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Openness and Growth

A Time Series, Cross-Country Analysis for Developing Countries

Ann Harrison

Correlations across openness measures are sometimes weak, but openness does seem to be positively associated with GDP growth — the more open the economy, the higher the growth.

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Harrison draws together a variety of measures of openness to test the association between growth and openness.

Although the correlation across measures is sometimes weak, there is generally a positive association between all these measures and GDP growth. The strength of the association generally depends on whether analysts use cross-section or panel data.

For industrializing countries, trade policies have varied too much over time to make the long-run averages used in cross-section estimates very meaningful.

In many respects, the results are surprisingly robust. When openness *is* statistically significant in the many specifications Harrison explores, she always finds that *greater* openness is associated with higher growth. Tests of the sensitivity of these results to country size do not change the results.

Harrison highlights two issues interesting for future research:

Does openness cause growth? Or is it the other way around?

And is it possible to disentangle short-run from long-run effects without throwing away annual data?

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Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries

by
Ann Harrison*

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* I would like to thank members of the *World Development Report 1991*, Lant Pritchett, and Bill Easterly for many useful discussions.

The new interest in the determinants of economic development has reignited the debate on openness and growth. In neoclassical growth models developed by Solow (1956) and others, technological change is exogenous--unaffected by a country's openness to world trade. Yet the "new" growth theories suggest that trade policy affects long run growth through its impact on technological change. [1] In these models, openness to trade provides access to imported inputs, which embody new technology; increases the effective size of the market facing producers, which raises the returns to innovation; and affects a country's specialization in research-intensive production.

New growth theories, however, do not predict that trade will unambiguously raise economic growth. Increased competition (as Schumpeter argued) could discourage innovation by lowering expected profits. Grossman and Helpman (forthcoming) point out that intervention in trade could raise long run growth if protection encourages investment in research-intensive sectors for countries with an international advantage in these kinds of goods. Since the theoretical literature does not provide a clear answer, empirical efforts are needed to resolve the debate on the relationship between openness and growth.

Despite the already voluminous empirical efforts in this area (see Table 1), it is easy to be skeptical of past results for a number of reasons. First, different studies have used a

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[1] See, for example, Grossman and Helpman (forthcoming) or Romer (1991).

dizzying array of "openness" measures, methodologies, and sample countries, leading to results which may differ for any number of reasons. Most research has examined the relationship between economic growth and trade volumes, not policies--this is partly because measuring "policy" poses difficult questions. Second, it is sometimes difficult to know how to interpret the observed correlation between trade policies and growth (see Levine and Renelt (1990)). Policies that are not directly concerned with trade (macroeconomic policy) may have caused both superior export performance and high GDP growth.

Third, most of the literature (including the more recent efforts by Barro (1991) and others) uses cross-sectional averages or starting values for time-series data. Barro (1991), for example, examines the impact of price distortions in 1960 on post-1960 GDP growth. Applying such an approach to developing countries has two shortcomings. First, the use of cross-section data makes it impossible to control for unobserved country-specific differences, possibly biasing the results. Second, long run averages or initial values for trade policy variables--particularly in developing countries--ignore the important changes which have occurred over time for the same country.

One exception to this approach is Bhalla and Lau (1991), which uses a panel of time series data for sixty countries to find a strong positive association between openness (proxied by the relative price of traded goods) and growth. Bhalla and Lau, however, do not control for country-specific effects, nor do they

examine the association between openness and growth using other measures.

This paper synthesizes previous approaches by comparing the association between many popular proxies for openness and the rate of GDP growth. We also compare the results from cross-section and panel estimation, controlling for country effects. The results suggest that using period averages versus annual data critically affects the strength of the association between openness and growth.

Section I reviews the empirical literature on openness and technological change. Section II discusses the dataset for this paper and the empirical specification, while Section III presents the main results. We test for the sensitivity of the results to the inclusion of both macroeconomic variables and country size in Section IV. Section V concludes and presents an agenda for future research.

I. An overview of the literature on openness and economic growth

The concept of openness, applied to trade policy, should be synonymous with the idea of neutrality. Neutrality means that incentives are neutral between saving a unit of foreign exchange through import substitution and earning a unit of foreign exchange through exports. Clearly, a highly export oriented economy may not be neutral in this sense, particularly if it shifts incentives in favor of export production through

instruments such as export subsidies. It is also possible for a regime to be neutral on average, and yet intervene in specific sectors. A good measure of trade policy would capture differences between neutral, inward oriented, and export-promoting regimes.

Price comparisons between goods sold in domestic and international markets could provide an ideal measure of the impact of trade policy, particularly in the absense of domestic policy distortions. Direct price comparisons would incorporate the impact of the various policies that affect domestic prices: tariffs, quotas, different exchange rates for imports and exports, and subsidies. Since information on relative prices is often not available, however, many other proxies are often used instead.

The simplest measures of trade orientation are based on actual trade flows, such as imports plus exports as a share of GDP or the growth rates of imports and exports. Most of these measures (see Section I in Table 1) show a positive association with GDP growth, even after controlling for other factors such as capital or labor. One problem with this approach, however, is that trade flows are at best an imperfect proxy for trade policy. Other factors, such as country size or foreign capital inflows, also affect trade: for example, large countries tend to have smaller trade shares. One improvement over this approach is to use the deviation of actual from predicted trade flows (as in Syrquin and Chenery (1989)), based on variables such as country size. Using this adjusted measure, Syrquin and Chenery (1989) do

find a positive association between openness and productivity growth, but the increase in productivity associated with more open economies is not very significant.

A more ambitious attempt to use adjusted trade shares as a proxy for trade policy openness was attempted by Leamer (1988). Leamer uses a theoretical model to predict the pattern and volume of trade in the absense of protection. He then measures "openness" as a function of the extent to which actual trade deviates from the pattern of trade predicted by the model. Edwards (1989) has used Leamer's measure to show a positive and statistically significant impact of openness on growth. Although this approach is quite promising--particularly since it relies on easily available data--the methodology in its current form has a number of shortcomings. In particular, Pritchett (1991) showed that Leamer's measure is <u>negatively</u> correlated with several other measures of openness, including import penetration, tariff levels, and the extent of non-tariff barriers. Leamer (1988) concludes that "in the absence of direct measures of barriers, it will be impossible to determine the degree of openness for most countries with much confidence."

