin America since the early 1960s; while this trend has accelerated and decelerated, it has never reversed for any substantial period of time. Using a standard empirical framework for analyzing economic growth with panel data, we find that Latin American countries with relatively diversified exports grow faster than those with relatively specialized exports. The potential effect of export diversification on economic growth appears large enough to account for a good portion of differences in cross-country growth performance in the region.

- The average rate of structural change in export composition in Latin America has undergone long swings, on the order of 20-25 years from peak to trough, with significant differences among countries. There is no readily achievable generalization about the relationship between export structural change and economic growth.

- The underlying determinants of economic growth in Latin America are broadly similar to those for developing countries as a whole; thus, the positive association we find between export diversification and economic growth in Latin America is unlikely to be induced by regional peculiarities. It would be useful to discover whether this association is replicated for other regions, for a broader sample of developed countries, or for developing countries.

- In comparisons of growth empirics across regions, we find that within the broad similarity between the determinants of growth in Latin America, sub-Saharan Africa, and developing Asia, Latin America experiences relatively large growth effects from increases in investment in general and in direct investment in particular. Furthermore, the rate of convergence between poorer and richer countries is more rapid in Latin America than in other developing regions. These results taken together suggest that the marginal return on investment has been relatively high in Latin America compared to other developing regions, and that the region should over the long run experience a continued ability both to attract foreign capital and to retain domestic savings.

