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Does The Degree of Openness of an Economy Affect its Economic Growth?

Openness and Growth: A Panel Data Analysis for Developing Countries

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Executive Summary

The issue of trade liberalisation has gained much attention in the past few decades. Many studies have been conducted to ascertain the effects of such commercial policies. However, no universal conclusion has been reached. The reasons can be numerous. The empirical methods employed in such studies have been many, the measure of the degree of openness have not been uniform and the data used have often required agile manipulation due to missing information.

This study contributes to the discussion in that it employs two different measures of openness and makes use of panel regression for a sample of ten developing countries during a period of twenty years 1969-1989.

The first measure of the degree of openness is of relatively simple form. The measure is the ratio of the sum of exports and imports to GDP. This measure gives an insight about the role that international trade plays in the GDP. Because this measure does not encompass the problem of endogeneity of the degree of openness in the model, a second measure using instrumental variables has been constructed as a proxy. This proxy is based on geographic characteristics.

The empirical analysis consists of an estimation of two equations. The first equation attempts to capture the relationship between the dependent variable GDP per capita and six independent variables (GDP per capita in the initial period, secondary school enrollment, terms of trade, ratio of investment to GDP, degree of openness and population growth). Because there is believed to be a dynamic misspecification, a second equation including lagged variables is estimated.

The findings indicate that the degree of openness has different effects on the economic growth of each country. The results show that only in three out of the ten countries has the degree of openness had a positive significant impact on GDP per capita. Moreover, the degree of openness has had a negative significant effect in one country, and was not significant in six countries. Consequently, the analysis is not able to show satisfactory results and hence remains unable to answer the question whether increased trade liberalisation affects economic growth.

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Section I - Introduction

The reasons why one could be interested in the matter of free trade are numerous. With the recent developments during the summit of the Americas, the question of increased trade liberalisation, particularly concerning the less developed countries, has gained much media attention as a result of increased concerns voiced by the general public. Although these concerns were demonstrated in a form that all may not agree with, the fact that the issue was raised is a commendable one. More than 80% of the world's population lives in about 140 countries classified as less developed countries (LDCs)¹.

For decades now, there have been ongoing debates regarding the benefits and drawbacks of increased trade liberalisation, particularly concerning less developed countries. The recent formations of free trade areas and economic unions have only added to the discussions in the matter. Industrialised countries are speeding up the pace of trade reforms, but should the developing countries follow their lead?

The general belief is that trade liberalisation which fosters an increasingly competitive environment leads to a more efficient allocation of resources. A better allocation of resources, on the other hand, promotes constant innovation and a higher level of productivity and thus reinforces the overall benefits of freer trade.

Another aspect of trade liberalisation is the decrease in government intervention. Particularly in the case of developing countries, protectionism has proven to be quite costly. Governments who have encouraged import-substituting industries have realised that the benefits of import substitution are short lived and the drawbacks prolonged. By import substitution is meant the development of domestic industry behind a high protective barrier of tariffs, quotas and licences². The already scarce resources were misallocated towards industries where they could never achieve a sustainable advantage and the other sectors had suffered irreparable damage.

Trade reforms have also increasingly become conditions in order for developing countries to be eligible for foreign financial aid. The increased pressures from such lending organisations as the World Bank and the International Monetary Fund on developing countries to diminish the barriers to trade, have raised awareness on the necessity to find an answer to the question: « Does an increased level of openness lead to higher economic growth? »

The present study will shed some light on the matter and attempt to answer the above underlined questions. To begin with, a detailed analysis of previous literature on

¹ Kasliwal, P. (1995), *Development Economics*, South-Western College Publishing, Cincinnati, Ohio.

² Dornbusch, Rudiger (1992), "The Case for Trade Liberalization in Developing Countries", *Journal of Economic Perspectives*, vol.6 no.1, Winter 1992

the matter will be presented in order to demonstrate the variety of methods that have been used along with their strengths and weaknesses. Second, an overview of the theoretical framework will be presented to better explain how this study differs from previous studies and to demonstrate how it contributes in the field. Third, results from the estimations will be shown. Last but not least, a conclusion will be drawn and some suggestions for future work on the subject will be made.

Section II - Problem Overview

Since the attention will be drawn to the case of less developed countries, it is important to define what constitutes the overall criteria distinguishing developing countries from developed countries. Developing countries are defined as countries whose incomes are less than 8,355 \$ per capita per annum (World Bank, 1994).

Currently more than 80% of the world's population lives in about 140 countries classified as less developed countries (LDCs)³. The problem of poverty and inequity as we can see has yet to be resolved. At the onset of the twenty-first century, it is difficult to imagine that such a large portion of the world population lives in such mediocre conditions; suffering from malnutrition, disease, predominantly uneducated and often live in war-like conditions.

The gap between the living standards of less developed countries and the developed countries is of such magnitude that one has difficulty imagining what can be done to remedy this scenario. For a very long time, the general belief was that less developed countries must first industrialise in order to be able to catch up to the richer countries. The view was that through extensive protectionist barriers to trade, domestic industries of LDCs would be able to develop and grow. Thus, reducing the demand for imports, promoting self-sufficiency and in the hope that in the future, LDCs would be able to compete on the international market along side the developed countries. However, such import-substitution policies had not led to the desired results. Those policies had first and foremost led to an important misallocation of resources to sectors where LDCs could never gain a sustainable advantage and away from sectors where they had a comparative advantage or were simply crucial for subsistence. Since import-substituting policies had not proven effective, the issue remains, to what extent should developing countries liberalise their trade?

For the majority of developing countries, tariffs on imports represent an important portion of government revenue. Developing countries often lack the needed infrastructures to be able to obtain that same revenue from other sources. In addition, it would be impossible for countries to be able to maintain tariffs on imports without any repercussions on their own exports. In a large part, developing countries have maintained their trading patterns with past colonisers. In such a situation, developing countries are often obligated to import at higher prices from past colonisers since the latter are their main export patrons.

