

Trade Openness And Economic Growth Revisited

Anna Merikas, Deree College, Greece
George S. Vozikis, (E-mail: george-vozikis@utulsa.edu), University of Tulsa
Andreas Merikas, University of the Aegean, Greece

Abstract

Our study attempted to establish how positive and how robust the relationship between average economic growth rate and the pace at which exporting activity grows using Extreme Bounds Analysis on Dollar's (1992) 95 nation openness index. Our results indicate that not only there is indeed such a positive and robust relationship, but there is also an equally robust but negative relationship between average economic growth rates and the real exchange rate distortion index, as well as a positive and robust effect between export share of GDP with the investment share in GDP, which in turn is robustly linked to output growth and GDP expansion.

Introduction

There is an extensive economic literature surveying the effect of different national trade strategies on overall national economic performance. However, most studies attempting to evaluate the effect of trade orientation on economic performance had to deal with two major problems: first, it was extremely difficult to develop and compare a satisfactory index of protectionism that accurately reflects the level of protectionism as well as a nation's trade orientation, and second, these studies have not provided solid, theoretical grounds that connect trade orientation to long term economic growth. The purpose of this research paper is to test how robust is the relationship between a country's trade policy and economic growth rate based on the most important past empirical and econometric studies that investigated this relationship, particularly those involving the use of cross-country data.

Readers with comments or questions are encouraged to contact the authors via e-mail.

Krueger's (1978) econometric work assessing the relationship between trade liberalization, growth of exports and aggregate growth became the starting point for many researchers working on development and trade issues. Krueger explored the effect of outward-oriented strategies on the growth of exports and economic growth as a whole. What she found was that openness positively affected growth in two ways, not only through higher capacity and efficiency benefits but also indirectly through exports, since the impressive growth rates of economies freed from trade barriers were associated with rapid growth of their exports. In other words, open, outward-oriented economies experienced faster growth of exports, which in turn resulted in a rapidly growing Gross National Product (*GNP*). Krueger constructed a model with real *GNP* as the dependent variable, and involved a classification of trade liberalization regimes, ranging from a closed Phase 1 economy, to Phase 5 where the economy is fully liberated, measured by the degree by which an economy's protective structure was biased in favor or against exports. Although

she found that higher exports positively affected economic growth, she did not find a direct relationship between trade orientation and growth.

This result stimulated many other researchers and among them Balassa (1982) who proposed an updated classification of trade regimes that contrary to Krueger's classification, would take into account the protective effect of tariffs. Using data on all classified countries, for the period between 1960 to 1973, Balassa concluded that protectionism had a negative effect on export growth. He then tried to examine the hypothesis that trade orientation has a direct effect on economic performance in terms of economic growth, and instead of using dummy variables, he used the growth rate of exports as an indicator of trade strategy. By using Spearman rank

coefficients for the same set of countries, he concluded that the growth of exports and economic growth rates were indeed positively correlated, although he failed to clarify if export growth affects GNP growth or the other way around.

In both of these empirical studies however, the sample size admittedly was very narrow, with only a small number of countries included into the analysis. Not surprisingly, subsequent research attempted not only to increase the number of countries they considered but also define and measure the variables better, in order to achieve more direct and causal evidence on the relationship between trade strategies and economic growth.

Table 1
LDC "Openness" Index

<u>Most Open Quartile</u>	<u>Second Quartile</u>	<u>Third Quartile</u>	<u>Most Inward Quartile</u>
Malta	Kenya	Gambia	Algeria
Thailand	Chile	Malawi	Paraguay
Colombia	Philippines	Suriname	Haiti
Sri Lanka	India	Senegal	Mauritania
South Africa	Tunisia	Zimbabwe	Zambia
Pakistan	Madagascar	Iran	Burundi
Bangladesh	Burkina Faso	Lesotho	Liberia
Malaysia	Togo	Central Africa Republic	Rwanda
Korea	Brazil	Trinidad and Tobago	Guinea
Mexico	Syria	Ecuador	Honduras
Singapore	Turkey	Swaziland	Guyana
Portugal	Burma	Ivory Coast	Tanzania
Nepal	Benin	Cameroon	Egypt
Cyprus	Mali	Venezuela	Nicaragua
Fiji	Indonesia	Dominican Republic	Angola
Hong Kong	Panama	Argentina	Zaire
Ireland	Barbados	Niger	Sierra Leone
Peru	Costa Rica	Yemen	Somalia
Spain	Greece	Congo	El Salvador
Papua New Guinea	Botswana	Jamaica	Iraq
Jordan	Uruguay	Mozambique	Ghana
Taiwan	Chad	Gabon	Uganda
Mauritius	Ethiopia	Guatemala	Bolivia
	Morocco	Sudan	Nigeria

