

# **Trade Openness and Economic Growth: An Empirical Investigation of Mauritius**

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The relationship between trade openness and growth remains a highly debated topic in the growth, trade and development literature. Whilst theory and anecdotal evidence in general favours the notion that openness to trade is positively related to growth, there is gradually, however, an increasing number of studies that have contested this positive generalization. In the light of this, and in recognition of the diversity amongst researchers about the beneficial effects of openness and the interpretation and measurement of openness, this paper aims to investigate, using various proxies for openness ranging from trade outcomes to trade policy and international capital flows, the empirical association between openness to trade and economic growth. To achieve this we investigate these links using time series analysis and Mauritian data. Despite being a small island economy, Mauritius is often hailed as a model country for others to follow as it has had sustained economic growth over the past four decades. Since 1970, its real GDP growth has averaged more than five per cent, and GDP per capita has increased more than tenfold. But is this stellar growth due to deeper international trade links? Our results show that contrary to widely held expectations, there is a negative relationship between openness to trade and growth. This therefore raises the possibility that real economic forces are giving us results consistent with the immiserising growth literature.

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# **Trade Openness and Economic Growth: An Empirical Investigation of Mauritius**

## **1. INTRODUCTION**

The relationship between the trade openness of an economy to growth remains a subject of much controversy and debate. This is not surprising since over time, despite the increasing trade liberalization efforts, there are still large differences among the growth rates of countries and regions in the world and this is most strikingly noticeable in Africa. There are very few African countries that have managed to sustain growth rates consistent with those growth rates needed to “catch-up” to other countries.

Theory and anecdotal evidence, in general favours the notion that openness to trade is positively related to growth. Accordingly, a large number of scholars have attempted to examine the growth effects of trade openness. These empirical studies, in general, seem to favor the notion that openness to trade is positively related to growth (Sachs and Warner, 1995; Edwards, 1998; Frankel and Romer, 1999; Ravallion and Chen, 2003; Dollar and Kraay, 2004; Besley and Cord, 2007). Recently however, a number of scholars (Harrison and Hanson, 1999; Rodriguez and Rodrik, 2001; Wacziarg and Welch, 2008) direct their attention to reviewing some of the influential body of empirical evidence testing the link between openness to trade and economic growth. Their studies have pointed out the flaws and difficulties in measuring trade openness and cast doubt on the positive association between openness and growth, in fact, they find the relationship between trade openness and growth is ambiguous. Thus, further evidence on the impact of openness is still very much needed especially for policy formulation.

In the light of this, and in view of the possibility of researchers overstating the positive effects of growth from openness to trade (Rodriguez and Rodrik, 2001), this paper seeks to establish whether there is a robust link between openness to trade and economic growth. Accordingly, in recognition of the diversity amongst researchers about the beneficial effects of openness and the interpretation and measurement of openness, this paper considers three channels of openness and thus uses various proxies for openness; ranging from trade outcomes to trade policy and international capital flows to investigate the empirical association between openness to trade and economic growth.

To achieve this aim, we use times series analysis and Mauritian data for the period 1964-2009. Despite being a small island economy, Mauritius is often hailed as a model country for others to follow as it has had sustained economic growth over the past four decades. Since 1970, its real GDP growth averaged more than five *per cent*

and GDP per capita has increased more than ten fold. As of 2011, the per capita GDP of Mauritius is above \$14 000, based on purchasing power parity, placing the island economy in the top five (behind Gabon, Botswana, Equatorial Guinea and Seychelles) highest income group in Africa. But is this stellar growth due to deeper international trade links?

The remainder of the paper is organized as follows. The next section reviews the literature on the link between trade openness and growth. Section 3 provides a summary of the empirical controversies on Mauritius openness. Section 4 describes the conceptualization of the growth model this study uses, the data sources and methodology. Section 5 presents the estimation results. Concluding comments are presented in the last section.

## **2. THE LITERATURE REVIEW**

The theoretical and empirical literature has been prolific in aiming to provide support for the argument that trade openness is linked to growth. In classical trade theory the issue of trade openness and well-being or growth is a central concern. These issues are found in the discourse of absolute and comparative advantage put forward by Adam Smith and David Ricardo. Later explanations of the same concern are found in the Heckscher-Ohlin (H-O) model and subsequent developments of this body of theory and empirical measurement. However, in drawing conclusions from this vast set of ideas, most would infer the theory allows for gains from trade. But the theory also suggests that increased willingness to trade does not always lead to gains. Caution is needed when one combines growth and trade. There is the distinct possibility of offsetting effects. For instance a decline in a country's terms of trade can affect the extent to which the country benefits from growth. This possibility for a developing nation was carefully analysed by Jagdish Bhagwati in 1958. His study shows that growth can be immiserizing for the nation that has experienced growth and that their increased growth and willingness to trade may actually result in the deterioration of the nation's welfare from a worsening in the country's terms of trade. This theoretical possibility for an island economy is further examined in Section 2.1 below.

In a somewhat similar notion, more recently, Samuelson (2004) examines the possibility for an industrialized nation following an import substitution path with biased product growth and in this circumstance their policy action, in turn leads to an adverse shift of the terms of trade since now the world terms of trade will shift against the biased product growth and worsens the country's welfare. From the viewpoint of the foreign country, the terms of trade for their exports in turn are adversely affected and this price shift may also result in a worsening of the country's welfare – effectively showing two cases of immiserising growth and is yet another viewpoint pointing out the possibility of trade with distortions producing immiserising growth. It is worthwhile noting that for Samuelson, the possibility of immiserising growth

appears to be “more common and less paradoxical than that discussed by Bhagwati, where it is primarily the actions of the home country that bring about its fall in social welfare” (Pryor, 2007: 212).

Additionally, the prominent work of Prebisch and Singer in the 1950s, is also of relevance. Prebisch (1950 and 1959) and Singer (1950) have cautioned the newly independent and less developed countries aiming to diversify and industrialize their economies against the conventional policy ideas of free trade by showing that the terms of trade can follow the opposite path to what was postulated by the classical trade theorists.

The Prebisch-Singer (P-S) hypothesis has generated much controversy, but still remains relevant. Toye and Toye (2003: 437-438) describe the P-S hypothesis as:

“Barring major challenges in the structure of the world economy, the gains from trade will continue to be distributed unequally. Further, inequality of per capita income .... will be increased by the growth of trade, rather than reduced.”

In view of such possibilities and taking a broader view of openness it is not surprising therefore that a number of skeptics including prominent economists such as Krugman (1994) and Rodrik (1995) have taken a less sanguine view of trade openness. That said, leading to Rodrik (1999: 25) highlighting that today the benefits of openness are oversold just as the advantages of import-substitution policies were overstated in an earlier era.

