Financial Liberalisation and Economic Growth in Selected Caribbean Countries

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Abstract

The Caribbean countries have over the last two decades implemented polices aimed at liberalising their financial systems especially the capital accounts and exchange controls, mostly as part of economic stabilisation and structural adjustment programmes. In recent times, there has been an acceleration for the process to accommodate the creation of the CARICOM Single Market and Economy (CSME). This paper attempts to ascertain the effect of the financial liberalisation process on economic growth in a select group of Caribbean countries. The methodology involves including a financial liberalisation indicator variable, previously developed by Greenidge (2006), in a standard growth regression. The impact of the liberalisation variable is evaluated within a single equation cointegration framework using dynamic OLS. The evidence suggests that financial liberalisation led to faster growth in Barbados and Jamaica but had no effect in Trinidad and Tobago. However, the positive growth influences in both countries waned and the equilibrium level of output either declined (Barbados) or was unaffected (Jamaica).

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Key words: financial liberalisation, economic growth, capital controls, sequencing

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Table of Contents

List of Tables

List of Figures

1.1 Introduction

The macroeconomic effects of financial liberalisation in developing countries have been of particular interest in the recent theoretical and empirical literature. Primarily because the last two or three decades have witnessed many developing countries liberalising their financial systems, to varying degrees, under the expectation that this would result in faster economic growth. However, the experiences have often been less than encouraging and in many cases have led to financial fragility and crises (for example, in Latin America and East Asia) which, as a result, undermined economic growth.[1] Consequently, the quest for a deeper understanding of the growth effects of financial liberalisation has become a major research and policy issue. In this regard, the evidence generally suggests that the outcome of financial liberalisation is dependent on such factors as: the pace of its implementation; the sequencing of the liberalisation measures; the degree of macroeconomic stability before, during and after the liberalisation period; and, the institutional structures of the liberalising economy.

However, much of this research has concentrated on countries of Asia and, to a lesser extent, Latin America. Nevertheless, Caribbean countries have also made significant progress in opening up to the flow of international finance and removing restrictions on the domestic financial sector. Moreover, in recent times the process has been intensified as the countries prepare to establish the CARICOM Single Market and Economy (CSME), which requires the free movement of capital between member countries and the coordination of foreign exchange and interest rate policies. Yet, there is a dearth of research into understanding the transmission and outcomes of the various liberalisation efforts. This is partly because in most cases the process began around the late 1980s and early 1990s, mostly as part of economic stabilisation and structural adjustment programmes, and thus until recently sufficient time would not have elapsed to allow for any rigorous econometric analysis. It also reflects to some extent the lack of systematic measures of the liberalisation process, a problem that is not only specific to the region.

[1] See, for example, discussions in Arestis and Demetriades (1999) and Arestis (2005).

This paper contributes to the literature by examining the growth effects of financial liberalisation in a selected group of Caribbean economies. There are a number of justifications for choosing to investigate this issue within the context of the Caribbean region. First, the region has a rich history of financial liberalisation with different start times and at varying paces[2]. For example, Barbados embarked on a very gradual process of liberalisation in 1991 and still has restrictions in place to date, Trinidad and Tobago began around 1988 and by 1993 had virtually eliminated all restrictions, while Jamaica features two distinct periods, 1986-88 and 1989-91. In addition, they have had different experiences, including a financial crisis in Jamaica and a near collapse of the financial system in Trinidad and Tobago. Second, there is a dearth of empirical studies providing policy makers in the region with the necessary information concerning the economic impact of these reforms. Unfortunately, drawing implications from studies conducted on other countries and regions, though insightful, is going to be somewhat limited from a policy perspective given that the literature suggests that country-specific factors, such as the country's economic structure, political environment and institutional framework, are important determinants of the effects of liberalisation.[3] Third, there are now data of sufficient length to allow for meaningful investigation of issues relating to financial liberalisation. However, our analysis in this paper is restricted to Barbados, Jamaica and Trinidad and Tobago because of data limitations with respect to the measures of financial liberalisation.