Dollar's (1992) empirical study used an alternative method of dealing with the problem of measuring the key variable "outward-orientation". He argued that outward orientation exists when there is a combination of two factors: first, a relatively low level of protection of the production process from imports that results in a non-distorted, sustainable level of the real exchange rate favorable to exporters; and second, consistent export incentives over time, so there is relatively little variability in the real exchange rate. Using data on international prices constructed through National Income Accounting for Less Developed Countries (*LDCs*) between 1974 and 1989 by Summers and Heston (1991), he estimated a measure of real exchange rate distortion (*RERD*) in order to examine whether there is evidence suggesting that export promotion and outward oriented strategies increase the rate at which economies expand. Indeed, a significantly positive relationship was found to exist between real exchange rate distortion (*RERD*) and growth of *LDC* income per capita.

In order to further illustrate the importance of the influence of trade strategies on national economic performance, Dollar also attempted a classification of 95 *LDC* countries according to their trade policies (Table 1).

What Dollar did in essence, is to create an "openness" index that combined both the effects of distortion and variability of real exchange rate (*RERD*) by attaching specific weights to each ef-

fect and rank 95 developing countries with 1976 incomes below \$6000 into four quartiles, from most open to most inward. Dollar's logic for focusing particularly on developing countries was that the effect of openness on growth tends to be greater for *LDCs* than developed countries (*DCs*), because of the increased rate at which these countries import and install technological advances from abroad. The cross country averages for Growth per capita of the Gross Domestic Product (*GYP*), Growth of Exports (*GX*), Export share of *GDP* (*X*), and Real Exchange Rate Distortion (*RERD*) are presented in Table 2.

In a similar vein, Levine and Renelt (1992) examined the cross-country statistical relationships between long-run average growth rates and various policy indicators. They performed a sensitivity analysis and used Extreme Bounds Analysis (*EBA*) to test the robustness of coefficient estimates when additional information is included in the regression equations. In other words, they attempted to answer the question: how confident should one be, in view of the findings of cross-country growth regressions.

This study will combine the findings of Dollar (1992) and Levine and Renelt (1992), and test whether the relationship between trade strategy and variations in economic growth rates is "fragile" or "robust" by using Extreme Bounds Analysis (*EBA*). More specifically, this study will test whether the degree of openness as a trade strategy has explanatory power over the

Table 2
Dollar's Openness Index and Cross Country Averages

<u>QUARTILES</u>	<u>GYP 1974-89</u>	<u>GX</u>	<u>X</u>	<u>RERD</u>
Most Open	2.81298	7.4024	0.3722	87.650
Second Quartile	1.55863	5.5069	0.2480	111.696
Third Quartile	0.14275	4.2069	0.2970	138.571
Most Inward	-0.60146	3.7436	0.2436	179.571

(Source: Dollar, 1992)

variations in economic growth rates among developing countries, and secondly, will determine how robust this conclusion could be.

The most important issue when conducting Extreme Bounds Analysis (*EBA*) is to calculate the widest range of coefficient point estimates of a variable that cannot be rejected at the 5% significance level. To be more precise, after selecting the trade-orientation variable to be tested, a basic regression equation is formed that includes: the four sets of *I* variables that are always included when the dependent variable is the average annual growth of per capita *GDP* (*GYP*); up to three *Z* variables which are explanatory variables in order to produce the extreme bounds, as well as the coefficient estimates for all their possible combinations; and finally, two extreme bounds identified by the highest and lowest coefficients of the trade orientation variable that cannot be rejected at the 5% level. The extreme upper bound is the estimated coefficient from the regression that produces the higher significant coefficient plus two standard deviations. Similarly, the lower bound is the lower coefficient deflated by 2 standard deviations. If the coefficient does not change sign and remains significant, then we can be confident that the relationship between economic growth and outward or inward trade orientation is robust. If that is not the case, the relationship is said to be fragile.