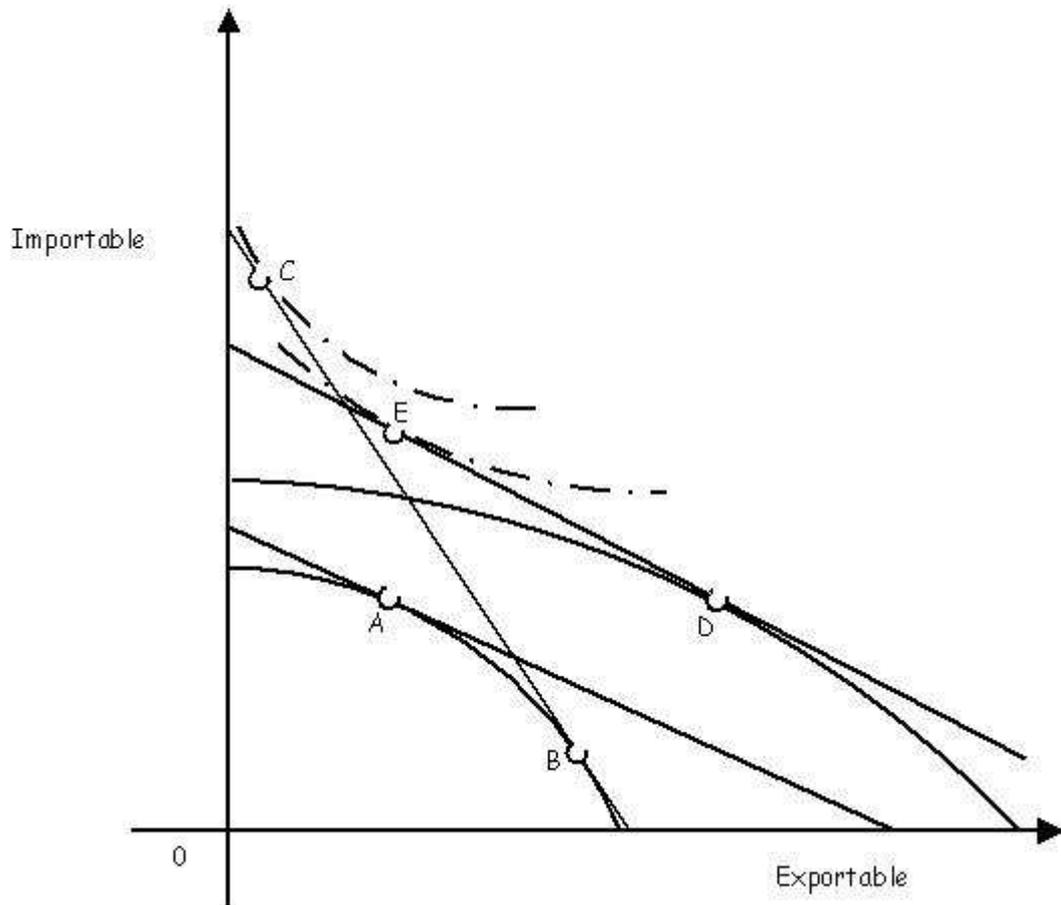


Figure 1

## 2.1 THE GEOMETRY OF TRADE AND GROWTH

Let us examine the theoretical links between trade and growth. Assume the island or domestic economy, like Mauritius has two goods and the import good (sometimes termed the second good) is deemed the benchmark. This means that gross income for the economy is the output of both goods but converting the output of the first good into a common unit of measurement, namely the second good (Moore, 1926). In Figure 1 above, the first good or exportable is shown on the abscissa and the import good as the ordinate. And point A in the figure is the autarky position and can be converted to gross domestic expenditure (GDE) using relative prices.

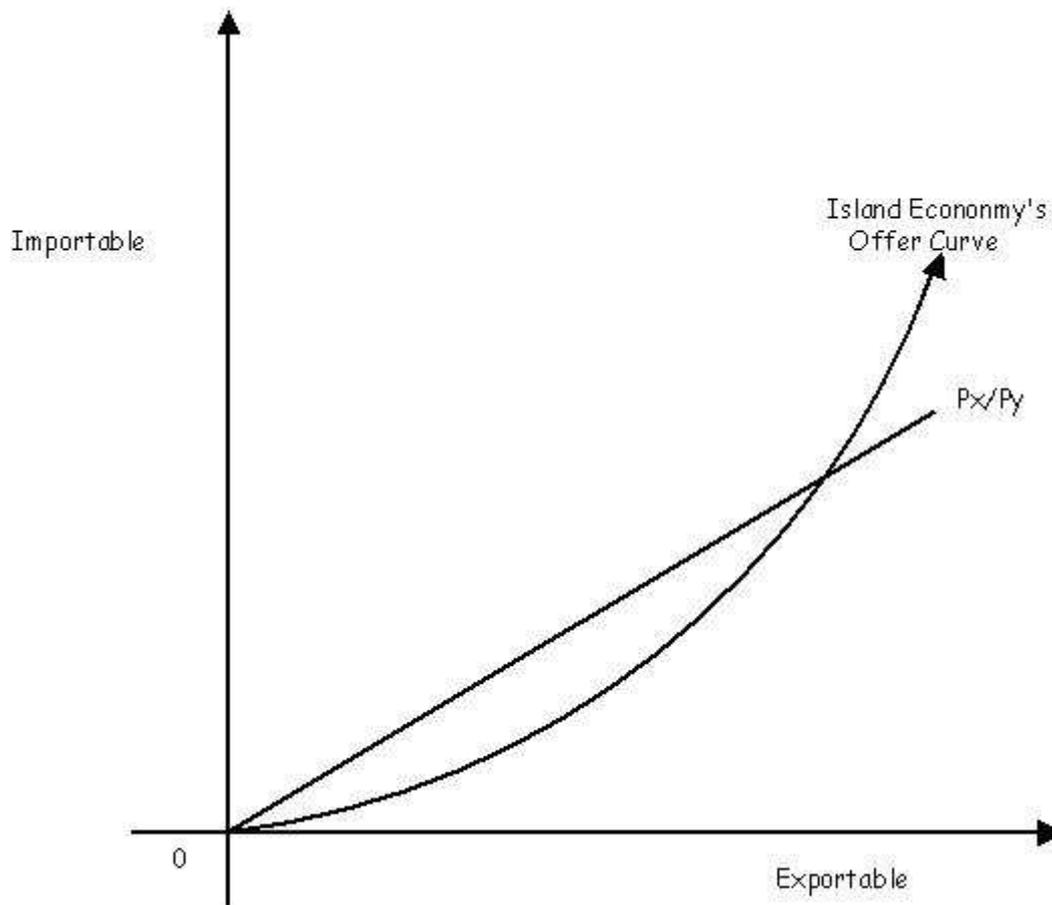


Figure 2

In addition to Figure 1 we need to work with the island economy's offer curve which shows the amount of good one that the island country supplies to the world market for export and the quantities of good two on the ordinate that it demands from world market as imports at any price. This is shown in Figure 2. And the price of the export good is  $P_x$ . In Figure 2 *one* possible ratio of the price of exports to the price of imports is the slope of the straight line from the origin and has the label  $P_x/P_y$ . A good source for the initial use of offer curves is Johnson (1913).