Direct measures of trade barriers could include administrative data, such as average tariff rates or coverage ratios for nontariff barriers. Problems typically arise, however, in attempting to aggregate these data into an overall index. Coverage ratios for nontariff barriers cause the greatest difficulty. Since the coverage ratio indicates the percentage of

imports covered by trade barriers, an extremely effective barrier that excludes almost all imports would receive little weight. The coverage ratio only suggests that barriers to trade exist, but cannot measure their effect (for a discussion of the relationship between these administrative measures and other indicators of openness, see Pritchett (1990)).

Related efforts have focused on using measures derived from a careful examination of tariffs and non-tariff barriers. Thomas, Halevi, and Stanton (1991) use a measure of trade liberalization based on a country-by-country assessment. They find that countries which liberalized in the 1980s increased their rate of GDP growth significantly, even when other effects were taken into account, including external financing, changes in the terms of trade, movements in the real exchange rate, and faster growth in OECD countries.

Research on trade and growth using both price-based or administrative measures has increased in the last several years. Studies based on these types of measures (See Section II in Table 1) have generally found a positive relationship between trade and growth. Although more recent efforts to identify the impact of openness on economic growth have relied on the use of cross-sectional averages of time-series data, one exception to this trend is Bhalla and Lau (1991), which examines the association between openness and growth using annual data. Bhalla and Lau (extending Lau, Jamison, and Louat (1991)) also construct annual measures of capital stock and educational stocks, which allows

them to disassociate the impact of openness from the effects of education and investment on growth. Their openness measure is constructed using national accounts data to derive the relative price of tradables, which is then compared with a benchmark price of tradeables. Their results suggest that openness significantly affects growth, even after controlling for the rate of growth of capital stock, land, labor, and educational stocks. They also find that the interaction between education and openness is important: the rate of return to education rises in more open economies.

Micro studies (Section III in Table 1) have generally shown a positive association between increased exports and productivity growth. However, the relationship between imports and productivity growth is often negative. Interestingly enough, Lopez (1990) finds a similar pattern in macroeconomic data, using different measures for policies affecting imports and exports: export incentives positively affect overall growth, while import restrictions have an insignificant effect. Lopez (1990) attributes this to a break-down of Lerner symmetry: restricting imports may not act as an implicit tax on exporters.

In the micro productivity literature, the observed pattern is likely to be due to two factors, both related to estimation problems arising from simultaneity bias. First, countries tend to export goods in which they have a comparative advantage and to import goods in which they do not. Past empirical work--which generally ignores any problems due to

simultaneity--has been unable to distinguish between the expected positive effect of imports on productivity growth in the long run and the fact that imports are drawn to low productivity sectors where a country does not have an international advantage. Second, the observed relationships could also be explained by the well-known pro-cyclical nature of productivity growth: productivity growth tends to be higher when output is growing, and falls during recessions or low-growth periods. Consequently, if greater import penetration is accompanied by a contraction of domestic industry, it is not surprising that productivity growth also falls.

One paper which has been able to convincingly address this simultaneity problem is Kaufman (1991). Using micro-level data on the rate of return to World Bank investment projects, Kaufman finds that a range of policies--including trade and exchange rate policies--significantly affect the rate of return to projects. A more open policy environment can double the rate of return to investment, even after controlling for general economic trends, such as GDP growth.

One difficulty in measuring the impact of trade policies on growth is that trade policy itself may be a function of other variables, including growth. Studies that have tried to identify the causal relationship between GDP growth and growth in exports or imports have had mixed results (See Section IV in Table 1).

This brief review of the literature on openness and economic growth reveals two important considerations. First,

despite the voluminous literature on this topic, the debate is by no means resolved. Many studies do reveal a positive relationship between various measures of openness and growth. But nagging problems remain. Methodological shortcomings make it difficult to link performance outcomes with policies per se; causality tests and micro-level analyses yield mixed results.

Second, it should be evident that no independent measure of so-called "openness" is free of methodological problems. Even the most recent use of direct price comparisons, facilitated by the work of Summers and Heston (1988), is plagued by small sample size--the data has not been collected for the same set of benchmark countries over many years. This may be one factor which has led to an emphasis on the use of cross-section estimation. Even if panel data--which spans a number of countries over several years--was widely available for international price comparisons, there would still exist the possibility that price distortions reflect domestic market imperfections (such as oligopolistic marketing channels for imported goods) as much as trade policy interventions.

Consequently, the approach adopted in this paper is to gather as many different measures of openness as are available for a cross-section of developing countries over time, and test whether these measures generally yield the same results. Unfortunately, we are forced to exclude a number of openness measures which are not available over time, such as the indices computed by Leamer (1988), and the comprehensive data on tariffs

and non-tariff barriers gathered by UNCTAD for a cross-section of developing countries in 1987. [2]

II. Data and correlations between openness variables.

The empirical specification employed in this paper is derived from a general production function, with output growth (GDP) as a function of capital stock, average years of education, population, labor force, agricultural land, and technological change. Inclusion of openness measures (or other policy variables) in the production function is consequently a test their impact on technological change--growth in output <u>after</u> controlling for increases in resource use. The production function is augmented--through the use of country dummy variables--to allow for unobserved country-specific differences in productivity.

GDP growth is calculated as log differences using national accounts data in 1980 dollars, collected by the World Bank. Physical and human capital stocks were calculated by Bhalla and Lau (1991), extending a method applied by Lau, Jamison, and Louat (1991) on a smaller sample of countries. Bhalla and Lau computed capital stock and years of education from annual capital investment and educational enrollment data, using the perpetual

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[2] See Pritchett (1991) for further details regarding the UNCTAD data. Pritchett (1991) uses cross-section data to compare a number of different openness measures, including the UNCTAD and Leamer measures. Although we considered using the UNCTAD data to estimate the impact of 1987 tariff and non-tariff barriers on consequent growth, not enough post-1987 data was available to do this exercise.

inventory method for investment and a similar approach for educational stocks.