The model to be tested will have the form:

$$Y = c + \alpha I_t + \beta M_t + \gamma Z_t + U$$

Where,

- Y* = either GDP per capita growth (the share of investment in GDP also in some cases)
- c* = the constant term
- I_t* = is a set of variables that are always included when the dependent variable is the average annual growth of per capita GDP (*GYP*)
- M_t* = is a set of trade orientation variables,

and finally,

- Z_t* = additional explanatory variables, most of which have been proposed by previous authors.
- U* = the random error term

The **(I) four variable set** includes:

1. **The initial level of real *GDP* per capita in 1974 (*INIT*), or its logarithm (*LOGINIT*).** Solow's (1994) theory of convergence suggests that poorer countries typically grow faster per capita and consequently tend to catch up in standards of living with the rich countries. We would therefore expect the growth rate of real per capita *GDP* to be inversely related to the level of per capita *GDP* in 1974. Thus, a negative coefficient is expected.
2. **The average annual growth rate of population (*GPO*).** Most economists support the idea that increases in the rate of population growth reduce the steady state level of capital per worker and consequently, the level of output per worker. Thus, we would expect that countries where population is growing rapidly would normally experience lower *GDP* per person growth rates.
3. **The investment share of *GDP* (*INV*)** This measure includes both public and private investment spending and is expected to have a positive effect on economic growth.
4. **The initial secondary education enrollment ratio in 1970 (*SED*)** This measure is highly consistent with the new growth theories that focus particularly on the importance of investment in human capital on economic growth. Although, *SED* does not control for differences in quality of education, a high secondary school enrollment ratio directly improves total labor productivity, because increases in the country's stock of educated human capital, normally result in more productive labor.

The **(Z) variables** are the additional ex-

planatory variables that are included into the regression in order to produce the extreme bounds and these are:

1. The average inflation of the *GDP* deflator (*PI*), and its standard deviation (*STPI*)
2. The growth rate of domestic credit (*GDC*), and its standard deviation (*STDC*)
3. The government consumption share of *GDP* (*GOV*) and finally,
4. The average number of political revolutions and upheavals per year (*REVC*).

The (*M*) trade orientation variables specifying the import share of the *GDP* are:

1. The export share of *GDP* (*X*)
 2. The growth of exports (*GX*)
- (Both of these variables have been used as

proxies for openness in most of past empirical studies)

3. The Real Exchange Rate Distortion (*RERD*) as defined by Dollar (1992)

Results

The primary purpose of this paper was to clarify two points: First, whether a nation's degree of openness as a trade strategy has explanatory power over the variations in economic growth rates, and second, to determine how confident these conclusions can be. The results indeed confirm what economic theory suggests. The hypothesis from Solow's (1994) model of absolute convergence, that poorer countries tend to grow faster than rich countries is also confirmed in all regression findings. The initial real per capita *GDP* variable has a negative sign in

Table 3
Extreme Bounds Analysis for Trade Orientation Variables
Dependent Variable: Growth of per capita *GDP* (*GYP*)

Variable	Coefficient β	Std	t-tests (Prob.)	R ²	Z Variables	Inference
<i>(GX)</i>	high:					
	0.24691	0.031303	7.8877(.000)	0.62796	<i>GDC, STDC, GOV</i>	
	base:					
	0.23648	0.030796	7.6791(.000)	0.61332		ROBUST
<i>(RERD)</i>	low:					
	0.22911	0.031515	7.2700(.000)	0.62115	<i>REVC, STPI</i>	
	high:					
	-0.0113002	0.00489	-2.6549(.000)	0.445	<i>GDC, PI</i>	
<i>(X)</i>	base					
	-0.014169	0.04980	-2.8421(.000)	0.404		ROBUST
	low:					
	-0.016523	0.00527	-3.1309(.002)	0.419	<i>GDC, CIVIL, STDC</i>	
<i>(X)</i>	No significant coefficient in all regressions					FRAGILE