Returning to Figure 1 we start at the tangency given by point A. The slope of the tangent shows the negative of the relative price of exports in terms of imports. Free trade moves production to point B and consumption to point C. As point C is a point of tangency between the now world price ratio (the negative of the slope of BC) and the highest indifference curve in Figure 1, gross (and now, after trade, national) expenditure (GNE) is higher at point C than it is at point A. This shows the usual gains from trade. We now need to add the rest of the world to our analysis and we do this in Figure 3 on the next page.

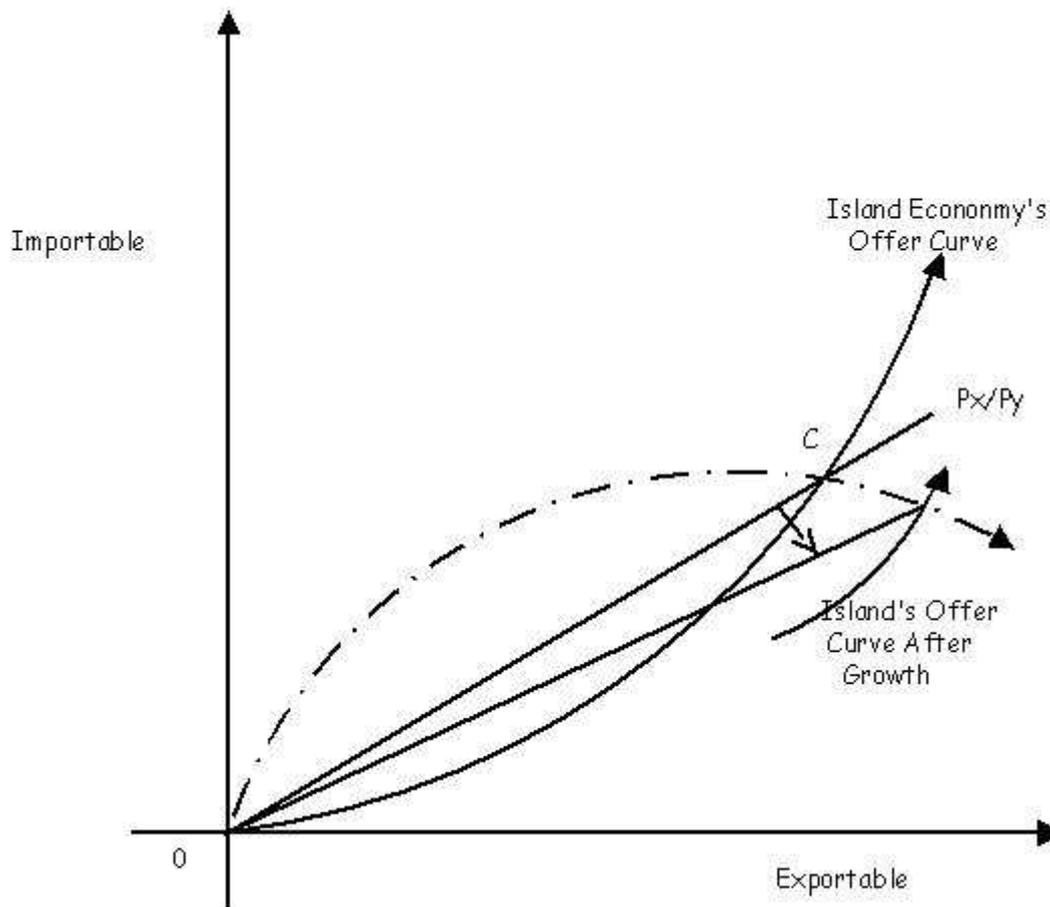


Figure 3

In Figure 3 we add the rest of the world's offer curve as dashed-and-dotted curve and the free trade equilibrium is at point C. The use of the label C makes Figure 3 consistent with Figure 1 where C is also the free trade equilibrium. Now to analyse growth, the production function needs to shift. The discovery of new resources or changes in technology causes a shift of the production function. Overall expenditure in the island economy can increase at existing output levels if relative price changes favour the island economy. An assumption that is made at this point is that the impact of growth on the exportable is positive. We now turn to the relative price effect. In Figure 1 we show the effect of growth by a shift of the production function outwards. It is the production function that passes through point D. In Figure 3 above, our assumption of the positive impact of growth on the exportable means the offer curve of the island economy also shifts outwards or to the right. This is shown in Figure 3 as a new (partial) offer curve with the label "Island's Offer Curve After Growth." Notice what happens in Figure 3. As it is possible to start from equilibrium (point C) in the inelastic portion of the rest of the world's offer curve,  $P_x/P_y$  falls or in other words the rest of the world holds onto its exports more than the island economy does. Thus in Figure 1 the new production combination, *inclusive* of this price fall, shown in Figure 3 using an open arrow, ( $\rightarrow$ ), is at point D. But the equilibrium is now at point E in Figure 1. The island's GNE is lower as E lies on an

indifference curve that is below the indifference curve passing through point C. This is the essence of Bhagwati's (1958) immiserizing growth argument. This is no *theorica curiositas* as it only depends on a single, and altogether reasonable, feature of the rest of the world's offer curve.

On the empirical front, the literature also offers an insight into the problem as there are a large number of studies that aim to capture the potential link between openness to trade and economic growth. A valid observation is that these studies have tended to be mostly cross-section tests with some large differences between the economic, political and demographic structures of countries. Cross-sectional data can be unreliable, and this cannot always be compensated for, by increasing the number of countries. Even if the sample of countries seems homogeneous, using a "common structure in the form of cross-section models can be a drastic simplification, and important parametric differences could be masked in cross-section estimates" (Ram, 1987: 52).

Nevertheless, whilst most of the empirical literature utilizes cross-section analysis, and seem to follow the conventional view on the growth effects of openness (Helpman and Hoffmaister, 1997; Edwards, 1998; Dollar and Kraay, 2002; Besley and Cord, 2007; Manole and Spatareanu, 2010), it is worthwhile noting however, as Yanikkaya (2002) points out, that the endogenous growth literature has provided us with a number of models where restrictions in trade can positively or negatively affect growth and rightly makes a reference to a number of studies including Romer (1990), Grossman and Helpman (1990) and Matsuyama (1992).