All values have been transformed into differences of log values, with the exception of years of education, where differences of levels are used. The stock of education has been divided into splines to test the impact on growth of 0 to 3 years of schooling and the additional effects of more than 3 years of schooling separately.

Seven different proxies for trade and exchange rate policies were collected from different sources to test the statistical relationship between openness and growth. The first, an annual index of trade liberalization for 1960-84, was derived using observations on exchange rate and commercial policies (Source: Papageorgiou, Michaely, and Choksi, 1990). Second, an index of trade liberalization for 1978-88, was calculated using country sources on tariffs and nontariff barriers (source: Thomas, Halevi, and Stanton, 1991). The third, a black market premium, measures the deviation of the black market rate from the official exchange rate (source: International Currency Analysis, Inc., various years). The fourth, trade shares, measures the ratio of exports and imports to GDP (source: World Bank data). The fifth, movement toward international prices, was derived from the relative price of a country's tradables, which was computed using current and constant national accounts price indexes (for more details, see Bhalla and Lau (1991) or the discussion above). This variable uses as a benchmarket the relative price of

consumption goods for 1980 from Summers and Heston (1988). It is then transformed to measure the movement toward unity. The sixth, index of price distortion, is a modified version of the index used in Dollar (1991). The relative price of consumption goods from Summers-Heston is "purged" of its non-traded component by taking the residual from a regression of this index on urbanization, land, and population. The seventh, bias against agriculture, measures the indirect bias against agriculture from industrial sector protection and overvaluation of the exchange rate (source: Krueger, Schiff, and Valdes (1991)).

Annual observations were available for time periods which ranged from 1960-87 for trade shares to 1978-88 for the Thomas et al. trade liberalization index. The number of countries available for each index varies, ranging from 60 (for trade shares) to 19.

Tables 2 and 3 examine the rank correlation between these seven different measures of openness. Table 2, which examines the rank correlation between openness measures in levels, excludes the measure for movement towards international prices, which is an estimate of changes in policy. The results suggest that there is generally a statistically significant (and positive) correlation between the two measures of trade reform, minimal disprotection of agriculture, and trade shares. This positive relationship exists for both levels of openness as well as changes, for a pure cross section as well as for a panel. However, the majority of the rank correlations using the pure

cross section (averages of the time series for each country) are not statistically significant. In many cases, the value of the rank correlation is unchanged across the annual and cross-section samples, but the significance is simply much lower for the cross-section data.

As expected, there is also a negative relationship between those four measures and the extent of a black market premium. The rank correlations in Tables 2 and 3 confirm that inappropriate levels of the official exchange rate, proxied by the black market premium, are generally inversely associated with "open" trade policies. Of course, these correlations do not indicate the direction of causation between exchange rate and trade policies; they only indicate that the two are significantly related.

The two remaining measures employed in the analysis, both measures of price distortions, do not show a consistent or generally significant relationship with the other measures (see Tables 2 and 3). Although the lack of an association between these measures and the others is surprising, it says nothing about the extent to which one measures is necessarily preferable to others. The lack of a perfect (or even appropriately signed) correlation between all these measures is likely to indicate that they are not capturing the same aspects of "openness": the black market premium, for example, is a direct measure of the extent to which inappropriate exchange rate policies may trigger (or be a consequence of) protection.

III. Basic Results

Tables 4 and 5 present the first set of regression results. Period averages were computed over time for each country to create a pure cross-section estimation across countries. The size of each sample depends on the number of countries with each of the openness measures, as well as the availability of educational and capital stocks. Table 4 presents the results when levels of openness are included as independent right-hand side variables, while Table 5 presents the impact of changes in openness. Static trade models do suggest that movements towards openness can temporarily increase the rate of growth due to short-run gains from the reallocation of resources, which would imply a positive relationship between changes in openness and GDP growth. Neoclassical growth models, however, do not suggest any long run relationship between the level of openness and economic growth. Recent efforts to model the impact of openness in a dynamic framework, however, predict that both levels and changes in openness can have a long-run impact on growth.

The results in Tables 4 and 5 suggest that after controlling for other inputs, when openness is computed as an average over several decades it generally has an insignificant impact on economic growth. The only variables which significantly affected growth are the level of the black market premium and changes in trade shares, both of which have the correct signs. Increasing the share of trade in GDP positively affects growth,

while a higher black market premium is negatively associated with growth.

What about other factors? The most important variables are the growth of the labor force and the capital stock: on average a one percent increase in capital accounts for an increase in the rate of GDP growth of between .4 and .6 percent. The coefficients on arable land and human capital, as proxied by years of education, vary in both magnitude and significance, indicating that the impact of these measures on growth is extremely sensitive to the sample of countries and time period chosen. In general, the impact of changes in the stock of education seem to be greater for the first three years of schooling than for any increments which follow. One possible reason for the sometimes insignificant impact of changes in the average years of education on growth could be that this variable changes only slowly over time. Alternative specifications which used the stock of education at the beginning of the sample period generally showed a positive and statistically significant association between average years of education and the rate of GDP growth.

Although a large share of earlier research has focused on period averages to identify the determinants of long run growth, using period averages is likely to hide significant variations in individual country performance. Most developing countries have experienced large swings in commercial and exchange rate policies over the last thirty years, which could render any proxies for openness essentially meaningless. Due to the large variation in

country policies since the 1950s, beginning of period values could also have little explanatory power. Consequently, the regressions were redone using annual data for the same dependent and independent variables. To control for unobserved country-specific differences in growth rates, we included dummy variables for each country--the so-called fixed effects model. The results are given in Tables 6 and 7.