The remainder of this paper is organised as follows. The next section reviews the literature on the growth effects of financial liberalisation. Section 3 discusses modelling issues. One main conclusion that comes out of those discussions is that it is best to take a time-series approach to the empirical analysis, as this allows for: a more in-depth analysis of the dynamic evolution of the economy in question; a more detailed examination of institutional and historical characteristics of the particular country; and, the use of a data set unconstrained by the need for measurement consistency across countries. Section 4 presents the country-specific data,

[2] See Greenidge 2006.
[3] See for example our discussion in Greenidge 2006, also Andersen and Tarp (2003), and, Ang and McKibbin (2005).

estimations and results, while Section 5 concludes the paper by summarising its main findings and draws implications thereof.

1.2 Review of the Growth Effects of Financial Liberalisation

Since the seminal contributions of Goldsmith (1969), McKinnon (1973) and Shaw (1973), the literature has focus on the relationship between financial liberalisation and economic growth. The general prediction that has emerged from this literature is that financial liberalisation may affect growth through three mechanisms. First, domestic financial liberalisation, which involves the lowering of reserves requirements and the removal of interest rates restrictions and credit controls, will exert a positive effect on economic growth via the interest rate mechanism; as interest rates rise toward their competitive market equilibrium. The result is a more efficient allocation of resources and faster growth. The second is through the opening up the capital account, where it is assumed that the increase in net capital flows will augment domestically financed investment, rather than crowd it out. Finally, where capital markets are imperfect and financial constraints exist, as is the case in most developing economies, external finance tends to be more costly than internal finance, and investment is more sensitive to cash flows. In such economies, a direct effect of capital market liberalisation would be the easing of capital constraints, and a possible indirect effect would be the enhancement of the quality of corporate governance via the adoption of international accounting rules and regulatory standards. The improved corporate governance should in turn lead to greater risk sharing and a lowering of the cost of capital as firms can now obtain funds in both the banking and securities markets (Stulz, 1999; Claesens *et al*., 2001).

However, critics of the liberalisation doctrine argue that efficiency in capital allocation can not be achieved merely by the removal of distortions caused by financial repression. In particular, the removal of one set of distortions may not be welfare enhancing if others remain in place. Thus, if external liberalisation occurs while trade barriers are still in place, capital inflows may be channelled to industries that are at a comparative disadvantage and this will not be welfare or growth enhancing.

Another criticism often levelled against the call for financial liberalisation is that in the presence of information asymmetries in the financial markets, there is little possibility of financial liberalisation leading to welfare improvement (Hellmann and Stiglitz, 2000; Hellmann *et al*., 2000; Stiglitz, 2000). Combined with moral hazard in an environment where corporate governance is weak and contract law is poor, capital inflows can be destabilising and may even impede growth.

In terms of empirics, there is an extensive empirical literature on the impact of financial liberalisation on economic growth. Table 1 summarises a selection of such studies. The common approach is to augment a growth regression with a measure of financial liberalisation and then use cross-country, time-series or panel estimates to evaluate its effects.

The earlier studies attempt to quantify the effects of financial liberalisation using real interest rates as an indicator of the level of financial repression. The hypothesis is that the liberalisation of real interest rates, by allowing them to rise to their competitive free-market equilibrium levels, will lead to faster growth. Many studies confirm a positive association between real interest rates and growth. However, since in most cases financial liberalisation is accompanied by other reforms, De Gregorio and Guidotti (1995) argue that real interest rates are not a good indicator of financial repression. They recommend the use of a broader indicator such as a financial development proxy.

Since then, there has been a proliferation of studies assessing the relationship between various measures of financial development and economic growth, including the often cited works of King and Levine (1993) and Levine *et al*. (2000). However, financial liberalisation and financial development are not the same, and more importantly, are poor proxies for each other. In fact, the recent literature acknowledges this distinction by investigating the effects of the former on the latter. In this regard, Arestis *et al*. (2002) conclude that financial liberalisation is a much more complex process than previous assumed in the literature, and that its effects on financial development are ambiguous. In a similar vein, Galindo *et al*. (2002)