There is no clear pattern between trade and growth (Kee, Ncita and Olarreaga, 2009) - the verdict on the issue of trade openness and growth are not unambiguous and conclusive, and the discussion in this section provides the theoretical and empirical support for the possibility of these findings.

### **3. THE EMPIRICAL CONTROVERSIES ON MAURITIUS OPENNESS**

Mauritius is viewed as a successful liberalizer (Milner and Wright, 1998). For this island economy, arguably, one of the most interesting and puzzling aspects of the country's strong economic performance has been the effects of its trade liberalizing reforms. Descriptions in the literature about Mauritius' trade policy regime shifts from an open or liberal trade policy (Sachs and Warner, 1997) to a "heterodox" trade policy and involving, seemingly similar to China, a two-track reform strategy combining both market liberalization and state regulation in both its export and import competing sectors (Rodrik, 1999 and 2001). Taking a cue from the heterodox view, the island has strategically protected its export sector by segmenting its export sector from the rest of the economy, preventing a restrictive regime spilling over to this sector and this has arguably led to increasing returns to the export sector. The mechanism for the segregation of the export sector was the establishment of the Export Processing Zone

(EPZ). At this juncture, it is worthwhile noting a study by Romer (1993) pointing out the island's openness to foreign direct investment and the consequential positive effects.

Most recently, Rodriguez and Rodrik (2001) provide the first systematic attempt in formally addressing the weaknesses in measuring the openness to trade for a number of influential studies including the likes of Sachs and Warner (1995). In the Sachs and Warner study, Mauritius was classified as an open economy. This classification of the country as an open economy is misleading. Rodriguez and Rodrik have argued convincingly that the results of Sachs and Warner study have incorrectly classified the country as being open or following a liberal trade policy. It is interesting to also note at this juncture that in a more recent paper Rodriguez (2007) draws our attention to the notion that openness may have a greater positive effect on the poorer income than middle income economies. Additionally, Harrison and Hanson (1999) have also questioned the Jeffrey Sachs and Andrew Warner study (Sachs and Warner, 1995) and their study demonstrates that there are indeed problems associated with identifying a robust relationship between trade openness and growth and therefore to infer anything about trade openness and growth is difficult.

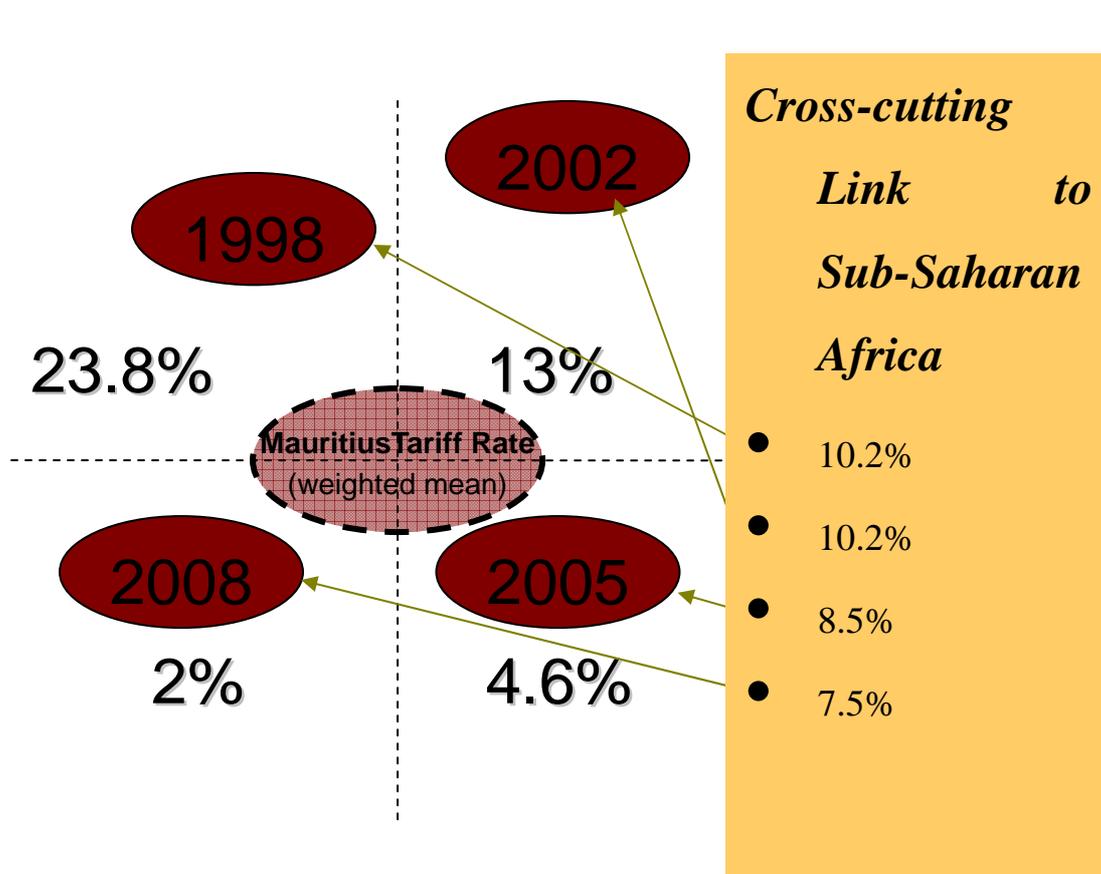


Figure 4

Thereafter, what seems to emerge in the new literature is that “Mauritius did not follow free trade policies, at least until relatively recently” (Frankel, 2010:16). Also, Subramanian (2009) pointed out that even the International Monetary Fund (IMF) ranked Mauritius as one of the most protected economies in the early 1990s. The country was a “highly restricted economy during much of the 1970s, 1980s and the early 1990s” (Subramanian and Roy, 2003 and Subramanian, 2009:10). A more recent study by Coughlin (2010) has highlighted, based on the Market Access Overall Trade Restrictiveness Index (MA-OTRI) index based on the Kee, Nicita and Olarreaga (2009) study, that Mauritius is the most restrictive economy in their examination of seventy eight countries. Also, a study by Hinkle and Herrou-Aragon (2001) assessing the progress in trade reforms in thirteen Southern African Development Community (SADC) countries in the late 1990s, concludes that Mauritius trade regime was actually more restrictive than the average African state. Compounding and to illustrate this, when comparing the average tariff rate on a weighted mean basis for all products as illustrated in Figure 4 above (based on the 2010 World Development Indicators data), Mauritius applied a tariff rate that was way above those for Sub-Saharan African countries in the 1990s.

Nevertheless, the diverse views in the literature regarding Mauritius’s openness can be expected especially, since openness is notoriously difficult to measure accurately. Compounding this, over time, the literature on Mauritius trade regime and policy debates has become somewhat confusing.