The results presented in Tables 6 and 7 show very different effects of the seven openness measures on growth. Four of the seven measures have a statistically significant impact at the 5 percent level of significance; all seven measures are significant--in either levels or differences--at the 10 percent level. All the measures have the expected sign--movements toward openness positively affect growth; greater distortions (as measured by the black market premium and modified Dollar (1991) measure) negatively affect growth. In addition, the F-tests reported in Tables 6 and 7 reject the null hypothesis that country effects are not important. In nearly all the specifications, the country dummies are jointly significant--suggesting the presence of country-specific differences that persist over time, even after accounting for changes in policy and increases in the labor force, education, and capital stock.

One problem with using annual data to identify the determinants of long run growth is that short term or cyclical fluctuations could be responsible for the strong relationship between policy variables and GDP growth. Quah and Rauch (1990)

used trade shares as a proxy for openness to decompose the short and long run effects of openness on economic growth. Using annual data, they found that most of the observed positive relationship between openness and growth was due to short-run cyclical fluctuations. Consequently, we also compute period averages for 1960-66, 67-73, 74-81, and 82-88. These results are given in Tables 6 and 7.

The six-year averages do seem to indicate a robust relationship between openness and growth. Five of the seven variables show a positive relationship between openness and growth, after controlling for investment, education, and country-specific effects captured through the use of dummy variables. Again, the null hypothesis that country dummy variables are jointly insignificant is generally rejected, although with less regularity than for the annual data.

Table 10 summarizes the relationship between openness and growth presented in Tables 4 through 9. Using six-year or annual data, the different specifications show a positive, generally significant association between the various measures of openness used in this study and productivity growth. However, using cross-sectional data derived from long run averages only reveals a significant relationship between openness and growth for two of the seven indicators.

Figure 1 plots the partial correlations between all seven measures of openness and productivity growth, using six-year averages. The scatter plots in Figure 1 reveal an important

stylized fact: although the partial correlations are generally statistically significant, explanatory power of these seven measures varies. The R-square on the partial correlations ranged from .03 to .30, indicating that although trade policy is important, much variation in growth rates is still unexplained, even after accounting for changes in education, labor, land, and capital stock.

IV. Sensitivity Tests: Country Size and Macroeconomic policy

Past efforts to isolate the impact of openness on growth have generally failed to control for two factors: country size and macroeconomic policy. If one of the primary gains from openness is through its impact on competition, then would it be possible for domestic competition in large countries to substitute for the effects of trade? If so, then openness may generate gains only for smaller countries. Another critique of existing studies arises from the possibility of omitted variable bias. Prudent macroeconomic policies--which often go hand in hand with more open trade and exchange rate policies--may lead to higher productivity growth. If so, then excluding these variables from the analysis may lead to mistakenly identifying the gains from trade instead of the real cause--macroeconomic stability. For example, Levine and Renelt (1990) found that the positive association between trade shares and GDP growth disappeared in a cross-section of countries when they included government

expenditures in the regression. We examine these two hypotheses in turn.

Although a number of different variables may be used to measure country size, we followed Kuznets, Chenery and Syrquin and chose country population as our measure. (The analysis was also conducted using the level of GDP as a measure of size, which did not significantly affect the results). The results are shown in Table 11. The size variable was included by itself and interacted with trade policy. If it is true that large countries benefit less from more open policies than small countries, then the coefficient on the interaction of trade policy and size should be opposite in sign to the coefficient on openness, mitigating its effect. The results in Table 11 do show a mitigating effect for 4 of the 7 variables, but none of these are statistically significant. The only trade policy variable for which the inclusion of size affects openness is the Choksi measure, yet it has the opposite of its expected effect: the impact of liberalization is positive and significant for larger countries.

Although the impact of size by itself varies with the number of countries included in the sample, country size is statistically significant (and always positive) in four specifications--those with the largest number of observations. This suggests that if the sample of countries is sufficiently large, one generally finds that larger countries have experienced higher productivity growth. This confirms results from earlier

studies, using a different sample of countries and different methodology (see, for example, Perkins and Syrquin (1989)).

To test for the possibility of omitted variable bias due to the exclusion of macroeconomic policy variables, we re-estimated the basic equations for the annual data, six-year averages, and long-run averages. Renelt and Levine (1990) showed that if changes in government consumption are included in a regression of GDP growth on trade shares, then the positive association between trade shares (often used as a measure of openness) and GDP growth becomes statistically insignificant. The results in Table 12 confirm this result. The statistically significant and positive relationship between changes in trade shares and growth disappears when we include changes in government spending as a share of GDP. The other openness measures, however, are generally robust to the inclusion of the government spending variable. Only in the annual data--which is more likely to pick up short-term fluctuations captured by changes in government consumption--do several openness measures lose statistical significance when government consumption is included--such as the black market premium, the Choksi et al. measure of trade liberalization, and the measure for bias against agriculture.

V. Conclusion and Directions for Further Research

This paper provides a summary of previous work on openness and growth and contributes to that literature by measuring the impact of a wide range of openness measures on economic growth.

The results suggest that the choice of time period for analysis is critical: whereas only 2 of the 7 openness measures positively affect growth when cross-section data are employed, 5 of the 7 proxies for openness reveal a positive association with growth when the data is averaged over six-year periods, and all 7 measures are statistically significant (in either levels or differences) using annual data.

Nevertheless, in other respects the results are surprisingly robust: when openness is statistically significant in any of the many specifications explored in this paper, we always find that greater openness is associated with higher growth. Tests of the sensitivity of these results to country size do not change the conclusions. We also test for the possibility of omitted variable bias by including government spending in the regressions. The inclusion of government spending does eliminate the statistical significance of trade shares in explaining growth, but leaves the results using other proxies for openness generally unchanged.