Note: The trade orientation variables are: growth of exports (*GX*), the real exchange rate distortion (*RERD*), the export share of *GDP*. The base coefficient is the estimated coefficient from the regression with the trade orientation variable only when the dependent variable is growth of per capita *GDP* (*GYP*) and without including the *I* variables. The high and the low coefficients are derived from the regressions with the extreme high bound (coefficient plus two Std.), and extreme low bound (coefficient minus two Std.) respectively. The *Z* variables, are the additional variables used in the regression, in order to produce the two extreme bounds. The final column indicates whether the relationship between the dependent variable (*GYP*) and the trade variable is robust or not. The number of observations (countries) is constantly 92 in all regressions, and the critical t-value is above 2.

all cases, implying that it is indeed inversely related to the growth of real per capita *GDP*. The coefficient is not significant but one should reexamine this relationship after considering some other variables and hold them constant. This however was not done, since the focus of this paper is not the level of per capita *GDP* per se.

All the *I* variables came out with the anticipated coefficient signs. Hence, economic growth increases with favorable movements in terms of the investment share of *GDP* (*INV*), and secondary education enrollment ratio (*SED*), and declines with increases in the population growth rate (*GPO*). The diagnostic tests for all regressions were significant at the 5% level. No evidence of correlation, functional form, normality or heteroscedasticity problems was identified in any of the regressions. Normality problems were experienced only when the logarithm of the initial 1974 level of *GDP* per capita (*LOGINIT*) replaced the actual initial level of real *GDP* per capita in 1974 (*INIT*), and for that reason, in most of the equations the actual level of the initial 1974 *GDP* per capita (*INIT*) was used.

As far as the trade orientation *M* variables are concerned, the main anomaly arises when the effect of export share of *GDP* (*X*) on the average per capita *GDP* growth (*GYP*) is examined. No matter which combination of *Z*-variables is included, the results completely fail to identify a regression where the export share of *GDP* (*X*) has a positive and significant effect on *GDP* growth. This is exactly where the difficulty of obtaining an accurate, as well as reliable measure of trade orientation becomes most apparent. Exports as a percentage of *GDP* ratios directly depend on the size of the economy, and therefore, larger economies tend to have lower export share of *GDP* ratios, regardless of the extent of trade restrictions or incentives, even if the volume of exports is larger (Table 3).

The EBA tests, summarized in Table 3, are also highly consistent with the literature since, not surprisingly, growth of exports (*GX*) was

found to be robustly correlated with economic growth. The estimated coefficient varied from 0.22 to approximately 0.25 when the growth rate of domestic credit (*GDC*), the standard deviation of *GDC* (*STDC*), and the government consumption share of *GDP* (*GOV*) were included in the growth regressions. In other words, an economy with its exports growing at an average annual rate of one percent should also expect incomes to be growing at an average rate between 0.22 and 0.25 percent per year. Impressively, all t-tests for export growth (*GX*) were also well above 7.0.

A possible explanation for the lack of significance between the export share of *GDP* (*X*) on the average per capita *GDP* growth was provided by examining the effect of export share of *GDP* ratio (*X*) on the investment share of *GDP* (*INV*). Using a model where only the export share of *GDP* (*X*) and a choice of *Z* variables are included, a robust (since the coefficient of *X* does not change sign and remains significant) and positive relationship between export share of *GDP* and the average share of investment in *GDP* was established. The coefficient fluctuated around 0.15, depending on the conditional information in the form of *Z* variables that were included in the regressions. This finding suggests that a one percent increase in the average export share of *GDP* (*X*) would have raised the average investment share by approximately 0.15 percent. Table 4 presents these findings, as well as the results that are obtained if the export share of *GDP* (*X*) is substituted by the import share of *GDP* (*M*), or the ratio of total trade (*X+M*) to *GDP* (*TRD*) in the investment regression. Again, identical figures have been secured, with the coefficients and the standard deviations being fairly indistinguishable.