Accordingly, considering that empirical evidence has not been forthcoming and given the theoretical possibility of immiserizing growth, the inconclusive nature and doubts of the empirical studies and the real concern over the height of the relative tariff barriers in Mauritius, inference of any gains from growth and trade is fraught with difficulty. Thus, this paper aims to contribute to this limited “new skepticism” on the beneficial effects of openness by investigating whether in the case of a “model-piece” like Mauritius openness is beneficial to growth.

## **4. THE CONCEPTUAL FRAMEWORK**

### **4.1 The Model, Data Sources and Methodology**

Against the background of the previous discussion, we now set out a model to test the hypothesis that openness to trade is linked with economic growth in Mauritius. The econometric model of this study is a time series model which includes a number of hypothesized determinants of growth from the “old” and “new” growth theory.

In the “old” growth theory, growth centers around the standard production function.

$$Y = f(K, L)$$

Where  $Y$  = output,  $K$  = stock of capital and  $L$  = labour force. It is noted that a policy that raises the  $Y$  factor necessitates the increasing of  $K$  and  $L$  factors. However, it was acknowledged in the “old” theory that increases in  $Y$  can come through other factors such as technological improvements and savings.

Yet, for a long time the “old” theory provides little insight as to the effects of trade on growth and the accumulation of knowledge and technology. Also, many assume that technological progress is exogenous. The emergence of the new endogenous growth theory in the late 1980s and early 1990s takes into account such limitations and addresses this gap by providing theory with a number of “new” models. The new growth theory models now take into account the role of a third factor – human capital. To include this human capital factor acknowledges that labour embodies other elements and that factor differences matter for growth. Also, little is known of the empirical effects of infrastructure in growth. The role of infrastructure influenced by the work of Barro (1990) is recognized in the new growth theory. We have therefore taken the step to include the effect of infrastructure. Infrastructure is measured by the availability of paved roads. Additionally, in the new growth theory the role that institutions can play is now increasingly recognized. Institutions that are bureaucratic or cumbersome and have shaped human interaction can impede growth (North, 1990). It is worthwhile pointing out that the role of institutions has a long history in economic thought from Adam Smith who acknowledged the role of institutions in growth. As a proxy for institutions we rely on the Polity IV Project scoring. In the polity database, a score of 10 indicates a strongly democratic state.

To test the robustness of the openness-growth model a range of openness measures including trade outcomes, trade policy and foreign capital flows are used. The empirical specification of this study and the choice of variables are based on growth models that are in line with old and new growth theories that control for the core determinants of growth (the importance of both physical and human capital as well as savings) and by other explanatory variables (macroeconomic and policy measures). As proxies for international trade openness we use the fairly standard ratio of trade; the ratio of trade (imports and exports) to GDP and alternative openness measures – including import tariffs, import penetration, export propensity and foreign direct investment. The most commonly used variables have been the share of imports and exports in GDP.

We allow for the heterogeneous impact of openness on growth by interacting the openness measure with a trade liberalization dummy; proxies of investment (physical and human); labour force, savings, the exchange rate, financial depth; terms of trade, government expenditure, infrastructure and political governance.

We therefore use the following empirical framework to investigate the Mauritian growth. In general form, this model is specified as

$$GDP_t = \beta_0 + \beta_1 Open_t + \beta_2 Tlib_t + \beta_3 Inv_t + \beta_4 Labour_t + \beta_5 Educ_t + \beta_6 Saving_t + \beta_7 Exch_t + \beta_8 Findev_t + \beta_9 Tot_t + \beta_{10} Gov_t + \beta_{11} Infra_t + \beta_{12} Pol_t + \varepsilon_t \quad (1)$$

where the subscript  $t$  represent the time period;  $\beta_0$  is the intercept and  $\beta_1$  to  $\beta_{12}$  are the slope parameters; and  $\varepsilon_t$  is the stochastic error term. The core data are gathered from the IMF-International Financial statistics (IMF-IFS), the United Nations Statistics, the World Bank and the National Statistical office (NSO). The human capital data are collected from the World Development Indicators (WDI) and the NSO. Data on the openness measures are based on the World Bank, IMF-IFS and the NSO datasets. The financial depth data are based on the IMF-IFS and WDI datasets. The paved roads data are based on the Canning dataset, WDI and the NSO while the political governance data are based on the Polity IV database. The sample covers annual time-series observation for the period 1964 to 2009. In Appendix 1 we provide a detailed description of all the variables and the sources of the dataset are also listed. We adopt a two-stage least squares (2SLS) approach to estimate the impact of the variables on GDP. Given the focus of this paper on openness and growth we expect  $\beta_1 Open_t$  to be positive.

In investigating the trade openness-led growth hypothesis, we recognize that there is a need to assess whether the underlying data series are stationary. This is because an attempt to regress non stationary series leads to spurious regression. A standard process for investigating the stationarity of a time series is via unit root tests. In this study, the stationarity properties of the variables are determined using the commonly used Augmented Dickey-Fuller (ADF) approach. This approach entails an estimation of the following:

$$\Delta Y_t = \beta_0 + \delta Y_{t-1} + \beta_i \sum_{i=1}^n \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

where  $Y_t$  is the variable of interest;  $\beta_0$  is the intercept;  $\Delta Y_{t-i} = (Y_{t-i} - Y_{t-(i+1)})$  and  $\varepsilon_t$  is the white noise error term.

The ADF test is essentially the test of significance of the coefficient  $\delta$  in the above equation. Under the null hypothesis that  $H_0: \delta = 0$  (unit root), the familiar t- test is now the tau test. The decision rule is that if the tau value of the lagged coefficient exceeds the critical tau values, then the null hypothesis of a unit root can be rejected and it can be concluded that the time series is stationary and the alternative non stationary.

## 5. THE EMPIRICAL RESULTS

All the variables are tested for stationarity using the Augmented Dickey-Fuller (ADF) test statistic. The unit root tests were carried out with an intercept. The results for the unit root tests are presented in Appendix 2. All the results are stationary. This means the regression we perform are unlikely to suffer from the problem of “spurious regression”. Keeping in mind the objective of the paper is to investigate the impact of openness to trade on growth; equation 1 above is estimated using four measures that capture a country’s stance on free trade. The other variables are primarily included as control variables, although their impacts are of interest, they are secondary importance for this paper.