This leads to yet another issue of concern. Namely, if developing countries liberalise their trade, they will be left to the mercy of developed countries. Developed countries would be free to exploit them without any consequences. It has been reported, for example, that numerous American multinationals have set up manufacturing plants in

³ Kasliwal, P. (1995), Development Economics, South-Western College Publishing, Cincinnati, Ohio.

poor countries and have produced at minimal production and operating costs by underpaying employees, making use of child labour and non existing pollution restrictions while earning astounding profits.

Hence, the reasoning behind the increased pressures on developing countries to liberalise their trade seems to somewhat become clear. However, the issue is not that simple. Developing countries that have liberalised their trade early on seem to have improved their situation and have joined the ranks of developed countries. Tariffs and quotas have also led to price distortions on domestic products, so the elimination of barriers to trade would lead to prices being determined solely by the market and thus improving the purchase power parity of the constituents. Trade liberalisation would also allow the servicing of a larger market share thus benefiting industries that have increasing returns to scale and consequently improving efficiency in production processes but also in resource allocation.

There is another important issue that requires mentioning. Many international-lending organisations require developing countries to liberalise their trade in order to be eligible for financial aid. The reasoning behind this is that increased openness creates an international interdependency and permits lending organisations to view the macroeconomic mechanics in place within a country. Through openness is created a certain transparency of the policies adopted at the national level that otherwise would be difficult to directly observe. When bestowing substantial amounts of financial aid, creditors want to be sure that the money is well spent and will lead to the desired purpose. This is brought by the fact that in most of the developing countries there is much corruption⁴.

The reasons why developing countries should or should not liberalise are diverse especially since the individual situations are often very different. Taking these differences into account is difficult and it often becomes necessary to treat the matter in a case by case form making studies limiting, expensive and extremely time-consuming. It would be greatly beneficial to be able to generalise the effects of trade liberalisation. Moreover, with the increasing pressures and deadlines at which trade reforms are taking place it would be would very rewarding to find a universal conclusion regarding the effects of freer trade on the developing world.

⁴ Mauro, P. (1997) Why Worry about Corruption?, Economic Issues, IMF, Washington D.C.

Section III - Literature Review

The first article that is reviewed is that untitled "Outward-oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-1985" by David Dollar, *Economic Development and Cultural Change*, 1992.

This study examines the sources of growth from 95 developing economies during the period 1976-1985. Dollar makes use of a cross-section index of real exchange rate distortion, using the international comparison of prices prepared by Summers & Heston (1988) as a measure for outward orientation. What he finds is that Asian economies exhibited more stability of the real exchange rate than their Latin American and African counterparts. Latin America was on average overvalued by 33% relative to Asia during this period and Africa was overvalued on average by 86% relative to Asia. Hence, the generalisation that Asian economies were more outward oriented was found to hold for this relatively large sample. The main finding resulting from the cross-section analysis was that there existed a significant, negative relationship between distortion in the real exchange rate and growth of per capita GDP after controlling for exchange rate variability an investment level. The estimated benefits of more outward oriented trade policies to Latin American and African economies reached increases of 15-21% in per capita GDP growth if these economies shifted their trade policies to resemble those followed by Asian economies.

This article contributes to the topic of trade liberalisation in that it estimates the general benefits of outward orientation. However, it is interesting to examine the different measures of outward orientation, which are discussed in the next article.

The second article that is reviewed is untitled "Openness and Growth: A Time-Series, Cross-Country Analysis of Developing Countries" by Ann Harrison, *Journal of Development Economics*, vol. 48 1996.

In this study, Ann Harrison (1996) tested the nature of the association between growth and the different measures of openness. Harrison discusses past studies that have yet to achieve the same results. Past studies have not all used the same measures of trade orientation. According to Harrison, price comparisons would be the ideal measure of the impact of trade policy. Comparing prices charged on the domestic market to those charged for the same goods on the international market would provide very useful information regarding the level of price distortions created by such trade policy instruments as tariffs and quotas. However, because information about prices is not readily available, many different proxies have been used but the results have not all led to the same conclusions. As a result, Harrison gathered as many different measures of openness as were available for a cross-section of developing countries over time, and tested whether these measures generally yielded the same results.

In order to create pure cross-section estimation across countries, period averages were computed for each country. The openness measures under examination were trade reform (1960-84), trade reform (1979-88), black market premium, price distortion, and movement towards international prices, trade shares, and disprotection of agriculture. The main findings were the following that the choice of the time period for analysis is crucial. Whereas only one of the seven openness measures positively affects growth when cross-section data are used, three of the seven proxies for openness demonstrate a positive relationship with growth when the data are averaged over five-year periods, and six of the measures are statistically significant using annual data.

Now that different proxies for openness have been mentioned, it is interesting to focus on why the degree of openness influences economic growth and this will be at the centre of the next article.

The next article is untitled "Why Trade Liberalisation is Good for Growth" by Anne O. Krueger, *The Economic Journal*, September 1998.

In this paper, Anne Krueger (1998) discusses the arguments as to why an outer-oriented trade strategy has led to more rapid growth. The general belief in the past was that import substitution and rapid industrialisation would be conducive to economic growth. In practice, however, import substitution has led to the misallocation of resources which costs were considerable. Krueger discusses these costs pertaining to developing countries since they are especially sensitive to trade policies.

High protectionism in developing countries has resulted in resources being shifted towards protected industries away from the disprotected industries causing important changes in the production and trading patterns.

Developing countries, having particularly skewed production patterns towards labour-intensive goods, import capital-intensive goods and services. Since capital-intensive goods and services include many investment and intermediate goods, developing countries are dependent upon their ability to import these for their own production processes. Having to pay a higher price for goods now produced domestically has led to higher prices being charged for the final goods produced. This in turn has resulted in a decrease of the demand for these goods, which translated into a slow down in growth.