Two issues have been highlighted by this paper as interesting for future research. First, the literature is still unresolved on the issue of causality. Does openness cause growth? Or is it the other way around? Harrison (in progress) applies causality tests using vector autoregressions to investigate the direction of causation between openness and growth. Although the limitations of such tests are well known, such an exercise constitutes at least a first step towards analyzing the problem

of causation. Second, the different results which arise from the use of cross-section and panel data suggest the importance of disentangling short-run from long run effects without throwing away the information in annual data. Quah and Rauch (1990) have made a first attempt to disentangle the impact of cyclical from long-run effects of policies on growth in time series data. Unfortunately, Quah and Rauch use trade shares as their proxy for openness, which is one of the least robust measure of openness in our analysis. Extending Quah and Rauch (1990) to analyze other openness measures would be a useful exercise.

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Table 1 Summary evidence on openness and growth

Openness measure	Countries	Period	Impact	Source
I. Measures Based on Trade Shares				
			Coefficient on openness	
Deviation from predicted trade	45	1973-78	Significant, > 0	Balassa (1985)
Deviation from predicted trade (Leamer (1988))		1982	Significant, > 0	Edwards (1989)
Changes in trade shares	19	1960-85	Significant, > 0	Helliwell and Chung (1990)
Trade shares	81 LDCs	1960-85	Weakly significant, >0	Quah and Rauch (1990)
II. Price-based and administrative measures				
Bhalla/Lau (1991), using the relative price of tradables to international prices	60	1960-87	Raises GDP growth	Bhalla and Lau (1991)
Relative domestic price of investment goods to international prices	98	1960-65	Raises GDP growth per capita	Barro (1990)
Relative price of traded goods	95	1960-85	Raises GDP growth per capita	Dollar (1990)
Effective rate of protection in manufacturing	47	1950-80	Lower protection raises GDP growth	Heitger (1987)
Trade liberalization index from Choksi (1989)	20	1964-84	Weak evidence of increased productivity	Phillips and Havrylyshyn (1990)
Trade liberalization index from Halevi (1989)	35	1975-85	Export incentives positively affect GDP per capita growth, insignificant impact of import restrictiveness	Lopez (1990)
Trade liberalization index from Halevi-Thomas (1990)		1978-88	Trade reform positively affects GDP growth.	Thomas/Nash (1991)
III. Micro and Productivity studies				
Deviation from predicted export share	108	1960-82	Positive	Syrquin and Chenery (1989)
Export growth	4	1955-78	Positive	Nishimizu and Robinson 1984
Export growth	17	1950-80	Positive	Nishimizu and Page (1990)
Export growth	4	1976-88	Positive	Tybout (1990)
Import penetration	17	1950-73 1973-85	Ambiguous Negative	Nishimizu and Page (1990)
Import substitution (IS) (1 - Import penetration)	4	1955-78	IS negatively affects TFP	Nishimizu and Robinson (1984)
Import substitution	4	1976-88	IS positively affects TFP	Tybout (1990)
Effective rates of protection and domestic resource costs	1	1963-76	Ambiguous	Krueger and Tuncer (1982)
Change in import shares	UK	1976-79	Ambiguous	Gerosk i (1989)
IV. Causality tests				
Methodology			Exports cause growth?	
Granger tests	37	1950-81	For only 4 countries	Jung and Marshall (1985)
White specification test	73	1960-77	Yes	Ram (1985)
Granger, Sims tests	4 (Asian NICs)		Sometimes	Hsiao (1987)
Granger tests	Austria	1965	No, but productivity growth causes exports	Kunst and Marin (1989)

Table 2 Spearman Rank Correlation Coefficients for 7 Openness Measures in Levels: Cross-Section and Annual Data 1/

	TR I	TR II	BLACK	DOLLAR	TRADE SHARES	INDIRECT
Trade reform (TR I)	1.0	.10	.44**	.36	.70***	.37
(1960-84)	1.0	.73***	-.37***	.08	.51***	.38***
Trade reform		1.0	-.39***	.05	.06	.20
(1979-88) (TR II)		1.0	-.34***	-.14**	.26***	.52***
Black market premium (BLACK)			1.0	-.07	-.16	-.61***
			1.0	.00	-.21***	-.47***
ice distortion (DOLLAR)				1.0	.11	.50**
				1.0	.06**	.22***
ade shares					1.0	.25
					1.0	.36***
Disprotection of agriculture (INDIRECT)						1.0
						1.0

Table 3 Spearman Rank Correlations for Changes in Openness1/

	TR I	TR II	BLACK	DOLLAR	MTP	TRADE SHARES	INDIRECT
ade reform (TR I)	1.0	-.07	-.60***	.01	-.11	.46**	.74***
(1960-84)	1.0	.47***	-.18***	.02	-.14***	.17***	.17***
ade reform (TR II)		1.0	-.27*	.17	.07	.12	-.23
(1979-88)		1.0	-.11**	.12	.08	.05	.32***
ack market premium (BLACK)			1.0	.21	.06	-.11	-.27
			1.0	-.01	-.01	-.15***	-.15***
ice distortion (DOLLAR)				1.0	.27	-.38***	.16
				1.0	.10***	.14***	-.05
vement towards International Prices (MTP)					1.0	-.10	.27
					1.0	-.03	-.09
ade shares						1.0	.49***
						1.0	.25***
sprotection of agriculture (INDIRECT)							1.0
							1.0

tes: 1/ Top figure indicates rank correlation for coefficients averaged over entire time period; bottom figure gives annual te rank correlations.
Indicates significant at 15 % level; ** indicates significant at 10 % level; *** indicates significant at 5 % level.