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Figure 7.1

Specialization Index: Simple Average

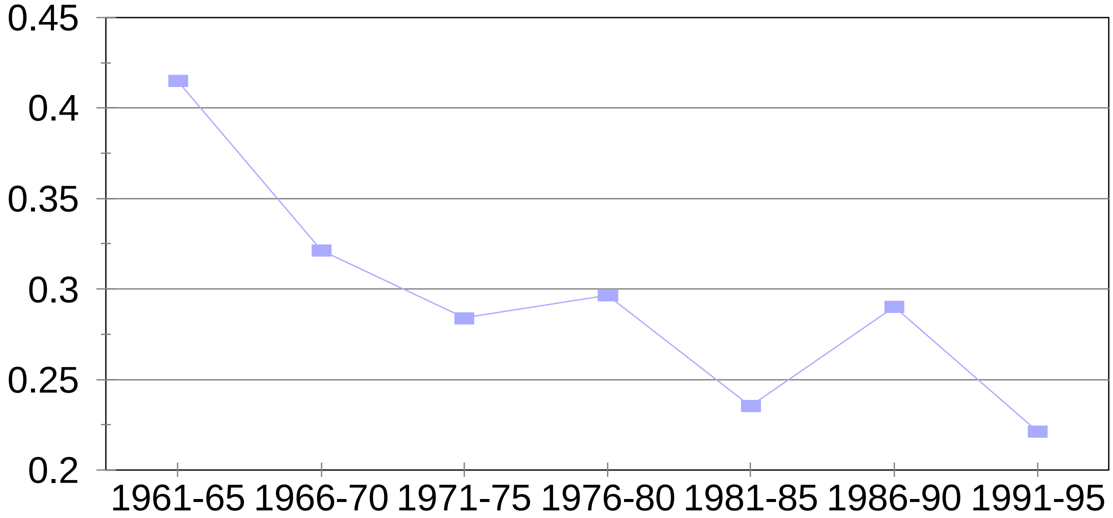

Figure 7.2

Export Structural Change

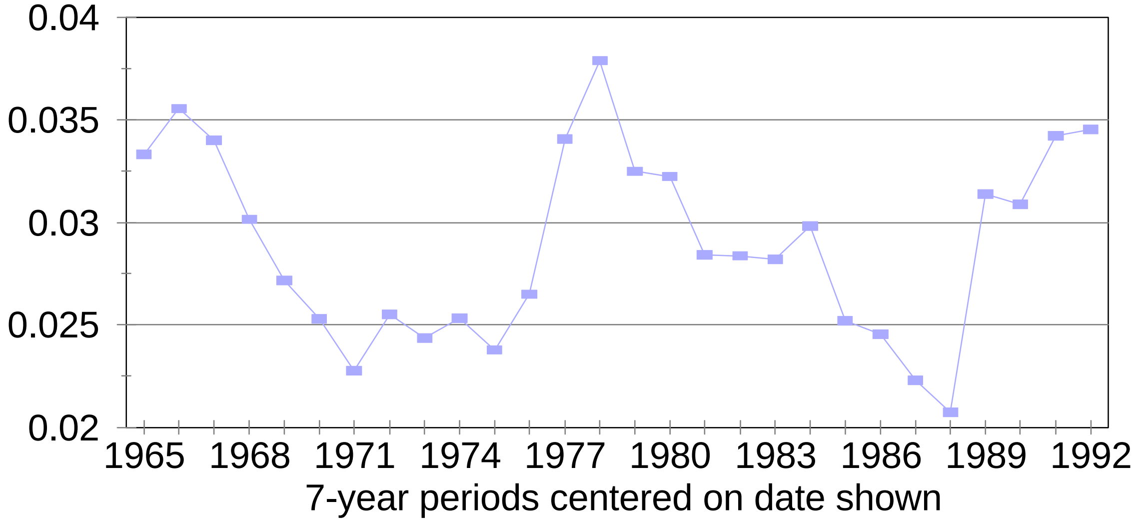

Figure 7.3

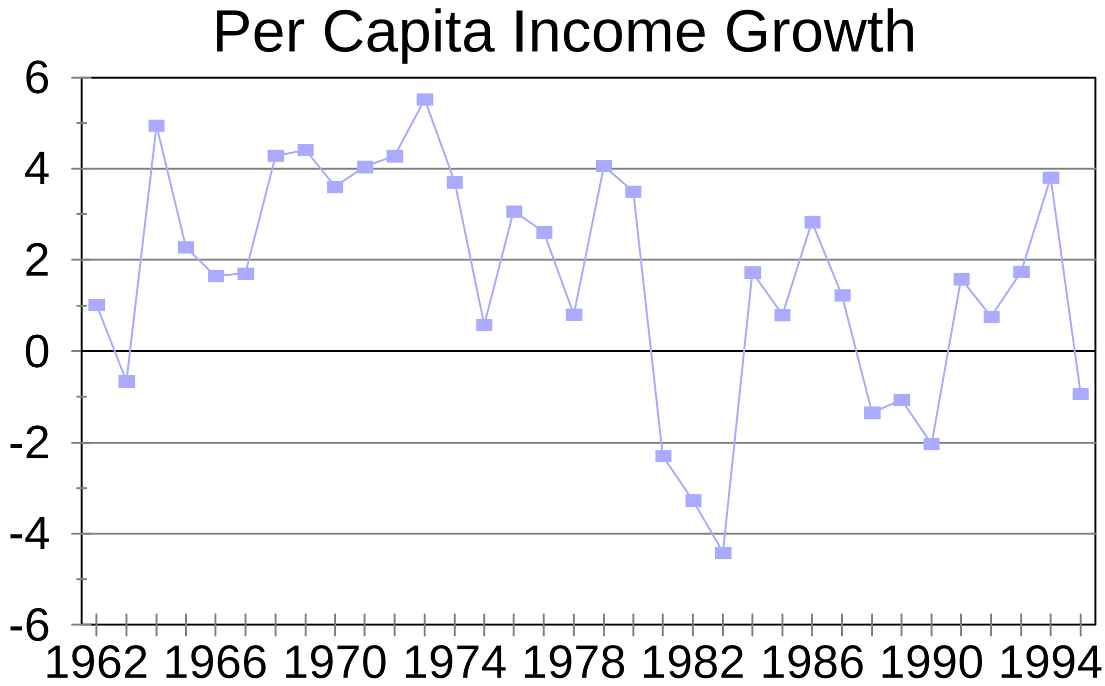
Per Capita Income Growth
6
4
2
0
-2
-4
-6
1962 1966 1970 1974 1978 1982 1986 1990 1994

Table 7.1
Export Diversification and Growth

Country	Export specialization index	Export specialization index	Annual per capita income growth	Annual per capita income growth
	1961-65	1991-95	1960-95	1985-95
Chile	0.568	0.152	0.84	4.26
Jamaica	0.221	0.291	0.87	2.78
Colombia	0.427	0.151	1.76	2.00
Uruguay	0.259	0.080	0.24	1.98
Costa Rica	0.361	0.145	1.48	1.72
El Salvador	0.490	0.236	0.64	1.19
Paraguay	0.165	0.379	1.84	1.16
Bolivia	0.593	0.190	0.45	1.12
Guatemala	0.381	0.170	0.91	0.65
Argentina	0.148	0.021	0.30	0.19
Brazil	0.401	0.058	2.22	0.05
Ecuador*	0.456	0.349	2.08	0.03
Honduras	0.359	0.279	0.81	-0.06
Panama	0.721	0.034	2.25	-0.45
Mexico	0.081	0.181	1.96	-0.51
Venezuela	0.959	0.725	-0.37	-0.72
Trinidad and Tobago	0.913	0.401	0.52	-1.19
Peru	0.158	0.139	-0.61	-2.19
Nicaragua	0.225	0.165	-1.34	-3.11

Source for columns 1 and 2: Authors' calculations. For columns 3 and 4: World Bank
*Growth reported in column 3 is for 1965-96.