Another aspect mentioned by Krueger is that developing countries face limited domestic markets since their citizens have low per capita incomes. Protection of production activities in these restrained markets result in certain caveats. Namely, either there must be a very small number of producers or the size of the individual plants must be below the minimum efficient size leading to high-cost, low-quality production.

Krueger also points out that the dynamic losses under import substitution policies far outweigh the static losses.

Krueger does not refute the fact that economies that have liberalised their trade do grow faster but ponders upon the difference between outer-orientation and trade liberalisation. Concluding that trade liberalisation, itself does not achieve sustained growth at rates achieved by truly outer-oriented economies, that support policies such as exchange rate determination are also needed.

Although this article discusses the relationship between the degree of openness and economic growth, there are issues remaining regarding the direction of the relationship as well as the causality. Hence, the next article uses a method to correct for the endogeneity of the degree of openness.

The following article reviewed is untitled "Does Trade Cause Growth?" by Jeffrey A. Frankel and David Romer, *American Economic Review*, June 1999.

Frankel and Romer (1999) had conducted an empirical investigation of the impact of international trade on standards of living. In order to by-pass the problem of trade being endogenous to the model, they had used geographic characteristics to construct instrumental variables estimates of trade's impact on income. The characteristics that were employed were: countries' size, their distance from one another, whether they shared a border, and whether they were landlocked. The use of geographic characteristics had permitted them to ensure that the instrument depended only on the geographic characteristics and not on trading patterns or their incomes. For comparison purposes, they had also used the Ordinary Least Squares method so to see if there was a considerable difference between the results obtained using the instrumental variables method and that of OLS.

To construct the instrument for international trade, Frankel and Romer first estimated a bilateral trade equation after which they aggregated the fitted values of the equation to estimate a geographic component of countries' overall trade. They then estimated cross-country regressions of income per person on international trade and country size by the instrumental variables method and compared the results to those obtained through the use of OLS.

The findings were that there was no evidence that the positive association between international trade and income arose because countries whose incomes were higher for other reasons engaged in more trade. The point estimates suggested that the impact of trade was substantial. The typical specification implied that raising the degree of openness by 1% increased income per capita by 1.5 to 2%. The estimates also implied that increased country size increased income. This supports the stylised fact that the larger the country, the larger is its within-country trade, which also leads to a higher level of income. The large estimated positive effects of trade and size were robust to changes in specification, sample, and construction of the instrument. However, the impacts of trade and size were not estimated very precisely.

Because the articles outlined thus far have employed either time-series or cross-section methods of statistical analysis and the present study examines a set of ten countries for a time period of twenty years, it is necessary to examine the methodology of time-series – cross-section, in other words a panel regression. The subsequent article of interest makes use of panel regressions.

The last article reviewed is untitled “ Trade Reform, Adjustment and Growth: What Does The Evidence Tell Us?” by David Greenaway, Wyn Morgan and Peter Wright, *The Economic Journal*, September 1998.

Greenaway, Morgan and Wright (1998) have used a very large database and a panel framework together with a range of openness measures to examine the dynamics of trade reform. According to the authors, there are three essential concepts of liberalisation. The first concept is the removal of import tariffs. The second concept is based upon the notion of reducing anti-export bias. The third concept is what they call ‘second best’ liberalisation, where one instrument of governmental intervention is simply replaced by another.

The testing of the relationship between liberalisation and growth is two-part. First, Greenaway, Morgan and Wright specify the model, which takes on the following form:

$$\Delta \ln y_{i,t} = \beta_1 \ln y_{i,65} + \beta_2 SCH_{i,65} + \beta_3 \Delta \ln TTI_{i,t} + \beta_4 \Delta \ln POP_{i,t} + \beta_5 (INV/GDP)_{i,t} + \beta_6 LIB_{i,t} + \Delta \epsilon_{i,t}$$

where

$y_{i,t}$	= GDP per head
$y_{i,65}$	= GDP per head as at 1965
SCH 65	= level of secondary school enrollment as at 1965
TTI	= terms of trade index
POP	= population
INV/GDP	= the ratio of gross domestic investment to GDP
LIB	= dummy capturing liberalisation episode
$\epsilon_{i,t}$	= error term

This type of model has been widely used. However, because of beliefs that it may be dynamically misspecified, the authors used a second estimating equation, which is of the form:

$$\Delta \ln y_{i,t} = \alpha \Delta \ln y_{i,t-1} + \beta_1 \ln y_{i,65} + \beta_2 SCH_{i,65} + \beta_3 \Delta \ln TTI_{i,t} + \beta_4 \Delta \ln POP_{i,t} + \beta_5 (INV/GDP)_{i,t} + \beta_6 LIB_{i,t} + \Delta \epsilon_{i,t}$$

where y_{t-1} are lags of GDP per head. The advantage of this is of that it can capture growth in a dynamic context so it is possible that liberalisation may have short-run and long-run effects. Since there is a correlation between the error term and the lagged dependent variable, the second equation was estimated using the method of Generalised Methods of Moments estimator. This method used the fact that values of y lagged two periods or more were valid instruments for the lagged dependent variable.

Greenaway, Morgan and Wright made use of three different measures of liberalisation, those of Sachs and Warner (1995), Dean et al. (1994) and that of the World Bank (1993).

The Sachs and Warner measure of liberalisation is based on five criteria pertaining to non-tariff barriers, average tariff levels, the black market exchange rate, whether public monopolies exist for major exports and whether the economy is a socialist one or not.

The Dean et al. measure of liberalisation is based on information regarding average nominal tariffs and the average black market premia to capture when a reform has taken place. Since differences in income arise following Structural Adjustment Loans (SALs) of the World Bank, the authors equated the first year of a SAL with a trade component as the beginning of the liberalisation episode. Although this did not resolve all the complications regarding this last measure, it gave the possibility of using a proxy for trade reforms initiated by the World Bank.