In Table 1, we present the results of regressing growth on four different measures of trade “openness”. These are labeled as model one to model four. As regards the results of the regressions as a whole, in each model the  $R^2$ 's are smaller than the Durbin-Watson measures. This is a good secondary test that the regressions can be interpreted in the classical manner. In addition, the  $R^2$ 's, while a little low for time-series analysis are nevertheless reasonable; explaining about two-thirds of the variation in growth. In Table 1 the F-tests for each regression are all statistically significant and at more than acceptable levels of testing. Our coefficient of interest is shown diagonally in the upper section of Table 1. Of interest, when we use a trade ratio to measure the stance on trade, a one *per cent* rise in the trade ratio variable results in a fall in growth of 0.2 *per cent*. This result is statistically significant at the ten *per cent* level. This indicates that a large portion of the sampling distribution of the estimated coefficient has a higher probability of encompassing negative values for this coefficient. This is in line with other empirical studies highlighted in the literature review of this paper that trade and growth have a complex relationship with each other that it may not always be a direct one. The other three trade measures, while statistically are indistinguishable in impact from zero, all have negative signs on the estimated coefficients. Overall, the pattern that emerges from these estimates is that it is not unreasonable to infer that the impact of growth on trade is negligible and possibly negative. Theoretically, this is possible and has been confirmed in other empirical work. Looking at the lower half of Table 1, it appears that savings, infrastructure and the terms of trade are more important for growth, although there may be some co-linear impacts here, which conventional growth theory does support.

Table 1: Models Based on Equation One With Four Measures of Openness (Trade Volumes and Policy)

	Model One		Model Two		Model Three		Model Four	
	Coefficient		Coefficient		Coefficient		Coefficient	
	t-ratio		t-ratio		t-ratio		t-ratio	
Openness	-0.039634	-0.611492						
Trade Ratio			-0.195468	-1.5865*				
Demand Trade Ratio					-0.080205	-0.282891		
Tariff Revenues per Imports							-1.122320	-0.211717
Trade Liberalization Dummy	-6.166	-1.583442*	-6.1896	-1.639929*	-6.076	-1.5452*	-5.6737	-1.6385*
Growth in Investment	0.046291	1.257143	0.051668	1.451131*	0.044566	1.194308	0.020700	0.598720
Growth in Secondary Education	0.314264	1.384952*	0.279603	1.272103	0.311347	1.359872*	0.259461	1.207100
Polity Score	1.711623	0.463487	0.946937	0.262599	1.665728	0.449187	2.779579	0.826820
Growth in Labour	0.286083	1.278882	0.292384	1.360136*	0.297142	1.325367*	0.404573	1.921259**
Savings	0.867815	3.852437***	1.103340	4.147795***	0.850133	3.699013***	0.917022	4.203214***
Financial Depth	0.029496	0.775444	0.080541	1.604940**	0.028166	0.727979	0.075858	1.887751**
Paved Roads	0.384546	3.077073***	0.397823	3.289396***	0.375882	3.018908***	0.029683	0.132222
Terms of Trade	-0.110971	-1.998253*	-0.177376	-3.1713***	-0.120755	-2.207794**	-0.140425	-2.90390***
Exchange Rate	-0.278386	-1.263463	-0.294705	-1.378165*	-0.287418	-1.284745	-0.253347	-1.2923
Government Expenditure	-1.019622	-2.080323**	-0.786199	-1.698986**	-0.958543	-1.995581**	-0.807820	-1.5397*
Constant	-9.252608	-0.715897	-10.24172	-0.870769	-9.356386	-0.605020	9.874189	0.636259
R <sup>2</sup> DW E	0.63 <b>2.3</b>	<u>4.55***</u>	0.65 <b>2.5</b>	<u>5.02***</u>	0.62 <b>2.4</b>	<u>4.48***</u>	0.68 <b>2.2</b>	<u>3.87***</u>

\*Significant at 10 per cent \*\*Significant at 5 per cent \*\*\*Significant at 1 per cent

In order to check the robustness of these results, instead of using just openness, we compare the impact of openness and foreign direct investment separately in Tables 2 and 3. In addition, each equation supporting the control variables and growth are estimated simultaneously. In Table 2, as expected, when foreign direct investment is related to growth, the impact of this variable is positive and statistically significant, controlling for all other variables. In fact, with the growth in the data aided by foreign direct investment, note that the trade liberalization dummy reduces growth and is statistically significant at the five per cent level.

Table 2: Model Based on Equation One (International Capital Flow)

Variable	Coefficient	t-statistic
Foreign Direct Investment	0.900002	2.172803***
Trade Liberalization Dummy	-5.674509	-1.752772**
Growth in Investment	0.016978	0.518512
Growth in Secondary Education	0.325043	1.679358**
Polity Score	2.985336	0.948849
Growth in Labour	0.500998	2.466610***
Savings	0.905325	4.702883***
Financial Depth	0.050322	1.273801
Paved Roads	0.022769	0.112038
Terms of Trade	-0.140288	-3.273885***
Real Exchange Rate	-0.234124	-1.274233
Government Expenditure	-0.667130	-1.502622*
Constant	8.710237	0.603728

R<sup>2</sup> = 0.68

DW=2.8

F=4.82\*\*\*

\*Significant at 10 per cent \*\* Significant at 5 per cent \*\*\* Significant at 1 per cent

In Table 3, foreign investment is replaced with a measure of openness and while this scenario analysis of substituting investment for openness is rather crude, it is nonetheless instructive. With a variety of regression techniques, variables that are stationary and reasonable diagnostics we are able to show that the measured relationships between growth and free trade is not positive and direct. Section 2 of the paper supports this possibility.

Table 3: Model Based on Equation One-Two Stage Least Squares

Variable	Coefficient	t-statistic
Openness	-0.027303	-0.400355
Trade Liberalization Dummy	-7.079392	-1.796391**
Growth in Investment	0.037461	0.998741
Growth in Secondary Education	0.335352	1.454818*
Polity Score	1.484984	0.396230
Growth in Labour	0.269181	1.184442
Savings	0.784919	3.626341***
Financial Depth	0.025636	0.663522
Paved Roads	0.326929	2.627606***
Terms of Trade	-0.098600	-1.787030**
Real Exchange Rate	0.034876	0.693132

Government Expenditure	-1.208094	-2.413434***
Constant	-8.836878	-0.668959

$R^2 = 0.61$	DW=2.2	F=4.311***
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\*Significant at 10 per cent \*\* Significant at 5 per cent \*\*\* Significant at 1 per cent

These estimates, based on five models and two regression techniques suggest a negative association between openness and growth is not a statistical anomaly. Our results conform to those found in the data for many other countries over different time periods. Whilst trade is good and growth is very good but both together might not be.

In order to provide additional evidence for the negative effect of openness on growth, our data is further subjected to a specific to general testing technique. After excluding insignificant variables obtained from the regression results we find the most parsimonious model giving the same  $R^2$  as the models above. After an exhaustive search, we find only investment and government expenditure matter for growth. In Figure 5 we present the nature of this relationship.