Table 4 Cross-section estimation using twenty-seven year averages and levels of trade policy

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.0 (.01)	0.0 (0.0)	-0.0 (0.0)	-0.02 (.01)	-0.01 (.01)	0.01 (.01)
TR I	-0.05 (.16)	-	-	-	-	-
TR II	-	0.0 (0.0)	-	-	-	-
BLACK	-	-	-.013** (.005)	-	-	-
DOLLAR	-	-	-	0.01 (.02)	-	-
TRADE SHARES	-	-	-	-	0.013 (.008)	-
INDIRECT	-	-	-	-	-	1.14 (2.14)
LAND	-0.48 (0.28)	0.50 (.27)	-0.10 (.73)	-0.12 (.21)	-0.01 (.14)	0.02 (.26)
LABOR FORCE	0.65 (.27)	0.98 (.33)	0.44 (.17)	0.74 (.35)	0.34 (.18)	0.07 (.47)
EDUCATION (0-3 Years)	0.21 (.14)	-0.13 (.08)	-0.03 (.06)	0.01 (.10)	0.02 (.06)	0.01 (.10)
EDUCATION (3-9 Years)	0.09 (.07)	-0.01 (.05)	0.06 (.03)	-0.01 (.06)	0.07 (.03)	-0.05 (.07)
CAPITAL STOCK	0.37 (.10)	0.45 (.09)	0.48 (.06)	0.60 (.10)	0.52 (.07)	0.61 (.10)
N	17	32	65	31	67	17
R-Square	.86	.72	.66	.72	.65	.87

Table 5 Cross-section estimation using twenty-seven year averages and changes in trade policy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TR I	0.18 (.94)	-	-	-	-	-	-
TR II	-	-.02 (.02)	-	-	-	-	-
BLACK	-	-	-0.09 (.07)	-	-	-	-
DOLLAR	-	-	-	-.38 (.35)	-	-	-
TRADE SHARES	-	-	-	-	0.78** (.33)	-	-
INDIRECT	-	-	-	-	-	2.2 (26.8)	-
Movement towards International Prices	-	-	-	-	-	-	0.04 (.07)
R-Square	.85	.73	.63	.73	.67	.87	.87

Note: Standard errors in ().*** indicates significant at 5 percent level; * indicates significant at 10 percent level. Intercept term included in all regressions but not reported here.

Table 6 Fixed effect estimation using annual data and levels of trade policy

	(1)	(2)	(3)	(4)	(5)	(6)
TR I	0.10* (.05)	-	-	-	-	-
TR II	-	0.02** (.005)	-	-	-	-
BLACK	-	-	-0.01** (.00)	-	-	-
DOLLAR	-	-	-	-0.05** (.02)	-	-
TRADE SHARES	-	-	-	-	0.01 (.02)	-
INDIRECT	-	-	-	-	-	2.82* (1.65)
LAND	0.00 (.03)	0.20 (.21)	0.13 (.05)	0.01 (.03)	0.04 (.03)	0.04 (.07)
LABOR FORCE	0.37 (.30)	-0.14 (.25)	0.68 (.18)	0.22 (.18)	0.64 (.17)	0.41 (.29)
EDUCATION (0.3 Years)	0.11 (.12)	0.33 (.14)	0.11 (.05)	0.04 (.07)	0.09 (.04)	0.06 (.09)
EDUCATION (3-9 Years)	0.01 (.07)	0.01 (.06)	0.02 (.04)	0.02 (.05)	0.01 (.03)	0.03 (.07)
CAPITAL STOCK	0.58 (.06)	0.67 (.10)	0.51 (.03)	0.56 (.04)	0.52 (.03)	0.50 (.06)
F-Value 1/	1.3	1.7	1.6	2.1	1.7	1.4
N	380	258	1498	838	1737	395
R-Square	.35	.37	.28	.33	.25	.38

Table 7 Fixed effect estimation using annual data and changes in trade policy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TR I	0.13 (.09)	-	-	-	-	-	-
TR II	-	0.01 (.01)	-	-	-	-	-
BLACK	-	-	-0.01** (.004)	-	-	-	-
DOLLAR	-	-	-	0.01 (0.04)	-	-	-
TRADE SHARES	-	-	-	-	0.06* (.03)	-	-
INDIRECT	-	-	-	-	-	0.16 (2.29)	-
Movement towards International Prices	-	-	-	-	-	-	0.04** (.01)
F-Value 1/	1.3	1.1	1.9	1.9	1.9	1.2	1.1
R-Square	.36	.31	.28	.33	.26	.39	.34

Note: Standard errors in ()."**" indicates significant at 5 percent level; * indicates significant at 10 percent level.
1/ F-Value for test of Null hypothesis that country effects are 0.

Table 8 Fixed effect estimation using six-year averages and levels of trade policy

	(1)	(2)	(3)	(4)	(5)
TR I	0.20** (.08)	-	-	-	-
BLACK	-	-0.02** (.004)	-	-	-
DOLLAR	-	-	-0.05** (.02)	-	-
TRADE SHARES	-	-	-	-0.02 (.02)	-
INDIRECT	-	-	-	-	5.16* (3.61)
LAND	-0.13 (.17)	0.01 (.11)	-0.23 (.13)	0.12 (.11)	-0.09 (.19)
LABOR FORCE	0.36 (.58)	0.83 (.28)	0.60 (.32)	0.67 (.28)	0.68 (.52)
EDUCATION (0-3 Years)	0.17 (.16)	0.14 (.06)	0.09 (.10)	0.06 (.06)	0.04 (.11)
EDUCATION (3-9 Years)	0.07 (.09)	0.04 (.04)	0.03 (.06)	0.00 (.04)	0.06 (.08)
CAPITAL STOCK	0.54 (.07)	0.42 (.04)	0.51 (.05)	0.44 (.04)	0.36 (.07)
F-Value 1/	1.1	1.6	1.6	1.4	1.3
N	67	237	125	265	69
R-Square	.76	.71	.75	.85	.76

Table 9 Fixed effect estimation using six-year averages and changes in trade policy

	(1)	(2)	(3)	(4)	(5)	(6)
TR I	0.20 (.24)	-	-	-	-	-
BLACK	-	-0.02 (.02)	-	-	-	-
DOLLAR	-	-	-0.04** (.01)	-	-	-
TRADE SHARES	-	-	-	0.23** (.10)	-	-
INDIRECT	-	-	-	-	16.75** (5.27)	-
Movement towards International Prices	-	-	-	-	-	0.05 (.03)
F-Value 1/	0.7	1.4	1.4	1.5	1.6	0.7
R-Square	.72	.67	.74	.65	.80	.69

Note: Standard errors in ()."**" indicates significant at 5 percent level; * indicates significant at 10 percent level.
1/ F-Value for test of Null hypothesis that country effects are 0.