It was found that a low initial per capita GDP and high initial level of schooling ratio were associated with a more rapid growth in GDP per capita as were a higher investment ratio and favourable terms of trade movement using the Sachs-Warner index. It was also found that higher population growth slows down per capita GDP growth, and that liberalisation has on average a significant positive effect on growth in years following liberalisation.

Using the Dean et al. Index, the results were similar. Liberalisation had a positive effect on growth but only at the 90% significance level.

Using the SAL indicator, the results again were similar to those obtain with the previous two indicators. The liberalisation proxy indicates an improvement in per capita GDP growth but of a smaller magnitude then previously found and at a lower significance level.

Section IV - Methodology

I - Theoretical Framework

The framework used is that of David Greenaway, Wyn Morgan and Peter Wright (1998). In their 1998 study titled «Trade Reform, Adjustment and Growth», Greenaway, Morgan and Wright used a panel analysis of liberalisation and growth.

A panel data set is defined as being of cross-section and time series dimension. A panel data set permits to observe the same set of variables over a longer period of time. In this case, a set of ten countries will be followed for a period of twenty years.

The period of interest is 1969-1989. The sample consists of 10 countries. The countries chosen are the following: Egypt, Kenya, Mali, Morocco, Nigeria, Senegal, Honduras, Peru, Bangladesh, and the Philippines.

The countries that have been chosen to take part in the present study have been selected in a relatively random fashion. That is, they have been selected randomly within the long list of developing countries and not according to whether or not complete data was available for those particular countries. Because of the lack of data for some countries within the set selected, it has been necessary to extrapolate some data, either by taking geometric averages or by taking the region averages.

Throughout the years, different studies examining the effects of trade liberalisation on economic growth have made use of various measures of openness and it is that, which has led to divergent conclusions about the effects of trade liberalisation. In an attempt to correct this common drawback, two different measures of openness will be used in the present study.

The first measure will be the relative share of international trade in terms of the GDP, which will be calculated as the ratio of the sum of exports and imports to the GDP. However, because of the possible endogeneity of the openness measure, a method of two-stage generalised least squares method will be used to correct the possible dynamic misspecification.

However, there is one critical issue that needs to be addressed. Namely, the endogeneity of the liberalisation measure. It is difficult to identify the causality between GDP growth and level of trade liberalisation. Do richer countries trade more or do countries that trade more become richer? Because the method of panel data method does not solve the problem of time varying omitted variables that are correlated with the explanatory variable, the method of instrumental variables will be used.

The instrumental variable method constructs a new variable that can be used as a proxy. The proxy is exogenous, meaning uncorrelated with the exogenous explanatory

variable, and is partially correlated with the endogenous explanatory variable. To construct the instrumental variable for the degree of openness, the empirical study by Frankel & Romer (1999) is used.

Hence, the second measure of the degree of openness is obtained through the method of instrumental variables. Geographic characteristics such as country size, distance from one country to other, whether the country is landlocked or not, whether the country shares a border and the length of the coastline are used to examine the impact of international trade on the economic growth.

II - Empirical Framework

As mentioned, the model used is that of Greenaway, Morgan and Wright (1998). The first equation thus takes the form:

Equation 1

$$\Delta \ln y_{i,t} = \beta_1 \ln y_{i,69} + \beta_2 SCH_{i,t} + \beta_3 \Delta \ln TTI_{i,t} + \beta_4 \Delta \ln POP_{i,t} + \beta_5 (CI)_{i,t} + \beta_6 OPEN_{i,t} + \Delta \varepsilon_{i,t}$$

where:

$y_{i,t}$	= GDP per head
$y_{i,69}$	= GDP per head in 1969
SCH	= level of secondary school enrollment
TTI	= terms of trade index with TTI in 1968 being equal to 100
POP	= population in thousands
CI	= the ratio of gross domestic investment to GDP
OPEN	= openness indicator
$\varepsilon_{i,t}$	= error term

Controlling for correlation among the dependent variable and the error term will require the use of a second equation that will aid to correct the dynamic specifications of the model.

The second equation is of the form:

Equation 2

$$\Delta \ln y_{i,t} = \alpha \Delta \ln y_{i,t-1} + \beta_1 y_{i,69} + \beta_2 SCH_{i,t} + \beta_3 \Delta \ln TTI_{i,t} + \beta_4 \Delta \ln POP_{i,t} + \beta_5 (CI)_{i,t} + \beta_6 OPEN_{i,t} + \Delta \varepsilon_{i,t}$$

In these above equations, the openness indicator is the ratio of the sum of exports and imports to the GDP. In order to encompass the problem of endogeneity, a proxy for the openness indicator is constructed. This proxy is based upon geographic characteristics such as country size, distance from one country to other, whether the country is landlocked or not, whether the country shares a border as well as the length of the coastline. These geographic characteristics are used to examine the impact of international trade on the economic growth.

A distinction from the Greenaway, Morgan and Wright model is that the level of secondary schooling is taken for all the years observed and not as a benchmark for the starting year.

Before discussing the empirical results obtained, it is necessary to mention the expected results. These expectations are the following: the level of secondary enrollment, the terms of trade, the ratio of investment to GDP should have positive effects on GDP per capita. The initial level of GDP per capita in 1969 and the lagged income level should

have negative effects on per capita GDP (R.J. Barro, 1991). The population level should also have a negative effect on per capita GDP since the growth in population decreases GDP per capita if the latter does not grow more rapidly.

In terms of the effects of the measure of openness, it is expected that the measure of openness should have a positive effect on economic growth. The positive impact is expected because of the increased international pressure on developing countries to liberalise their trade as well as the increased formation of new free trade zones.

The results of the estimation of the first equation are reported in Table 1 untitled "Seemingly unrelated regression – Equation 1", which reports the results obtained after a panel data set has been regressed. What can immediately be observed is that certain variables are shown to be significant for the majority of the sample of countries while other variables are more dispersed in their level of significance within the sample.