Table 1: Selected Studies on the Growth Effects of Financial liberalisation

Author(s)	Objective / hypothesis being tested	Scope	Methodology	Findings/Comments
King and Levine (1993)	Relationship between financial development and economic growth	80 countries over the period 1960-89.	Cross-country estimates of a standard growth function augmented with one of four indicators of financial development.	High correlation between financial development and future rates of economic growth, physical capital accumulation, and economic efficiency improvements. Finance leads to economic growth.
Jappelli and Pagano (1994)	Role of Capital Market Imperfections and Subsequent Deregulation	OECD Countries	Cross-country regressions of saving and growth rates on various indicators of liquidity constraints.	Financial deregulation - easing of liquidity constraint - in the 1980s had a negative impact on households' saving, growth and welfare
Fry (1997)	1). Impact of the real rate of interest (*r*) on economic growth (*EG*) 2). Impact of financial distortions, proxied by *r* and the black market exchange rate premium (*B*), on saving and investment ratios as well as export and output growth rates.	16 developing countries.	Pool time-series fixed-effect estimation of the model – $EG = \beta_0 + \beta_1(r + \beta_2)(r + \beta_2)$ The same model as above but within a simultaneous-equation system (estimated using Iterative three-stage LS).	They suggest that the relationship between *r* and *EG* might resemble an inverted U curve: Very low and negative *r* tend to reduce *EG*, but very high *r* that do not reflect fundamentals is likely to result in lower level of investment and *EG*.
Bekaert *et al.* (2000, 2001)	The impact of financial liberalisation (mainly equity market liberalisation) on growth	Initially 35 emerging market economies. Expanded in the later study to 95 countries.	Uses official dates of stock market liberalisation. Panel data estimation of a standard growth equation augmented by the liberalisation indicator.	In both studies, the liberalisation indicator is consistently positive and statistically significant across countries. Also, after liberalisation, investment to GDP increases, consumption to GDP decreases, both imports and exports increase but imports more than exports, government sector is usually smaller.
Arteta *et al.* (2001).	1) Is there a positive association of capital account liberalisation with growth? 2) If it is limited in particular to high-income economies, does this reflect their more advanced stage of financial and institutional development? 3) Do the effects hinge to a greater extent on the way it is sequenced with other policy reforms?	Greece, Thailand, Philippines, Korea, India, Egypt.	Uses Quinn's and ΔQuinn's index of capital account liberalisation. Also IMF's Share indicator and two additional capital account interaction terms by multiplying the Quinn index by both the black market premium and the Sachs-Warner (1995) openness measure. Follows Edwards (2001) but with weighted (different weights) and unweighted and with different instruments.	Little evidence that capital account liberalisation varies with the level of financial depth. Countries that liberalise their capital accounts grow faster but only if they first eliminate the black market premium.

Table 1 (continued): Selected Studies on the Growth Effects of Financial liberalisation / Repression

Author(s)	Objective / hypothesis being tested	Scope	Methodology	Findings/Comments
Edwards (2001)	Investigates the effect of capital mobility on economic growth and whether this is dependent on the degree of economic development.	40 developing economies and 21 advance ones	Uses Quinn's index along with an interaction term (product Quinn and per capita income) in standard growth regressions. Estimates by SURE, Weighted least squares (1985 GDP as weight), and IV.	Quinn's index significantly increases GDP growth. The interaction indicates that at low GDP levels capital account liberalisations may lower GDP growth. Interacting the Quinn index with standard measures of domestic financial development suggests that for financially sophisticated countries an open capital account is a boon but at very low levels of local financial development it may adversely affect growth.
Edison *et al.* (2002)	1) Investigate the impact of IFL on economic growth. 2) Is the relationship dependent on the level of economic development, financial development, institutional development, or macroeconomic policies?	57 countries	Uses Share plus outcome indicators (Capital Stocks and Capital Flows to Growth in GDP per capita) along with interaction terms with financial development and other macroeconomic policies. Estimates by cross section (OLS and IV) and Panel (GMM).	No evidence that international financial integration accelerates economic growth even when controlling for particular economic, financial, institutional, and policy characteristics.
Fratzscher and Bussiere (2004)	To examine the time-varying relationship between financial openness and growth	45 developing and developed economies	Panel data estimation of a standard growth model augmented with various measure of financial openness: those from Kaminsky and Schmukler (2001) and others based on capital inflows.	Faster growth in the initial five years following financial liberalisation. But significantly slowly growth afterwards. Countries that gain in the initial five-year period are those that experience an investment boom, have large portfolio investment and debt inflows and have larger current account deficits. What promotes growth after those initial years are the quality of institutions as well as the composition of capital inflows.

argue that financial liberalisation can, under certain conditions, promote financial sector development, which in turn can encourage growth.