Table 7.2
Means of Variables by Subsample

	Full Sample	Latin America	Sub-Saharan Africa	Developing Asia
Per capita GDP growth	1.23	0.90	0.55	3.16
Gross fixed investment/GDP	20.6	19.3	20.7	23.0
Foreign direct investment/GDP	1.24	1.28	1.22	1.21
Secondary school enrollment	32.3	39.8	15.4	45.6
log(initial per capita income)	6.62	7.23	6.12	6.38
Openness (Sachs-Warner)	1.40	1.53	0.87	2.17
Export specialization		0.316		
Export structural change		0.0312		
N	290	115	115	60
N (for secondary school enrollment)	259	110	93	56

Table 7.3
Growth Equation Estimates - Ordinary Least Squares

	Full Sample	Full Sample	Latin America	Latin America	Sub-Saharan Africa	Sub-Saharan Africa	Developing Asia	Developing Asia
Intercept	2.71 (2.18)**	1.93 (1.67)*	9.34 (2.39)**	10.6 (3.40)**	2.63 (1.23)	0.624 (0.32)	5.28 (1.93)*	4.80 (1.92)*
Gross fixed investment/GDP	0.133 (5.88)***	0.118 (6.19)***	0.190 (3.28)***	0.184 (3.40)***	0.125 (4.29)***	0.0973 (4.21)***	0.169 (2.80)***	0.170 (3.06)***
Foreign direct investment/GDP	0.261 (3.97)***	0.250 (3.87)***	0.394 (2.72)***	0.406 (3.03)***	0.243 (3.20)***	0.276 (3.69)***	0.108 (0.45)	0.0526 (0.002)
Secondary school enrollment	0.938 (1.18)		-1.15 (0.69)		-3.91 (2.09)**		0.716 (0.42)	
log(initial per capita income)	-0.788 (4.00)***	-0.583 (3.37)***	-1.70 (2.74)***	-1.92 (4.14)***	-0.760 (2.12)**	-0.425 (1.30)	-1.07 (2.24)**	-0.957 (2.29)**
Openness (Sachs-Warner)	0.330 (4.50)***	0.302 (4.38)***	0.121 (1.06)	0.0669 (0.66)	0.400 (2.68)***	0.208 (1.56)	0.226 (1.46)	0.256 (1.75)*
N	259	290	110	115	93	115	56	60
R^2	0.290	0.247	0.256	0.243	0.368	0.274	0.296	0.291
Mean of dependent variable	1.28	1.23	0.89	0.90	0.56	0.56	3.23	3.16

T- statistics in parentheses. *** - significant at .01 ** - significant at .05 * - significant at .10

Dependent variable is growth rate of per capita income. All data are averaged over five-year periods, beginning in 1961-65 and ending in 1991-95.

Table 7.4

Growth Equation Estimates -Fixed Effects

	Full Sample	Full Sample	Latin America	Latin America	Sub-Saharan Africa	Sub-Saharan Africa	Developing Asia	Developing Asia
Gross fixed investment/GDP	0.192 (6.56)***	0.161 (6.81)***	0.256 (4.45)***	0.246 (4.53)***	0.175 (4.23)***	0.141 (4.79)***	0.276 (0.37)	0.273 (0.38)
Foreign direct investment/GDP	0.121 (1.76)*	0133 (1.98)**	0.280 (1.71)*	0.335 (2.20)**	0.00765 (0.09)	-.0124 (0.15)	0.710 (2.44)**	0.659 (2.30)**
Secondary school enrollment	-3.29 (2.15)**		-1.68 (0.72)		-3.06 (1.08)		-0.456 (0.13)	
log(initial per capita income)	-3.21 (5.10)***	-4.00 (7.63)***	-6.17 (5.11)***	-6.58 (7.03)***	-4.16 (3.72)***	-5.32 (5.49)***	-0.792 (0.68)	-0.873 (0.95)
Openness (Sachs-Warner)	0.275 (3.32)***	0.203 (2.64)**	0.184 (1.77)*	0.153 (1.61)	0.316 (1.68)*	0.159 (1.06)	0.140 (0.60)	0.148 (0.70)
N	259	290	110	115	93	115	56	60
R^2	0.267	0.258	0.448	0.440	0.257	0.294	0.148	0.128
Mean of dependent variable	1.28	1.23	0.89	0.90	0.56	0.56	3.23	3.16

T- statistics in parentheses. *** - significant at .01 ** - significant at .05 * - significant at .10

Dependent variable is growth rate of per capita income. All data are averaged over five-year periods, beginning in 1961-65 and ending in 1991-95.