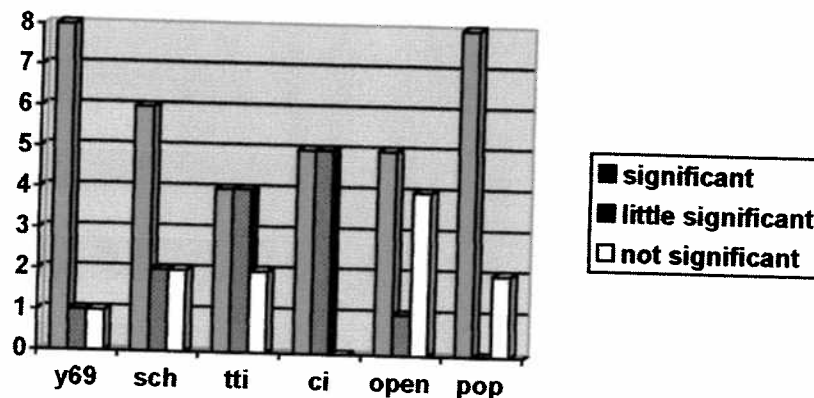
Table 1 "Seemingly Unrelated Regression – Equation 1"

Independent variable	Egypt	Kenya	Mali	Morocco	Nigeria	Senegal	Honduras	Peru	Banglad	Philipp
Y69	-1.1199 (-3.282)	.49646 (1.270)	.00521 (.037)	.32590 (2.062)	2.5848 (9.227)	2.0092 (16.605)	1.11544 (12.366)	16.481 (9.129)	-.44226 (-1.234)	.89854 4.787
SCH	-.59970 (-2.493)	.06702 (1.149)	.02488 (.560)	.26488 (4.848)	.27716 (3.919)	.89457 (10.808)	.292748 (7.991)	-.47797 (-.527)	-.96214 (-5.328)	-.22537 -1.304
TTI	.347345 (1.772)	.07946 (1.180)	.19953 (2.852)	.07092 (1.854)	.25625 (2.852)	.118329 (2.711)	.022616 (.371)	5.0854 (3.085)	.402087 (1.423)	-.10020 -1.899
CI	.017313 (1.182)	-.00949 (-3.242)	-.02048 (-1.902)	.01128 (4.124)	.00472 (1.109)	-.02794 (-6.093)	-.004427 (-1.710)	.19612 (4.262)	-.023907 (-1.072)	.02452 8.505
OPEN	-.00124 (-0.883)	.00640 (4.128)	-.00573 (-6.510)	-.00216 (-1.970)	.00172 (.765)	-.00041 (-1.011)	.003937 (3.412)	-.05633 (-1.595)	.000054 (.011)	.00406 2.263
POP	1.77519 (3.112)	-.31580 (-2.248)	.041055 (.322)	-.41439 (-2.120)	-2.3278 (-9.274)	-2.5709 (-13.196)	-1.01311 (-9.729)	-14.526 (-6.349)	1.5939 (4.545)	-.21224 -.658

* t-ratio is shown between brackets

The variables that have been found to be significant for most of the variables are the initial GDP per capita in 1969, the secondary enrollment, the degree of openness and the population level. The variables whose significance has been more dispersed are the terms of trade index and the ratio of investment to GDP.

Figure 1 “Level of Significance of the Variables Modelled – Equation 1”



Because we are particularly interested in the impact of the degree of openness on GDP per capita, we can see that the openness indicator is only significant in five of the ten countries. Hence, the results of this panel regression are somewhat disappointing in that we would like to obtain results where all variables are relatively significant whether the relationship with GDP per capita be positive or negative.

What is observed is that, in general, the initial level of per capita GDP in 1969 has a positive impact on income per head in the sample.

The secondary school enrollment, on the other hand, has a positive effect for almost five of the countries, negative for three countries, while not having any impact on the income per head in Mali and Peru.

The terms of trade index has overall a positive effect on income per head for 8 of the countries and a negative slightly significant effect on income per head in the Philippines and no effect on GDP per capita in Honduras.

The effects of the ratio of investment to GDP are more mixed. In five of the countries, the effect is positive while in five the effect is negative.

For the indicator of the degree of openness, which is the main interest of this study, the results are also varied. In three of the ten countries, the degree of openness has a positive effect, on another three it has a negative effect and has no effect on the remaining four, which are Egypt, Nigeria, Peru and Bangladesh.

The effect of the population level is much more prevailing. The population level has a negative effect on six of the ten countries in the sample, has a positive effect on only two countries and no effect on Mali and the Philippines.

In the table reporting the results obtained as a result of the first panel regression, the effects of the variables on the income level are demonstrated for each of the ten countries. What can be observed for Egypt is that the initial level of per capita income has a significant negative impact on GDP per capita, that secondary school enrollment also has a significant negative effect and that the population level has a significant positive effect. The remaining variables do not have a significant impact at the 5% significance level.

In the portion showing the findings obtained for Kenya, we can see that the results are somewhat different. The level of per capita GDP in 1969 has a significant positive effect on revenue per head, moreover, the ratio of investment to GDP has a significant negative effect, the degree of openness has a significant positive effect and the population has a significant negative effect. The remaining two variables are not significant.

For Mali, on the other hand, the terms of trade index has a significant positive effect and the investment to GDP ratio and the degree of openness both have a significant negative effect.

For Morocco, we can see that almost all of the variables have a significant effect on GDP per capita. The initial level of per capita GDP, secondary enrollment as well as the ratio of investment to GDP all have positive significant effects. However, the degree of openness and the population both have a significant negative effect.

In the case of Nigeria, the initial level of per capita GDP has a very significant positive impact on the level of income per head. The level of secondary enrollment and the terms of trade index also have a positive significant effect.

For Senegal, five of the variables have a significant effect. The GDP per capita in 1969, secondary enrollment and the terms of trade index all have a significant positive effect on income per head. On the other hand, the ratio of investment to GDP as well as the population level, both have a significant negative effect.