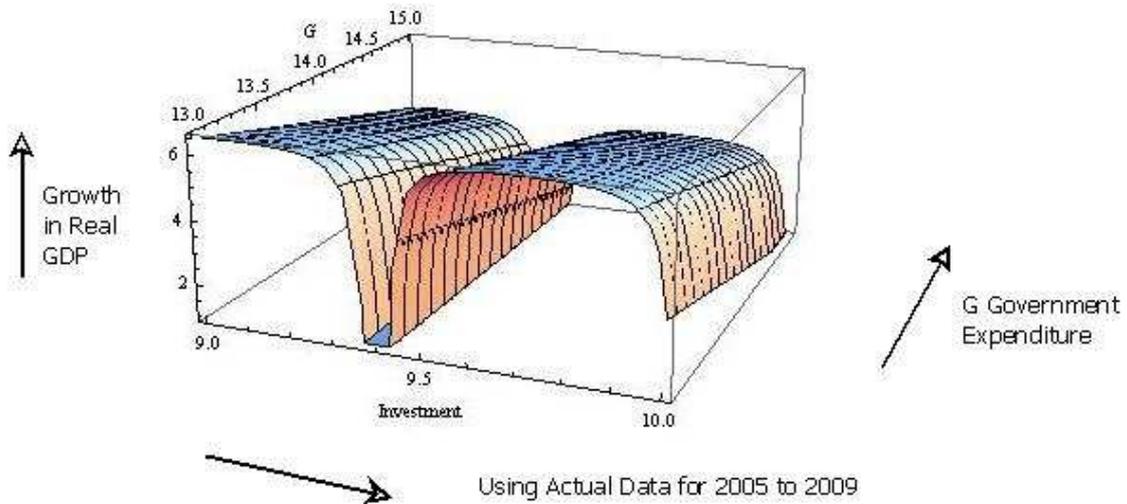


Figure 5

Growth is measured vertically in Figure 5 and investment plus government expenditure are shown along the horizontal axes. For a given level of investment, government expenditure always reduces growth. On the other hand, investment adds to growth but its impact fades after some time. At this juncture it is interesting to note that according to Barro (1991:437):

“Per capita growth and the ratio of private investment to GDP are negatively related to the ratio of government consumption expenditure to GDP. An interpretation is that government consumption introduces distortions, such as high tax rates, but does not provide an offsetting stimulus to investment and growth.”

Additionally, in Figure 5, along the investment axis in the initial stage, investment adds to growth but thereafter, there is a time period where investment reduces growth and much later does investment adds to growth. Of interest is that, in the general to specific testing method we confirm against the positive role of openness in growth.

## 6. CONCLUSIONS

Given the aim of this paper which is to attempt to establish whether there is a robust relationship between openness to trade and growth in Mauritius, the econometric results indicate that factor accumulation and the growth of human capital are integral in our measured explanation of determinants of the rapid rise in the per capita income of this island but not isolated economy.

Drawing on more recent growth theory, that still has savings at its core, that suggests political institutions are also important to spur and maintain growth, it is interesting to note that our measure of such institutional effects in Mauritius plays a positive role in adding to growth opportunities. Turning to the complex interaction between growth and trade the empirical results are not so clear cut. Politicians, government and trade theorists would like to see trade being the "engine" or "handmaiden" of growth. Our results do not show this. In fact, the measured effect of trade on growth is negative in some contexts. On one hand, this might not be that surprising as the gains from trade are measured in consumption and *not* the growth in real output. Another explanation is the entirely plausible possibility of *immiserizing* growth. In retrospect this also questions the neo-liberal paradigm à la Washington Consensus.

Clearly much more needs to be done in solving the causes of the Mauritian growth and trade experience especially as regards the econometric measures of trade, growth and other variables which are at best only proxies for the actual forces at work in the complex set of relationships between the domestic economy and the rest of the world.

**Appendix 1: Description and Sources of Data**

<b>Variable</b>	<b>Description</b>	<b>Source</b>
<b>Economic growth</b>	The growth rate of Real GDP	International Monetary Fund- International Financial Statistics
<b>Import penetration</b>	The ratio of total imports to domestic demand (GDP-X+M)	International Monetary Fund- International Financial Statistics
<b>Export propensity</b>	The Ratio of exports to GDP	International Monetary Fund- International Financial Statistics
<b>Investment</b>	Gross fixed capital formation share of GDP	National Statistical Office International Monetary Fund- International Financial Statistics
<b>Labour Force</b>	The Labour force	National Statistical Office International Monetary Fund- International Financial Statistics
<b>Secondary Education</b>	The ratio of secondary school enrollment to the number of secondary school-age group	National Statistical Office World Development Indicators
<b>Exchange Rate</b>	The real exchange rate.	National Statistical Office International Monetary Fund- International Financial Statistics

<b>Inflation</b>	The inflation rate	World Bank National Statistical Office
<b>Financial Depth</b>	The ratio of M3 to GDP.	International Monetary Fund- International Financial Statistics World Development Indicators National Statistical Office
<b>Terms of Trade</b>	The ratio of export to import prices	International Monetary Fund- International Financial Statistics
<b>Government expenditure</b>	The value added of government consumption expenditure as a share of GDP	United Nations Statistics National Statistical Office
<b>Savings</b>	Gross domestic savings share of GDP	World Bank
<b>Infrastructure</b>	The ratio of paved roads to total roads	Canning Database National Statistical Office World Development Indicators
<b>Political Governance</b>	Dummy variable taking a value of 1 for a democratic score (+10) and 0 otherwise	Polity IV database
<b>Trade Liberalisation Dummy</b>	Dummy taking a value of 1 for trade liberalization (post 1982) and 0 otherwise	Milner and Wright
<b>Trade Openness –Model 1*</b>	The ratio of exports plus imports to GDP	International Monetary Fund- International Financial Statistics

<b>Trade Openness Model 2*</b>	– The Ratio of exports to GDP	International Monetary Fund- International Financial Statistics
<b>Trade Openness Model 3*</b>	– The ratio of imports to domestic demand	International Monetary Fund- International Financial Statistics
<b>Trade Openness Model 4*</b>	– The ratio of tariff revenues to imports	National Office World Bank
<b>Trade Openness Open 5**</b>	– The ratio of foreign direct investment to GDP	National Office World Bank

\* The annual data set covers the time period 1964 to 2009.

\*\* The annual data set covers the time period 1970 to 2009.