It becomes clear from Table 4 that there must be an indirect effect of exports on economic growth through investment, which in turn is robustly correlated to economic growth, and specifically growth of per capita *GDP* (*GYP*). Economic development therefore depends to a

Table 4
 Extreme Bounds Analysis for Trade Orientation Variables
 Dependent Variable: Investment share of GDP (INV)

Variable	Coefficient β	Std	t-tests (Prob.)	R ²	Z Variables	Inference
(X)	high: 0.18322	0.035285	5.1925(.000)	0.230709	GDC, STPI	
	base: 0.18068	0.035499	5.0899(.000)	0.21489		<u>ROBUST</u>
	low: 0.12752	0.041094	3.1030(.003)	0.26150	REVC, GOV, STDC	
(M)	high: 0.15565	0.031710	4.9087(.000)	0.21759	GDC, STPI	
	base: 0.15685	0.031544	4.9700(.000)	0.20668		<u>ROBUST</u>
	low: 0.11936	0.036646	3.2572(.002)	0.26891	REVC, GOV, STDC	
(TRD)	high: 0.09076	0.017146	5.2935(.000)	0.24406	GDC, STPI	
	base: 0.090487	0.090487	5.2757(.000)	0.22772		<u>ROBUST</u>
	low: 0.068332	0.068332	3.3726(.000)	0.27460	REVC, GOV, STDC	

Note: The trade orientation variables are: the Export share of GDP (X), the Import share of GDP (M), and the ratio of total trade to GDP (TRD). The base coefficient is the estimated coefficient from the regression with the trade orientation variable only when the dependent variable is the Investment share of GDP (INV) and without other I variables. The high and the low coefficients are derived from the regressions with the extreme high bound (coefficient plus two Std.), and extreme low bound (coefficient minus two Std.) respectively. The Z variables are the additional variables used in the regression to produce the two extreme bounds. The final column indicates whether the relationship between the dependent variable (INV) and the trade variable is robust. The number of observations (countries) is constantly 92 in all regressions, and the critical t-value is well above 2.

large extent to capital accumulation and openness can indeed improve it. This finding may also account for failing to detect a robust relationship between the export relationship of GDP (X) and the growth of per capita GDP (GYP), when controlling for the share of investment in GDP (INV).

Figure 1 graphically illustrates the relationship between the average investment share of GDP (INV) and the export share of GDP (X), with the correlation coefficient calculated to be 0.4728.

Similarly, Figure 2 graphically shows the relationship between the average investment share of GDP (INV) and the ratio of total trade

(X+M) to GDP (TRD), with the correlation coefficient calculated to be 0.489.

In most theoretical discussions, openness is assumed to improve an economy's allocation of resources, since under an import substitution policy, domestic industries produce using more resources at a higher cost. The relationship between trade indicators and investment share depicted in Figures 1 and 2 suggests however, that there may be other factors, in addition to openness, which encourage economic growth, such as the increased per capita availability of capital, as well as the transfer through international trade mechanisms of real factor resources which may be in scarce supply, especially in LDCs.

Figure 1
Investment share of *GDP* (*INV*) vs. Export Share of *GDP* (*GX*)

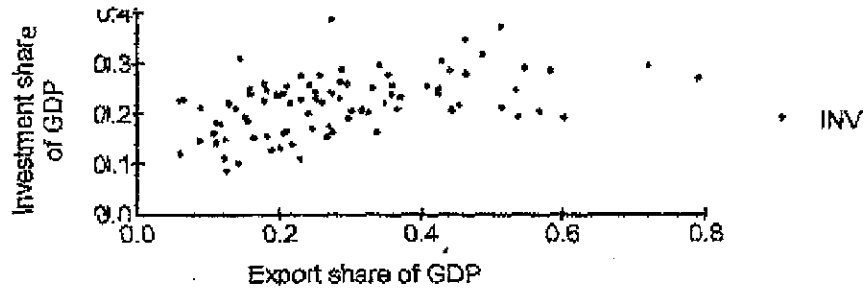


Figure 2
Investment Share of *GDP* (*INV*) vs. the ratio of total trade *IX+MI* to *GDP* (*TRD*)