In the case for Honduras, we observe that the GDP per capita, secondary enrollment and the degree openness have positive significant effects. Whereas, the population level has a significant negative effect on GDP per head.

For Peru, there are four out of the six variables are significant at the 5% level of significance. The initial level of GDP per capita in 1969, the terms of trade index and the ratio of investment to GDP have significant positive effects. The population level has a significant negative effect. The secondary enrollment and the degree of openness are not significant.

For Bangladesh, only two out of the six variables have significant effects. The secondary enrollment variable has a significant negative effect while the population has a significant positive effect. The remaining variables do not have significant effects.

For the Philippines, it can be seen that three out of the six variables modelled have a significant effect on GDP per capita. The secondary enrollment in 1969, the ratio of investment to GDP as well as the degree of openness all have significant positive effects. The remaining variables, on the other hand, do not have significant effects.

The results of the estimation of the second equation are reported in Table 2 “Seemingly unrelated regression – Equation 2”. This equation is estimated in order to correct the believed dynamic misspecification error. The results obtained are quite different, not only does the significance of the obtained coefficients change but in some cases so do the signs.

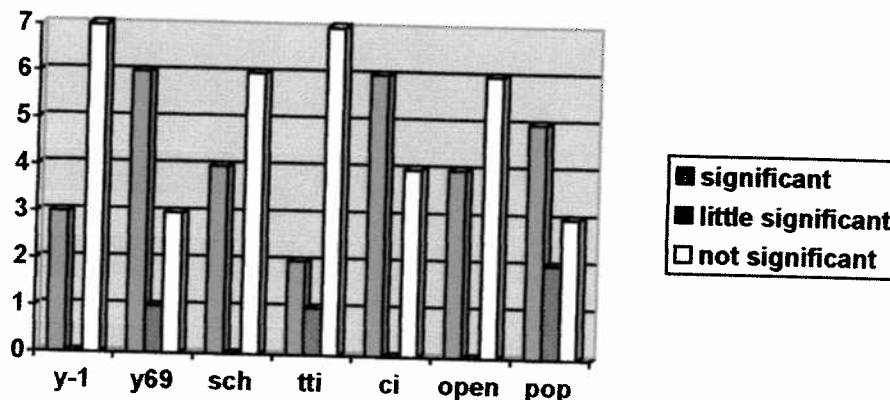
Table 2 “Seemingly Unrelated Regression – Equation 2”

Independent variable	Egypt	Kenya	Mali	Morocco	Nigeria	Senegal	Honduras	Peru	Banglad	Philipp
Y-1	.89199 (7.888)	-.2172 (-.125)	.00202 (.018)	.018818 (.102)	.21771 (1.419)	-.062388 (-.754)	.15956 (.965)	.39544 (2.444)	.188944 (1.439)	.22939 (2.086)
Y69	.20684 (.842)	.57888 (2.290)	-.06754 (-.433)	.327039 (1.665)	2.0689 (4.684)	2.1975 (13.683)	.87282 (3.869)	.85714 (4.823)	-.35101 (-1.003)	.55228 (2.304)
SCH	.037235 (.243)	.08386 (.947)	.018844 (.389)	.239997 (2.974)	.14469 (1.171)	.967955 (9.479)	.215333 (2.947)	.04893 (.788)	-.83396 (-4.073)	-.2312 (-1.382)
TTI	-.05424 (-.457)	.04843 (.727)	.178664 (2.333)	.025128 (.566)	.25204 (2.679)	.102526 (1.802)	.029160 (.462)	.15745 (1.377)	.33033 (1.181)	-.02656 (-.430)
CI	.004082 (.461)	.00330 (-2.930)	-.02801 (-2.263)	.011451 (3.229)	.00197 (.390)	-.029877 (-5.511)	-.002942 (-1.071)	.00969 (3.075)	-.04262 (-1.855)	.02140 (6.643)
OPEN	.00203 (2.190)	.00175 (3.668)	-.00625 (-6.239)	-.00186 (-1.387)	.00209 (.860)	-.000481 (-1.048)	.003431 (2.783)	-.00135 (-573)	.00300 (.599)	.00248 (1.402)
POP	-.17898 (-4.456)	.23554 (-1.615)	.114084 (.816)	-.366900 (-1.601)	-1.7922 (-4.068)	-2.7913 (-11.769)	-.768239 (-3.351)	-.73143 (-4.621)	1.35564 (3.645)	.00822 (.025)

* t-ratio is shown between brackets

The general result is that although adding the lagged income per capita into the equation corrects the dynamic misspecification, fewer variables are now significant at the 5% significance level (Figure 2 “Level of Significance of the Variables Modelled – Equation 2”).

Figure 2 “Level of Significance of the Variables Modelled – Equation 2 “



The lagged income per capita is only significant for three out of the ten countries. It has a positive significant effect for Egypt, Peru as well as the Philippines.

The 1969 level of income per capita has become significant for only six out the ten countries. It has a positive significant effect for Kenya, Nigeria, Senegal, Honduras, Peru and the Philippines.

The secondary school enrollment is now significant for only four out of the ten countries while it had been significant for six in the first regression. The secondary school enrollment has a positive significant effect for Morocco, Senegal and Honduras and a negative significant effect on the per capita GDP of Bangladesh.

The terms of trade are significant for only two countries compared to the previous result of being significant for four countries out of the ten in the sample. The terms of trade have a positive significant effect for Mali and Nigeria.

The ratio of investment to GDP is now significant for six out of the ten countries compared to being significant for only five in the first panel regression. The direction of the relationship between the ratio of investment to GDP and the GDP per capita is harder to generalise. The ratio of investment to GDP has a positive significant effect on the GDP per capita of Morocco, Peru and the Philippines while a negative significant effect for Kenya, Mali and Senegal.