There is also a body of research suggesting that the link between financial liberalisation and economic growth depends on the country's level of development. The higher the initial level of development of the country, not only in terms of its institutions but also the size and sophistication of the capital markets, the higher is the probability that the country can benefit from further liberalisation.

1.3 Modelling Issues

1.3.1 Specifying the Relationship between Financial Liberalisation and Growth

Most empirical studies on financial liberalisation and growth begin with the standard growth regression of the literature (see Table 1), often referred to as the Barro regression following the pioneering work of Barro and Sala-i-Martin (1995), and add to this baseline model a financial liberalisation indicator (*fl*) and perhaps a number of interaction terms depending on what is being investigated (see Equation 1). The idea is to estimate the effects of financial liberalisation on growth, controlling for other possible growth determinants. Note that this workhorse regression model of the growth literature, the Barro regression, is really that first proposed in the seminal work of Mankiw, Romer and Weil (1992), *MRW*, but with additional explanatory variables.

Original model of Mankiw, Romer & Weil (1992)

$$y_{i,t} = \gamma X_{i,t} + \varepsilon_{i,t} + \pi Z_{i,t} + \varphi fl_{i,t} \quad + \omega(fl_{i,t} \cdot ?_{i,t}) \qquad (1)$$

Barro regression

Here, *y* is growth in real GDP per capita and, as noted by Durlauf *et al.* (2004), *X* can be seen as representing those growth determinants suggested by the Solow growth model, while *Z* captures those determinants that lie outside the original Solow theory. In addition, whereas the *X* variables are quite common in empirical studies, the *Z* variables vary considerably across studies and also by country (Kenny and Williams,

2001). Moreover, there is an extensive list of such *Z* variables. The Durlauf *et al*. (2004) survey identifies 145 different regressors, the vast majority of which have been found to be statistically significant in at least one study using conventional standards. They note that one of the main reasons why so many alternative growth variables have been identified is due to questions of measurement, and attribute the high percentage of statistically significant growth variables to publication bias and data mining.

If we stay in line with the empirical literature and accept Equation 1 as being an appropriate framework for examining the growth effects of financial liberalisation, the question is how we choose among the vast number of possible growth determinants. This is far from an easy task. In fact, the one issue on which the growth literature is in agreement is that there is no agreement as to which variables should be included in the growth regression. Durlauf *et al*. (2004) argue that the absence of consensus is one of the fundamental problems of the empirical growth literature.

The common approach to variable selection in the literature is to choose from among the *X* variables those that have been found to be robust across different studies, and to choose from *Z* those additional controls that the researcher wants to account for in relation to the issue being investigated. In this regard, we note that Levine and Renelt (1992) and Kalaitzidakis *et al*. (2000) conclude that the only robust growth determinants among *X* are initial income and the share of investment in GDP. In surveying the literature on growth and financial liberalisation, we note the variables commonly used in *X* and *Z*, and these are presented in Table 2 (with citations).

With respect to the *X* variables, initial GDP is only included in panel estimation and thus will be excluded in our case, while the other *X* variables will form our core regressors. In terms of the *Z* variables, we to further narrow our selection using any growth research specific to the Caribbean region and also on the basis of the interactions we are interested in. For example, we are certainly be interested in the interaction between financial liberalisation and financial development and between financial liberalisation and trade liberalisation, and would therefore want to have measures of financial development and trade liberalisation in our model. Finally, we

propose to employ a general-to-specific approach to our modelling procedure, allowing for a more robust method of selecting the variables.