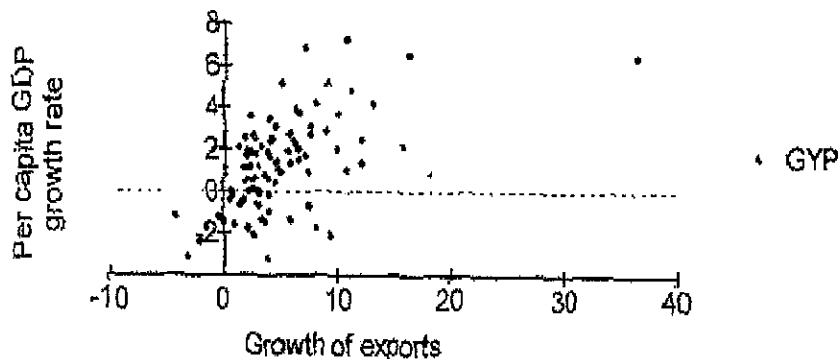
The next question therefore to be addressed should be the investigation of the relationship between the growth of exports (*GX*) and the per capita GDP growth rate (*GYP*), within Dollar's (1992) "Openness Index" depicted earlier in Table 2.

As mentioned earlier, Dollar (1992) discovered that growth of exports, on the average, was higher in most outward-oriented developing countries which he classified as the "most open to international trade," with an export yield of 7.4 percent on the average. Countries falling in

the most inward-oriented, least open quartile produced a "poor" average export growth rate of approximately 3.7 percent.

Figure 3 plots the average annual growth rate of per capita *GDP* (*GYP*) against the average growth rate of exports (*GX*) for the period 1974 to 1989, and for all 92 countries in Dollar's Openness Index. Numerically, this clear relationship can be summarized by looking at the Pearson Correlation coefficient of approximately 0.58, which implies a sufficiently strong, positive, linear relationship between *GYP* and *GX*.

Figure 3
Per capita Growth rate of GDP (GYP) vs. Growth of Exports (GX)



These results therefore, seem to confirm the hypothesis of this study on the effect of the export growth rate (*GX*) on national economic performance in terms of economic growth.

Another important feature of the average export growth as a proxy for a trade orientation of openness, is the sufficiently high R^2 which fluctuates around 0.59 in all regressions where the export growth variable is included. This suggests that approximately 59 percent of the variation in economic growth rates of developing countries can be explained by the variations in the four *I* variables and export growth rates. Even though this percentage level, statistically speaking, is not impressive, it is considered satisfactory given the fact that the literature cites over fifty variables that have at least some explanatory power over variations in economic growth rates.

The causality issue could also be possibly argued, since it is not clear whether it is export growth that causes output and income expansion, or the other way around. However, as Ballassa (1982) concluded, it is precisely the expansion of exports AND the resulting economic growth that have been the ultimate results of export promo-

tion incentives as applied to outward oriented trade strategies, which renders the causality issue almost irrelevant.

Conclusion

In this study, we have managed using Extreme Bounds Analysis to establish a positive and robust relationship between average economic growth rate and the pace at which exporting activity grows. Another finding is that there is an equally robust but negative relationship between average economic growth rates and the real exchange rate distortion index, as well as a positive and robust effect between the export share of *GDP* with the investment share in *GDP*, which in turn is robustly linked to output growth and *GDP* expansion.

Economic growth therefore, does require and does depend on openness and outward orientation, and that is why trade policies such as export promotion incentives taking advantage of lucrative foreign markets, are increasingly becoming a must among *LDCs*. Furthermore, developing economies that promote openness, were not only associated with higher export growth rates but also more stable real exchange rates,

because the maintenance of a stable and non-fluctuating real exchange rate are a *sine qua non condition* for openness and economic growth and development.

Openness is also essential in order to attract foreign investment, which, as the findings convincingly pointed out, can be a very decisive factor in an economy's overall economic performance. Therefore, it becomes apparent that countries should seek policies that promote not only openness, but also policies that promote capital accumulation and direct foreign investment by high-tech firms that would in turn benefit the process of overall economic growth. Only an open economy has the opportunity to freely export and import technological innovation and knowledge and ultimately improve the level of efficiency to exploit its resources and factor productivity.