The degree of openness, which is of main interest in this study, has now become significant for only four out of the ten countries while it was significant for five countries in the previous regression. The degree of openness has a positive significant effect for Egypt, Kenya and Honduras while a negative significant effect for Mali. The negative significant effect on the GDP per capita for Mali could potentially be explained by the fact that Mali is the only country in the sample that is landlocked. The fact of being landlocked hinders the diversity in trading partners, which practically constrains Mali to trade with its

surrounding neighbours. The main trading partners are not much more technologically or economically advanced, limiting the transfer of knowledge that is usually present when international trade takes place.

The population level has also become less significant, it is only significant for five countries compared to being significant for eight in the previous regression. The population level has a negative significant effect for Nigeria, Senegal, Honduras and Peru and has a positive significant effect for Bangladesh.

Hence, the second equation might correct the dynamic misspecification but the regression results are weaker and less conclusive.

It is also interesting to mention that the signs are also not those that were originally anticipated. The lagged income level as well as the income level in 1969 should have a negative relationship with economic growth (R.J. Barro, 1991). The secondary school enrollment, the terms of trade and investment to GDP ratio were expected to yield a positive relationship with GDP per capita. The degree of openness was expected to have a positive relationship due to the fact that increased trade liberalisation has become a general tendency in the developed world. The population level was anticipated to have a negative effect on per capita GDP. The faster the population level grows, the less is the per capita GDP, hence, the slower the economic growth.

Although the empirical analysis yield mixed results, all of the variables other than the lagged income level and the 1969 income level generally indicate the anticipated relationships. The lagged income level and the 1969 income level, on the other hand, both yield positive relationships, which is the contrary of what economic theory dictates. This result not only questions the reliability of the empirical analysis but also questions the validity of the growth theory as it applies to developing countries.

In the case of Egypt, there are only two significant variables out of the seven in the equation, the lagged income per capita and the degree of openness. These two variables both are reported to have a positive significant effect on the level of GDP per head while the remainder of the variables have no significant effect.

For Kenya, on the other hand, there is no drastic change. The addition of the lagged income per head does not have a strong effect on the results obtained through the panel regression. The three out of the seven variables have a significant effect. The level of GDP per head in 1969 and the degree of openness both have a significant positive effect on the GDP per capita while the ratio of investment to GDP has a significant negative effect. The other variables have no significant impact. In the results of the estimation of the second equation, the population level has no significant effect on GDP while it had a significant negative effect in the results obtained from the estimation of the first equation.

The second equation has yielded better results for Mali. Only two out of the six variables included in the estimation of the first equation were significant. In the second

estimation three out of the seven variables are significant. The terms of trade are reported to have a positive significant impact while the ratio of investment to GDP and the degree of openness have negative significant effects.

In the case of Morocco, the situation seems to have worsened. In the results obtained from the first regression, five out of the six variables were reported to be significant. In the results obtained from the second regression, only two out of the seven variables are found to be significant. The secondary school enrollment and the ratio of investment to GDP both are found to have a positive significant impact on GDP per head.

For Nigeria, only three of the seven variables are significant at the 95% confidence level while four out six variables were significant in the previous regression. The income per head in 1969 and the terms of trade have positive significant relationships with the GDP per capita. The population level, on the other hand, has a negative significant impact.

The second regression, which included a lagged term for the income level per capita, has lowered the number of significant variables in the case of Senegal. Although five of the six variables were significant in the previous regression, only four out of the seven now have a significant role in explaining the changes in the GDP per head. The income level per capita in 1969 and the secondary school enrollment both are found to have a positive significant effect on GDP per capita. The ratio of investment to GDP and the population level both have a negative significant effect.

In the case of Honduras, not much has changed. There are still four variables that are reported to have a significant relationship with the GDP per capita. The per capita GDP in 1969, the secondary school enrollment and the degree of openness have significant positive effects on the GDP per head. The population level has a negative significant impact at the 95% confidence level.

While four variables were reported to have a significant relationship with the GDP per capita in Peru in the first regression and the second regression, they are not the same variables in both regressions. The lagged income level, the income level in 1969 and the ratio of investment to GDP have a positive significant effect on per capita GDP. However, the population level has a negative significant effect at the 5% significance level.

The results obtained for Bangladesh remain unchanged after the second panel regression. The secondary school enrollment is still reported to have a negative significant effect while the population level a positive significant effect on the GDP per capita.

For the Philippines, the lagged income plays an important role in explaining the GDP per capita, it is found to have a significant positive effect. The 1969 level of GDP per capita, as well as the ratio of investment to GDP are also found to have positive significant effects on the growth of GDP per capita.

In order to correct the problem of endogeneity of the degree of openness, an instrumental variable based on geographic variables was constructed. The geographic variables that were used are the area in square kilometres, the number of bordering countries, whether the country is landlocked or not, the distance from other countries in square kilometres and the coastline length in square kilometres. The terms of trade were also added in the construction of the instrumental variable in order for there to be at least one variable that varies during the course of the time period examined.

The idea of constructing the instrumental variable based on geographic variables was taken from the Frankel & Romer (1999) study. However, Frankel & Romer (1999) had conducted their study only on a single year whereas this paper uses a panel regression methodology and therefore some modifications were made. An Ordinary Least Squares method was used to estimate the following equation:

Equation 3

$$\Delta \text{Open}_{i,t} = \beta_1 \text{tti}_{i,t} + \beta_2 \text{area}_{i,t} + \beta_3 \text{border}_{i,t} + \beta_4 \text{landlocked}_{i,t} + \beta_5 \text{distance}_{i,t} + \beta_6 \text{coastline}_{i,t} + \Delta \varepsilon_{i,t}$$

where

- Open_{i,t} = openness indicator
tti_{i,t} = terms of trade index with TTI in 1968 being equal to 100
area_{i,t} = area in square kilometres
border_{i,t} = number of bordering countries
landlocked_{i,t} = dichotomic variable (if yes = 1, if no = 0)
distance_{i,t} = distance to other countries in square kilometres
coastline_{i,t} = length of coastline in square kilometres
ε_{i,t} = error term

The results of the regression show that almost all of the geographic variables are significant at the 95% confidence level (Table 3 – Instrumental Variable).