Table 10 Impact of openness on growth: synthesis of findings

Openness variable	Annual data		Six-year averages		Entire period averages	
	Levels differences (1)	(2)	Levels differences (3)	(4)	Levels differences (5)	(6)
Trade liberalization Index (1960-84)	>0*	>0	>0,**	>0	<0	>0
Trade liberalization Index (1978-88)	>0**	>0	-	-	<0	<0
Black market premium 1/	>0,**	>0,**	>0,**	>0	>0,**	>0
Trade shares	>0	>0,*	<0	>0,**	>0	>0,**
Price distortion measure 1/	>0,**	<0	>0,**	>0,**	<0	>0
Movement towards world prices	-	>0,**	-	>0	-	>0
Bias against agriculture 1/	>0,*	>0	>0,*	>0,**	>0	>0

** Indicates significant at 5 percent level; * indicates significant at 10 percent level.

Notes: All regressions except entire period average include country dummies.
1. For purposes of comparison, a value of ">0" indicates that more openness (less distortion) positively affects growth. Consequently, for the black market premium, price distortion measures, and bias against agriculture, this table will show ">0" when a higher level of distortion negatively affects growth.

Table 11 Testing for Sensitivity of Results to Country Size, Using Six Year Averages and Trade Policy 1/

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TRI	0.03 (.11)	-	-	-	-	-	-
TRI*Size	5.00** (2.35)	-	-	-	-	-	-
TR II	-	0.0 (0.0)	-	-	-	-	-
TRII*Size	-	0.05 (.16)	-	-	-	-	-
Black	-	-	-0.02** (0.0)	-	-	-	-
Black*Size	-	-	0.04 (.05)	-	-	-	-
Dollar	-	-	-	-0.06** (.02)	-	-	-
Dollar*Size	-	-	-	.61 (.42)	-	-	-
Trade Shares	-	-	-	-	0.25** (.10)	-	-
Trade Share*Size	-	-	-	-	-3.60 (3.36)	-	-
Indir	-	-	-	-	-	29.44** (7.97)	-
Indir*Size	-	-	-	-	-	-766.09 (367.80)	-
Movement towards international prices	-	-	-	-	-	-	0.04 (.03)
Movement*Size	-	-	-	-	-	-	0.71 (.82)
Land	-0.24 (.17)	0.07 (.47)	-0.01 (.11)	-0.25 (.12)	0.16 (.11)	-0.21 (.17)	-0.13 (.22)
Labor force	-0.07 (.58)	0.92 (.47)	0.82 (.27)	0.61 (.31)	0.59 (.27)	0.38 (.49)	-0.02 (.52)
Education (0-3 years)	0.18 (.16)	-.22 (.09)	0.17 (.06)	0.15 (.10)	0.10 (.06)	0.16 (.11)	0.06 (.14)
Education (3-9 years)	.05 (.09)	-0.10 (.06)	0.04 (.04)	0.03 (.06)	0.00 (.04)	0.09 (.08)	0.02 (.08)
Capital Stock	0.50 (.08)	0.34 (.11)	0.43 (.04)	0.51 (.05)	0.44 (.04)	0.37 (.07)	0.53 (.07)
Size	-0.42 (.46)	-0.04 (.22)	0.17 (.06)	0.32 (.13)	0.22 (.08)	0.28 (.32)	0.22 (.12)
N	67	32	231	125	263	67	102
R-Square	.96	.62	.90	.94	.89	.96	.91

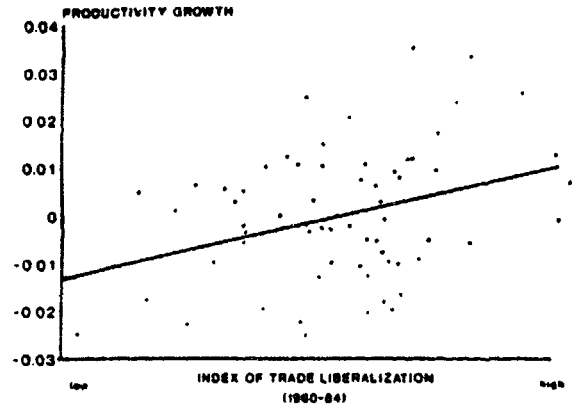
1/ Levels of policy variables used for all variables except trade shares, indir, and movement towards international prices -- which use changes in policies.

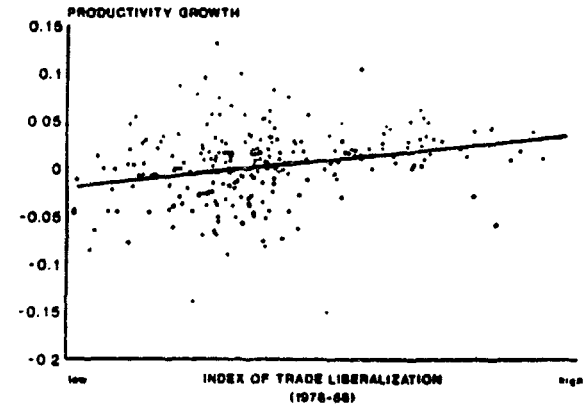
Table 12 Testing for Sensitivity of Results to Inclusion of Changes in Government Spending[1/]