Table 7.5
Difference-of-Means Tests Across Regions
(specifications without secondary school enrollment, export specialization, or export structural change)

	Latin America vs. Sub-Saharan Africa		Latin America vs. Developing Asia		Sub-Saharan Africa vs. Developing Asia	
	OLS	Country fixed eff.	OLS	Country fixed eff.	OLS	Country fixed eff.
Investment						
Test statistic	15.77437	17.59383	1.559645	20.641	-9.65517	-3.669167
p-value	1	1	0.940578	1	0	0.0001
Foreign dir. investment						
Test statistic	9.041031	20.82192	13.0559	-8.14213	9.417407	-0.434697
p-value	1	1	1	1.94e-16	1	0.3318912
Convergence						
Test statistic	-28.0998	-1.24617	-13.8034	-38.4482	8.518408	-4.31409
p-value	0	0.106351	0	0	1	0
Openness						
Test statistic	-8.98151	-0.3566	-8.87917	0.166079	-2.09037	0.3544571
p-value	1.36e-19	0.360697	3.25e-19	0.565953	0.01829	0.6385018

Table 7.6
Latin America - Results With Export Specialization and Export Structural Change

	OLS	OLS	Fixed effects	Fixed effects
Intercept	10.2 (3.25)***	11.9 (3.63)***	NA	NA
Gross fixed investment/GDP	0.184 (3.39)***	0.186 (3.45)***	0.266 (4.90)***	0.246 (4.50)***
Foreign direct investment/GDP	0.432 (3.15)***	0.378 (2.79)***	0.339 (2.26)**	0.334 (2.13)**
log(initial per capita income)	-1.83 (3.86)***	-2.02 (4.31)***	-7.44 (7.38)***	-6.58 (6.97)***
Openness (Sachs-Warner)	0.0584 (0.57)	0.834 (0.82)	0.108 (1.12)	0.153 (1.59)
Export specialization	-0.911 (0.87)		-3.96 (2.11)**	
Export structural change		-18.3 (1.26)		-0.251 (0.18)
N	115	115	115	115
R^2	0.249	0.254	0.462	0.440
Mean of dependent variable	0.90	0.90	0.90	0.90

T- statistics in parentheses. *** - significant at .01 ** - significant at .05 * - significant at .10

Dependent variable is growth rate of per capita income. All data are averaged over five-year periods, beginning in 1961-65 and ending in 1991-95.

1. For example, Chua (1993) found that inclusion of a distance-based spillover effect for investment in the neoclassical growth equation accounted for some 14-18 percent of country-specific economic growth and helped explain away much of the effect of dummy variables for Latin America and Africa.

2.Our measure accommodates periods of export contraction as well as expansion. If all sectors experience similar proportionate patterns of contraction and expansion year-by-year, measured structural change will be low.

3.Since our sample consists of countries which were still classified as developing as of 1995, net and gross foreign domestic investment are approximately equal in most cases. A sample including developed countries, or economies such as Hong Kong and Singapore, would more appropriately utilize a variable for gross (inbound) FDI.

4.We use contemporaneous human capital, rather than lagged human capital, due to the lack of data from the late 1950s. Because of the behavior of the human capital variable, this makes relatively little difference for the results. For export structural change, we use the value centered on the 5-year period, e.g. the 1983 value, which utilizes export data from 1980-86, is used to characterize the 1981-85 interval. Because of truncation at both ends of the data, we matched the 1965 value (using 1962-68 data) to the obeservation for 1961-65, and the 1992 value (using 1989-95 data) for the 1991-95 observation. Re-estimating our equations omitting the initial and/or terminal periods yielded results qualitatively similar to those presented here; thus, we report estimates using the full sample.

5.Islam (1995), in a Monte Carlo study based on his growth regression data, found that a fixed-effects estimator, while performing "very well," was surpassed by Chamberlin's Minimum Distance estimator, but that actual estimation results using the two were very similar.

6.However, see the recent results of Kose (1998), who finds, using variance decomposition methods, that price shocks of primary commodities relative to prices of capital goods and intermediate inputs explain about 75 percent of business cycle variation in small open economies. If, as is plausible, accelerated structural change in exports is associated with periods of relative price instability between various tradable goods, then a deeper analysis may potentially identify an underlying mechanism linking export structural change with fluctuations in economic growth.