Table 3 “Instrumental Variable”

Number of observations = 210

F (6, 203) = 36.91

Prob > F = 0.0000

R-squared = 0.5217

Adj R-squared = 0.5076

Independent variable	Sample
TTI	.0032098 (.0101791)
ARE	3.31e-06 (1.080)
BDR	7.046306 (7.462)
LLD	21.00397 (4.939)
DTC	-.0135044 (-13.536)
CLN	-.0006139 (-5.056)

The number of bordering countries and whether or not the country is landlocked both have a positive significant effect on the degree of openness. The distance from other countries and the coastline both have a negative significant impact on the degree of openness. The terms of trade index and the size of the country are not significant at the 5% significance level. However, due to the fact that the geographic variables do not change over time, the variation in the constructed instrumental variable is minimal (Table 4 – Geographic Openness Indicator). Hence, the constructed instrumental variable can not be used as a proxy for the original degree of openness.

Table 4 “Geographic Openness Indicator”

Year	egyopen	Kenopen	Mliopen	maropen
1969	48.32385	59.0271	45.35398	55.90759
1970	48.32643	59.05016	45.35655	55.90306
1971	48.33422	59.01033	45.36434	55.89681
1972	48.33455	58.98817	45.36467	55.87613
1973	48.3595	58.9786	45.38962	55.86639
1974	48.51183	58.94706	45.54195	55.97568
1975	48.47767	58.92567	45.50779	56.00159
1976	48.5005	58.96114	45.53062	55.92159
1977	48.51696	59.04127	45.54708	55.89883
1978	48.48399	58.9747	45.51411	55.92934
1979	48.54184	58.95354	45.57196	55.95978
1980	48.59638	58.9333	45.6265	55.94277
1981	48.61362	58.90091	45.64374	55.85948
1982	48.60383	58.89236	45.63395	55.84424
1983	48.56169	58.88067	45.59182	55.84496
1984	48.57121	58.91076	45.60133	55.82748
1985	48.5621	58.87669	45.59222	55.83214
1986	48.52737	58.89861	45.55749	55.83463
1987	48.54734	58.86369	45.57746	55.85754
1988	48.53807	58.87091	45.56819	55.85124
1989	48.54718	58.85302	45.5773	55.8967

Conclusion

There have been numerous studies that have attempted to uncover the effects of increased trade liberalisation on developing countries. Their findings have led to mixed results. Widely because the methods as well as the variables that were used were varied. In addition to this, the fact that the data for developing countries is not readily available and its reliability easily questioned, has only added to the difficulty in obtaining a universal answer to the question: Does increased trade liberalisation cause economic growth?

In this study, a panel regression has been used to attempt to find an answer to that question. Ten developing countries were followed for a period of twenty years to observe the influence that has had the degree of openness on their respective growths. Various variables have been modelled in order to better understand their share in the economic growth process as well as better capture the effect of trade liberalisation. The estimation procedure has been two-fold.

The first part of the empirical analysis consisted of regressing per capita GDP, the dependent variable, on per capita GDP in 1969, secondary school enrollment, terms of trade index, the ratio of investment to GDP, the degree of openness and the population level, the independent variables. This estimation yielded mixed results. The variables that have been found to be significant for most of the variables are the initial GDP per capita in 1969, the secondary school enrollment, the degree of openness and the population level. The variables whose significance has been more dispersed are the terms of trade index and the ratio of investment to GDP.

The impact of the degree of openness on GDP per capita is only significant for five of the ten countries. Hence, the results of this panel regression are somewhat disappointing in obtaining results where all variables are relatively significant whether the relationship with GDP per capita be positive or negative.

The second part of the empirical analysis consisted of an estimation of a similar equation but including lagged variables in order to correct the possible dynamic misspecification.

The general result is that although adding the lagged income per capita into the equation corrects the dynamic misspecification, fewer variables are now significant at the 5% significance level. The lagged income per capita is only significant for two out of the ten countries. The 1969 level of income per capita has become significant for only five out of the ten countries. The secondary school enrollment is now significant for only four out of the ten countries while it had been significant for six in the first regression. The terms of trade are significant for only two countries compared to the previous result of being significant for four countries out of the ten in the sample. The ratio of investment to GDP is now significant for six out of the ten countries compared to being significant for

only five in the first panel regression. The degree of openness, which is of main interest in this study, has now become significant for only four out of the ten countries while it was significant for five countries in the previous regression. The degree of openness has a positive significant effect for Egypt, Kenya and Honduras while a negative significant effect for Mali. In other words, not only is the degree of openness not significant for a large portion of countries in the sample but the direction of the relationship to GDP per capita is also unclear. The population level has also become less significant, it is only significant for five countries compared to being significant for eight in the previous regression.

The results obtained from both regressions are disappointing. They do not clearly indicate the relationship between the degree of openness and the per capita GDP for the entire sample of countries.

In order to correct the possible problem of endogeneity, a proxy for the degree of openness was constructed using the instrumental variable method. The instrumental variable was based on geographic variables and the terms of trade index. However, because the method of panel analysis is at the core of this study, it was crucial for the proxy to vary through out time and it did not. Hence, it was impossible to use the instrumental variable as a proxy for the degree of openness.

Because economic growth does not necessarily lead to less poverty or less inequality, increased trade in itself will not lead to the resolution of prolonged economic and social problems of the developing world. Therefore freer trade alone will not lead to stronger economic growth. Additional policies and infrastructures need to be put in place so that the maximum benefits can be drawn with as little as possible negative consequences.

An interesting study would be the effect of increased trade liberalisation on living standards, poverty and inequality. In order to capture full repercussions of freer trade in the developing countries.

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