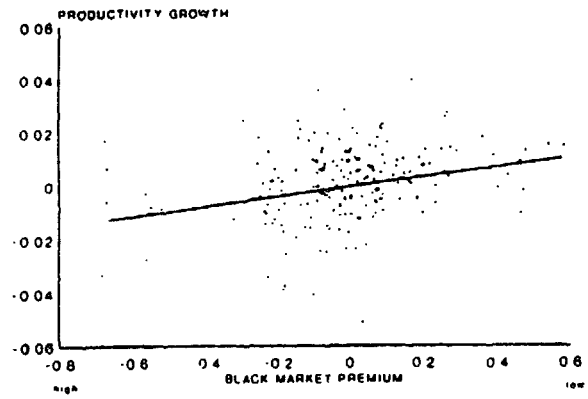
	ANNUAL DATA		SIX-YEAR AVERAGES		PERIOD AVERAGES	
	OPENNESS	GOV'T. SPENDING	OPENNESS	GOV'T. SPENDING	OPENNESS	GOV'T. SPENDING
(1) TR I	0.08 (0.09)	0.86 (.39)	0.25** (.12)	1.35 (1.06)	-0.30 (.74)	1.14 (2.46)
(2) TR II	0.02** (0.0)	0.22 (.21)	0.02* (.01)	-1.26 (1.24)	0.0 (0.0)	0.96 (.77)
(3) BLACK	-0.01 (.01)	0.44 (.14)	-0.03** (.01)	-0.30 (.43)	-0.02** (.01)	1.41 (.55)
(4) DOLLAR	-0.06** (.02)	0.80 (.20)	-0.06* (.03)	-0.03 (.05)	-0.01 (.02)	0.27 (.93)
(5) TRADE SHARES	-0.06 (.06)	0.42 (.14)	-0.10 (.27)	-0.44 (.48)	0.41 (.51)	1.59 (.60)
(6)INDIR	1.50 (3.09)	0.33 (.20)	6.00** (2.91)	-0.82 (.42)	27.11 (28.85)	-0.15 (1.08)
(7) MOVEMENT	0.05** (.02)	0.63 (.21)	0.07 (.05)	-0.05 (.62)	0.08 (.08)	0.68 (.55)

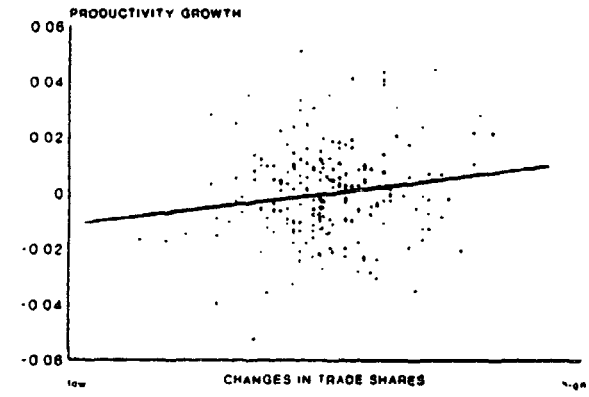
1/ Levels of policy variables used for all variables except trade shares, in dir, and movement towards international prices -- which use changes in policies. Standard errors in ( ). Significance levels for openness variables (only) indicated by ** (5 percent), and * (10 percent).

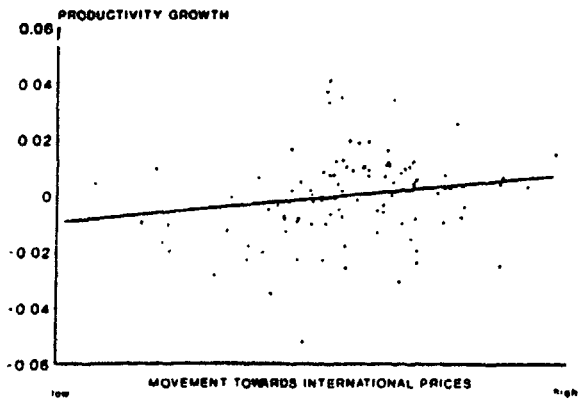
Figure 5.1 OPENNESS AND GROWTH: PARTIAL CORRELATIONS FOR A SAMPLE OF COUNTRIES, 1960-87

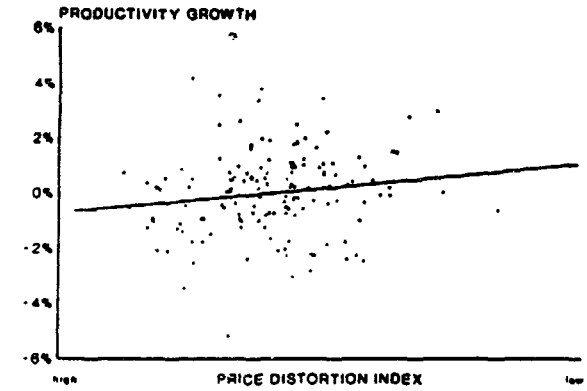


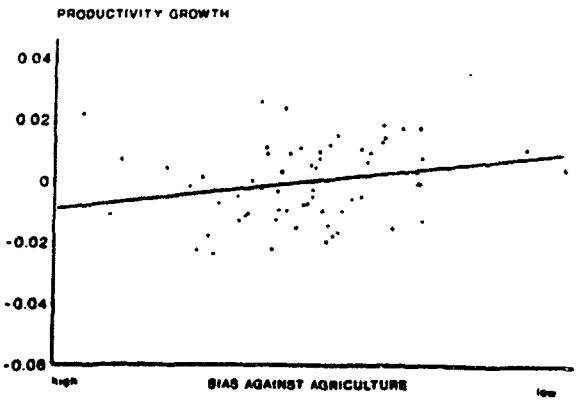












Notes: Five of the seven measures of openness are significant at the 5 % level in a regression of GDP growth on openness, input growth (capital, labor, education, land) and country dummy variables. The remaining two, the price distortion index and the movement towards international prices, are significant at the 10 % level. These scatter plots present a visual picture of the partial correlation between GDP growth and openness, after accounting for other factors. Country dummies were included in all regressions. All values (except the trade liberalization index which uses annual values, 1978-88) are averages for 1960-66, 67-73, 74-81, and 82-88. The number of countries ranges from 60 (for trade shares) to 19 (for trade liberalization index, 1960-84).

Sources: For black market premium, Pick's Currency Yearbook; Index of trade liberalization 1960-84, Papageorgiou, Choksi, Michaely (1991); index of trade liberalization 1978-88, from Halevi/Thomas (1991); bias towards agriculture, Krueger, Schiff, and Valdes, 19 changes in trade shares and movement towards international prices World Bank. The price distortion index is a modified version of Dollar (1991).

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