Table 2: A Selection of Commonly used variables in Growth Regressions

X	*Z*
Core Macroeconomic	**Institutional & Other macroeconomic**
• log initial (real) per capita GDP *(MRW, fb, KO, BH, P)* • investment/GDP *(MRW, C, D, A, KO, P)* • human capital: education *(MRW, C, D, fb, BH, P)* • pop growth *(MRW, fb, BH, P)* • gov't consumption/GDP *(D, fb, BH, P)*	• Political risk indicator *(fb)* • Financial crisis dummy *(fb)* • Inflation, (*fb, Ac, RC, BH, P)* • Private cons./GDP *(fb)* • Private invest/GDP *(fb, Ac)* • Growth rate of real exports *(D)* • Financial Development*(C, D, KO, P)* • Current Account/GDP *(fb)* • Trade Balance/ openness *(fb, Ac, KO)* • Total or external debt/GDP *(fb) ,(Ac)* • Short-term debt/GDP *(fb)* • Terms of Trade *,(D, Ac, BH)* • Real exchange rate overvaluation*,(Ac)* • Employment per capita *(C)* • Private credit (*BH)* • Quality of Institutions (*BH)* • Law and Order (*BH)* • Human capital: health (*P)* • life expectancy (*KO*, *BH)*

Notes*: MRW* = Mankiw, Romer & Weil, (1992), *KO* = Klein & Olivei (1999), *fb* = Fratzscher & Bussiere (2004), *A*c = Achy (2003), *BH* = Bekaert and Harvey (2005), *LC* = Lewis and Craigwell (1998), *D*= Downes (2003), P = Peters (2001).

1.3.2 The Estimation Technique

Now, having decided on how to model financial liberalisation and growth and on how to go about choosing the control variables, the final issue that remains is what estimation techniques to employ. That is, whether to use cross-sectional, panel or time series analysis. In this regard, the estimation choice will be guided by our data, as the debate over panel versus time series has sound arguments on both sides. Our preference is for single country estimation (based on time series), and this is because of the problems involved in both the estimation and interpretation of cross-sectional and panel regressions.[4] In addition, cross-sectional and panel growth regressions in which a financial liberalisation variable is added can only be

[4] The short comings of cross-sectional and panel analysis are discussed extensively in the literature, see for example, Schultz, 1999; Solow, 2001; Brock and Durlauf (2000, 2001) and Durlauf *et al.* (2004).

interpreted as investigating the average (across countries) affect of financial liberalisation on growth. We are more interested in explaining the effects of financial liberalisation on growth within individual countries and how these effects differ over time and between countries. This naturally suggests a time series approach for our investigation.[5] In general, moreover, a time series approach would also allow for: a more detailed exposition of the dynamic evolution of the economy; a more careful and in depth examination of institutional and historical characteristics of a particular country; and the use of a data set unconstrained by the need for measurement consistency across countries. Moreover, the assumption of parameter homogeneity, often imposed in panel and cross-sectional studies, may be inappropriate in the context of the Caribbean region, as the islands have relatively different economic structures: Barbados is primarily a tourism and services based economy; Trinidad and Tobago driven by the oil and energy sector; Guyana depends mainly on agriculture and mining; and the key sectors in Jamaica are bauxite and tourism.

Even beyond the above reasons, it is important to carry out country-level studies in order to relate the findings and conclusions to policy designs within the respective countries (Ang and McKibbin, 2005). Finally, the time-series setting provides a natural environment for distinguishing between different causal patterns and this is desirable since the functioning of the financial system is particularly contingent upon the institutional setting. In this regard, we use cointegration and error-correction models to study the long- and short-run determinants of growth in the individual countries.

However, since for each country we will have at most 40 observations and is likely to include at least 5 to 6 variables, our preference is for a single-equation estimation approach to cointegration. At the same time we must be mindful of issues of endogeneity in choosing our estimation procedure, since in the presence of simultaneity cointegration regressions may be biased in small samples even though they are consistent estimators. Therefore, we employ the dynamic OLS (DOLS) method developed by Saikkonen (1991) and generalised by Stock and Watson (1993), allowing us to take explicit account of endogeneity.

[5] For a detail discussion of the various estimation procedures and the issues involved see Greenidge (2006).