## Appendix 2: The Unit Root Results

Variables	ADF-statistic	Critical values	Order of integration
GDP	-2.8312	-2.6031	I (0)*
Openness	-3.0054	-2.93970	I (0)**
Import Penetration	-3.2639	-2.9266	I(0)**
Export Propensity	-2.61383	-2.6022	I(0)*
Investment	-3.5545	-2.9314	I(0)**
Labour	-6.6997	-3.5847	I(0)***
Secondary Education	-4.05695	-3.5847	I(0)***
Exchange rate	-7.8644	-3.5847	I(0)***
Inflation	-3.9905	-3.5967	I(0)***
Saving	-8.7132	-3.5847	I(0)***
Infrastructure	-4.18649	-3.5811	I(0)***
Gov Expenditure	-3.0159	-2.9389	I(0)**
Financial Depth	-7.58424	-3.58474	I(0)***
Terms of Trade	-2.70373	-2.6014	I(0)***
Tariff Revenue	-9.5985	-3.6056	I(0)***
Foreign Direct Investment	-3.5017	-2.9389	I(0)**

\*Significant at 10 per cent \*\* Significant at 5 per cent \*\*\* Significant at 1 per cent

## REFERENCES

- Barro, R. (1990) Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy* 98, pp. 103–117.
- Barro, R. (1991) Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics* 106, pp. 405–443.
- Barro, R. J. and Sala-i-Martin, X. (1995) *Economic Growth*. Cambridge, Massachusetts, McGraw-Hill.
- Besley, T. and Cord, L. (eds.) (2007) *Delivering on the Promise of Pro-Poor Growth: Insight and Lessons from Country Experiences*. New York, Palgrave Macmillan and the World Bank.
- Bhagwati, J. (1958) Immiserizing Growth: A Geometrical Note. *Review of Economic Studies* 25(3), pp. 201–05.
- Dollar, D. and Kraay, A. (2004) Trade, Growth, and Poverty. *The Economic Journal*, 114(493), pp. 22-49.
- Edwards, S. (1998) Openness, Productivity and Growth: What do We Really Know? *The Economic Journal* 108(March), pp. 383– 398.
- Grossman, G and Helpman, E. (1990) Comparative Advantage and Long-run Growth. *American Economic Review*, 80, pp. 796-815.
- Harrison, A., (1996) Openness and Growth: a Time Series, Cross-Country Analysis for Developing Countries. *Journal of Development Economics* 48(196), pp. 419–447.
- Johnson, W E (1913) The pure Theory of Utility Curves. *The Economic Journal* 23(92), pp. 483–513.
- Kee, H. L., Nicita, A. and Olarreaga, M. (2009) Estimating Trade Restrictiveness Indices. *Economic Journal*, January 2009, 119(534), pp. 172-99.
- Krugman, P. (1994) The Myth of Asia's Miracle. *Foreign Affairs*, November/December, 73(6), pp. 62-78.
- Lucas, R.E. (1988) On the Mechanics of Economic Development. *Journal of Monetary Economics* 22, pp. 3-42.
- Manole, V and Spatareanu, M. (2010) Trade Openness and Income—A

- Re-examination. *Economics Letters*, 106(1), pp. 1-3.
- Matsuyama, K. (1992) Agricultural Productivity, Comparative Advantage, and Economic Growth. *Journal of Economic Theory* 58, pp 317–334.
- Milner, C and Wright, P. (1998) Modelling Labour Market Adjustment to Trade Liberalization in an Industrializing Economy. *Economic Journal*, 108(447), pp. 509-528.
- Moore, H L. (1926) A Theory of Economic Oscillations. *Quarterly Journal of Economics* 41 (1), pp 1–29.
- North, D. C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge University Press
- Prebisch, R. (1950) *The Economic Development of Latin America and Its Principal Problems*. New York: United Nations
- Prebisch, R. (1959) Commercial Policy in the Underdeveloped Countries. *American Economic Review* 49, pp. 251-273
- Pryor, F. L. (2007) Immiserizing Growth as Seen by Bhagwati, Samuelson and others. *Journal of Economic Education* 38(2), pp. 135-147
- Ram, R. (1987) Exports and Economic Growth in Developing Countries: Evidence from Time-series and Cross-section data. *Economic Development and Cultural Change* 36(1), pp.51-72.
- Ravallion, M. and Chen, S. (2003) Measuring Pro-Poor Growth. *Economics Letters* 78 (1), pp. 93-99.
- Rodriguez, F. and Rodrik, D. (2000) Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence. In: Bernanke, B. and Rogoff, K. (Eds) *NBER Macroeconomics Annual 2000*. Cambridge, Massachusetts, MIT Press.
- Rodriguez, F. (2007) *Openness and Growth: What Have We Learned?* Working Paper 51, United Nations, Department of Economics and Social Affairs.
- Rodrik, D. (1995) Trade Policy and Industrial Policy Reform. In: Behrman, J and Srinivasan, T.N. (Eds) *Handbook of Development Economics*, vol. 3B. Amsterdam, North Holland.
- Rodrik, D. (1999) *The New Global Economy and Developing Countries: Making Openness Work*. Washington, DC, Overseas Development Council.

- Rodrik, D. (2001) *The Global Governance of Trade as if Development really Mattered*. United Nations Development Programme.
- Romer, P. (1986) Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(5), pp. 1002-1037.
- Romer, P. (1990) Endogenous Technical Change. *Journal of Political Economy*, 98, pp. 71-102.
- Romer, P. (1993) Two Strategies for Economic Development: Using Ideas and Producing Ideas. In *Proceedings of the World Bank Annual Conference on Development Economics*. Washington,DC:World Bank.
- Sachs, J.D. and Warner, A.M. (1995) Economic reform and the process of economic integration. *Brookings Papers of Economic Activity*, 1995(1), pp. 1 – 118.
- Sachs, J.D. and Warner, A.M. (1997) Fundamental sources of long-run growth. *American Economic Review* 87, pp. 184–188.
- Samuelson, P. A. (2004) Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization. *Journal of Economic Perspectives* 18(3), pp. 135–47. 214
- Singer, H. (1950) The Distribution of Gains Between Investing and Borrowing Countries. *American Economic Review* 40, pp. 473-485
- Subramanian, A. and Roy, D. (2003) Who Can Explain the Mauritian Miracle: Meade, Romer, Sachs or Rodrik?. In D. Rodrik (ed) *In Search of Prosperity: Analytic Narratives on Economic Growth*, Princeton,NJ: Princeton University Press.
- Subramanian, A. (2009) *The Mauritian Success Story and its Lessons*. UN University Research paper No. 2009/36.
- Toye, J. and Toye, R. (2003). The Origins and the Interpretation of the Prebisch-Singer Thesis. *History of Political Economy*, 2003, 35(3): 437- 467.
- Wacziarg, R. and Welch, K.H. (2008) Trade Liberalization and Growth: New Evidence. *World Bank Economic Review*, 22(2), pp. 187-231.
- Yanikkaya, H. (2002) Trade Openness and Economic Growth: A Cross-Country empirical Investigation. *Journal of Development Economics*, 72, pp. 57-89.
- Young, A. (1995) The Tyranny of Numbers: Confronting the Statistical Realities of

the East Asian Growth Experience. *Quarterly Journal of Economics*, 110(3), pp. 641–80.