Suggestions for Future Research

Although, theoretically speaking, there is no doubt that greater outward orientation improves the pace at which economies are growing, empirically there have always been difficulties with fully capturing the quantitative effects of various trade policies. Therefore, an important challenge that lies ahead, is to obtain more effective measures of trade policy and degrees of openness than Dollar's "openness index", which will enable future researchers to investigate more accurately the mechanisms through which outward looking strategies such as export promotion impact economic growth. □

References

1. Balassa, Bela, *Development Strategies in Semi-Industrial Economies*, World Bank, Johns Hopkins University Press, 1982.
2. Ballasa, Bella, "Disequilibrium Analysis in Developing Economies: An Overview," *World Development*, Vol. 10, December 1982, pp. 1027-1038.
3. Balassa, Bela, "Exports, Policy Choices,

- and Economic Growth in Developing Countries After the 1973 Oil Shock," *Journal of Developmental Economics*, Vol. 18, No. 1, March 1985, pp. 23-25.
4. Balassa, Bela, "Policy Responses to Exogenous Shocks in Developing Countries," *American Economic Review*, Vol. 76, No. 2, 1986, pp. 75-78.
5. Barro, Robert J., "Economic Growth in a Cross Section of Countries," *The Quarterly Journal of Economics*, Vol. 106, May 1991, pp. 407-443.
6. Berger, Peter L., Gastil, Raymond Duncan, and Weigel, George, *The Structure of Freedom Correlations, Causes and Cautions: Essays*, Neuhaus, Richard John, ed., Grand Rapids, Mich.: W.B. Eerdmans Publishing Company, 1991.
7. Chenery, Hollis Burnley, Robinson, Sherman, and Syrquin, Moshe, *Industrialization and Growth*, World Bank Publication, New York, NY: Oxford University Press, 1986.
8. Dollar, David, "Outward-Oriented Developing Economies Really Grow More Rapidly: Evidence From 95 LDCs, 1976-1985," *Economic Development and Cultural Change*, Vol. 40, April 1992, pp. 523-544.
9. Dollar, David, *Competitiveness, Convergence, and International Specialization*, Cambridge, Mass: MIT Press, 1993.
10. Krueger, Anne O., *Liberalization Attempts and Consequences*, National Bureau of Economic Research, Cambridge, Mass: Ballinger Publishing Company, 1978.
11. Levine, Ross and Renelt, David, "A Sensitivity Analysis of Cross-country Growth Regressions," *The American Economic Review*, Vol. 82, September 1992, pp. 942-963.
12. Michaely, M. "Exports and Growth: An Empirical Investigation," *Journal of Development Economics*, Vol. 4, March 1974, pp. 49-53.
13. Solow, Robert, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, February 1956, pp. 65-94.

14. Solow, Robert M., "Is the End of the World at Hand?," *Challenge*, March-April 1973.
15. Solow, Robert M., "Discussion: Economic Development and the Development of Economics," *World Development*, Vol. 11, October 1983, pp. 891-893.
16. Solow, Robert M., "Perspectives on Growth Theory," *Journal of Economic Perspectives*, Vol. 8, Winter 1994, pp. 45-54.
17. Summers, Robert, and Heston, Allen, "The Penn World Table: An Expanded Set of International Comparisons, 1950-1988," *The Quarterly Journal of Economics*, Vol. 106, May 1991, pp. 327-368.

Appendix
Description of variables

CIVL	Index of Civil Liberties
GDC	Growth rate of Domestic Credit
GOV	Government Consumption share of <i>GDP</i>
GPO	Growth of Population
GX	Growth of Exports
GYP	Growth of per capita <i>GDP</i>
INV	Investment share of <i>GDP</i>
M	Import share of <i>GDP</i>
PI	Average inflation of <i>GDP</i> deflator
REVC	Number of revolutions and coups per year
RERD	Real Exchange Rate Distortion
INIT	Real <i>GDP</i> per capita in 1974
LOGINIT	Logarithm of <i>INIT</i>
SCOUT	Dummy for outward orientation based
SED	Secondary enrollment rate 1970
STPI	Standard Deviation of <i>PI</i> (inflation)
STDC	Standard Deviation of <i>GDC</i> (growth of domestic credit)
TRD	Ratio of total trade (<i>X+M</i>) to <i>GDP</i>
TRDI	Initial value of <i>TRD</i> in the time period
X	Export share of <i>GDP</i>

Notes