Implementing the DOLS Procedure

The DOLS procedure provides unbiased and asymptotically efficient estimates of the long-run relation, even in the presence of endogenous regressors. Thus, the endogeneity of any of the regressors has no effect, asymptotically, on the robustness of the estimates. Further, statistical inference on the parameters of the cointegrating vector is facilitated by the fact that the t-statistics of the estimated coefficients have an asymptotic normal distribution, even with endogenous regressors (Stock and Watson, 1993). Another advantage of DOLS is that it allows for direct estimation of a mixture of *I(1)* and *I(0)* variables,[6] which is an important gain since the Johansen multivariate procedure does not admit *I(0)* variables to the cointegrating vector. Often we are interested in the long-run effects of such variables (for example, interest rates which are often *I(0)*), and it would be incorrect to assume that because they are *I(0)* they can not exert an influence on the dependent variable. In addition, Stock and Watson (1993) show that the DOLS estimator is asymptotically equivalent to the maximum likelihood estimator of Johansen (1988) in the case where the variables are *I(1)*, and even in the presence of multiple long-run relations if there are no cross equation restrictions (see also Park and Phillips, 1988; Phillips, 1991; Watson, 1994; and Caporale and Pittis, 1999). Moreover, it performs well in small samples, which is perhaps the most important reason for our choosing DOLS, since for any single country we have at most 44 annual observations. The potential biases due to endogeneity among the regressors and small sample size are dealt with by the inclusion of lags and leads of the first differences of the *I(1)* variables. Thus, the estimation of the long-run relation for Equation 1 is based on the following regression:

$$Y_t = \mathrm{B}' X_t + \sum_{j=-K}^{K} \lambda_j' \Delta X_{t-j}^I + \xi_t \qquad (3)$$

[6] This is an important plus for us since the Johansen multivariate procedure does not admit *I(0)* variables to the cointegrating vector but often we are interested in the long-run effects of such variables (for example, interest rates which are often *I(0)*) and it would be incorrect to assume that because they are *I(0)* they can not exert an influence on the dependent variable. As noted in Loayza and Ranciere (2005, pp. 6), the assumption "that long-run relationships exist only in the context of cointegration among integrated variables" has been a common misconception of the cointegration literature.

Where Y is real GDP, X^I denotes the sub-set of *I(1)* variables of *X*, *B* is the vector of long-run coefficients and the inclusion of ΔX^I_{t+j} takes care of the possible endogeneity of *X*. The equation is estimated in most cases with *K=1*, but then a 'general to specific' procedure[7] is applied to reduce the model to a more parsimonious congruent specification where only significant variables are retained.

In order to investigate the short-run dynamics, the estimates from Equation 3 can be used to formulate a general error correction model of the form:

$$y_t = \sum_{j=1}^{p} \varphi_j y_{t-j} + \sum_{j=0}^{p} \phi_j' \Delta X^I_{t-j} + \sum_{j=0}^{p} \gamma_j' Z_{t-j} + \zeta_j \sum_{j=1}^{p} \left(Y_{t-1} - \mathrm{B}' X^*_{t-1} \right) + \varepsilon_t \qquad (4)$$

which specifies real GDP growth as a function of lagged values of the first difference of the nonstationary variables, stationary variables that may have short-run effects (*Z*), and stationary combinations of the nonstationary variables, which represents the long-run relation between real GDP and its determinants. This long-run relation among variables is given by the elements of *B* and the rate at which real GDP responds to disequilibrium in the long-run relation is given by ζ. In estimating Equation 4, a general-to-specific approach will also be used in order to reduce it to a more parsimonious representation.

The Financial Liberalisation Indicator

Our measure of financial liberalisation is taken from Greenidge (2006) and comprises both domestic and international financial liberalisation. Domestic financial liberalisation is constructed by coding the various possible restrictions imposed on the financial system: credit controls; interest rate controls; entry barriers; state ownership; and regulations, which combines regulation of operations and prudential regulations.[8] Thus, it reflects all the possible dimensions on which the domestic financial sector maybe restricted. International financial liberalisation accounts for

[7] See Campos *et al*. (2005) for detailed expositions on the general-to-specific approach to econometric modelling.

[8] Each dimension is assigned a value of 0, 0.5 or 1, where a 1 indicates full liberalisation, thus the index has a maximum value of 5. It is rescaled for the econometric analysis to have a maximum value of 1.

any policy that encourages the flow of international finance. Each index is rescaled to lie between 0 and 1.

It would be preferable to include all the dimensions in the same model along with the various interaction terms but this may lead to problems of multicollinearity, especially between the interaction terms and the individual variables. Such an approach may seriously infringe on the degrees of freedom during estimation, resulting in unreliable inferences. We could include the indicators separately but this may result in biases due to omitted variables, as in most instances the various liberalisation policies are implemented simultaneously. Similar observations are made in Demetriades and Luintel (1996a, 1997) in which the authors construct indices of financial repression. We follow their recommendation and construct a summary indicator using principal component analysis (other examples include Bandiera *et al*., 2000; Abiad and Mody, 2005).

1.3.3 A Caribbean Country Growth Model

As discussed above, a wide range of variables have been used in growth empirics; however a number of these, such as ethno-linguistic fractionalisation (from Sala-i-Martin, 1997a, 1997b; Easterly and Levine, 1997) and assassinations (Burnside and Dollar, 2000), are not applicable to the Caribbean. We arrive at our choice of variables by a survey of the literature as it relates to developing countries, in particular work done on the Caribbean region[9]. There are human capital, fiscal policy, openness to international trade, financial development, inflation, physical capital and the population growth rate

In the absence of continuous and consistent data on school enrolment and qualifications obtained to proxy *human capital*, we follow the World Bank (1994) procedure in intra- and extrapolating the Barro and Lee (2000) measures of educational attainment. In this regard, we use the percentage of the population that have successfully completed only the secondary school level and the percentage

[9] Specifically, works by Williams and Daniel (1991), the World Bank (1994), Boamah (1997), Lewis and Craigwell (1998), Peters (2001), and Downes (2003). Note that a wider review of the literature on these variables is contained in Greenidge (2006).

that have successfully completed a tertiary level.[10] *Fiscal policy* is proxied by the ratio of government consumption to GDP and this is obtained from the WDI CD ROM 2005. In terms of o*penness to international trade*, we use the share of exports in GDP ratio to capture the effect of a more outward-looking trade regime. However, given that it is normally imports that are most affected under a trade restrictive regime and usually stand to benefit most from greater openness to international trade, we also employ the share of imports to GDP as an alternative proxy. We also experiment with the trade volume (merchandise exports plus imports) to GDP ratio for comparison purposes. This data also came from the WDI 2005.

Financial development is measured by the ratio of broad money (M2) to GDP, and the inflation rate by the twelve month moving average of changes in the consumer price index. However, since it is recognised in the literature that even in low inflation environments high inflation volatility can impede growth by generating uncertainty concerning future prices, we experiment with the conditional standard deviation of the inflation rate as a measure of uncertainty (also employed as a determinant by Levine and Renelt, 1992; Barro, 1997; and, Sala-i-Martin, 1997). This is obtained by estimating a generalised autoregressive conditional heteroscedasticity model (GARCH) of the inflation rate.[11] Finally, physical capital accumulation is given by the gross domestic investment.

When the financial liberalisation index is added to these standard growth variables, its impact on economic growth is expected to be positive, based on the evidence presented earlier. If it results in an easing of borrowing constraints then the consequent lowering of the financial cost of investment can lead to faster growth. Moreover, if the more efficient use of information and loosened borrowing constraints

[10] For each country we also present the percentage of the population for whom the secondary level or the tertiary level is the highest attained but not necessary completed. However, we use the completion rates as the literature (including Barro and Lee, 2000) argues that this is a better measure of educational attainment.

[11] The GARCH model, developed by Bollerslev (1986), is the most popular tool for modelling volatility as it allows for more precise estimates in allowing for time dependence of the second moment of the variable in question (Serven, 1998; and Bo and Sterken, 1999). We use a GRACH (1,1) model of the form: $\pi_t = \alpha_0 + \alpha_1 \pi_{t-1} + \varepsilon_t$ where $\sigma_t^2 = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \sigma_{t-1}^2$ and π is the inflation rate, σ_t^2 is the condition variance of ε_t and the σ_t is taken as our measure of uncertainty.

cause financial services to be extended to include human capital investment (such as loans for educational and training purposes) then faster growth can occur.

1.4 Estimations and Results

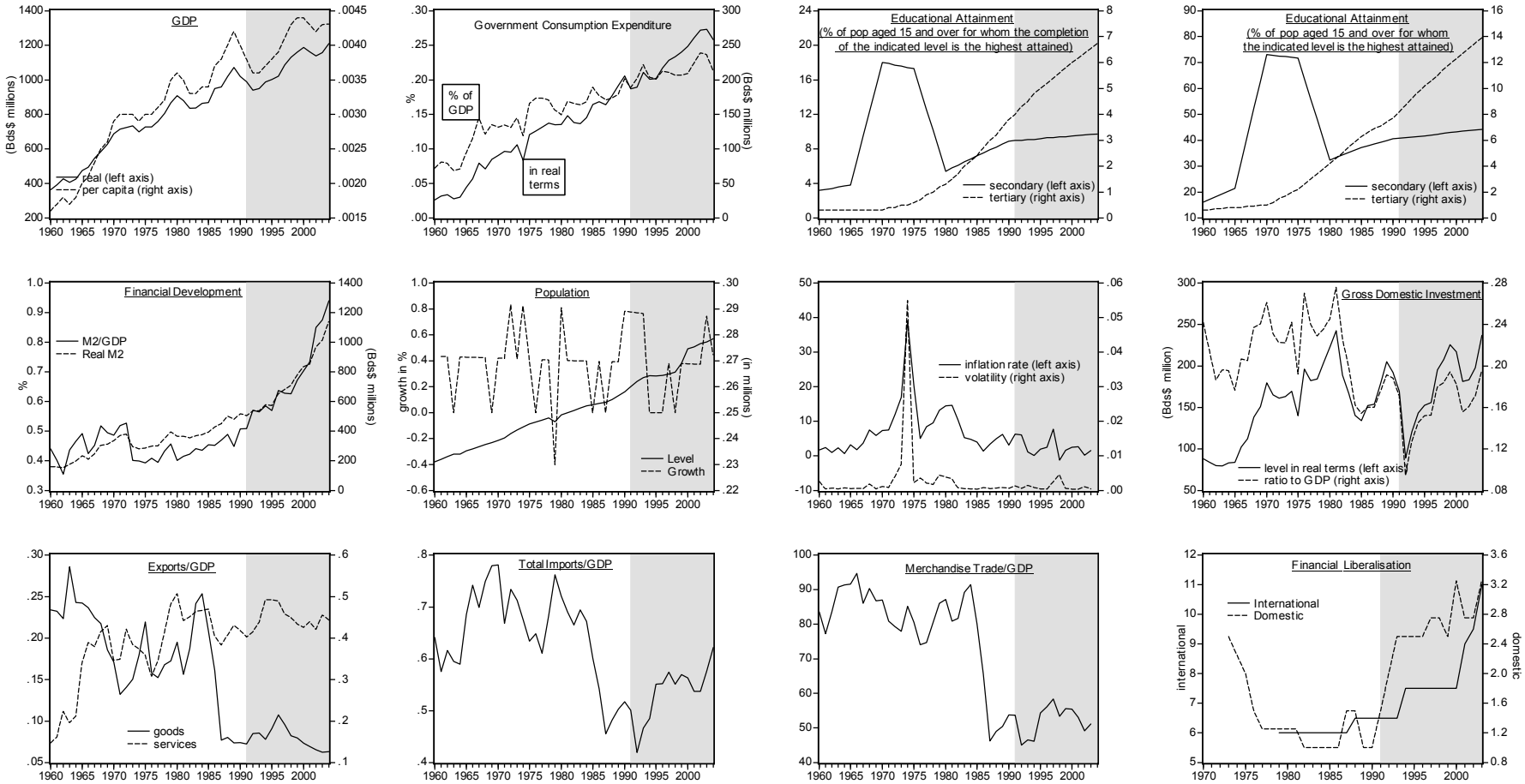
1.4.1 Barbados

Output and its possible determinants for Barbados are presented in Figure 1. For comparison purposes, where possible we plot the series in both real terms and as ratios of GDP. In most instances there is very little difference between the two. The population growth rate has been relatively low (averaging roughly 0.36 percent per annum). Also, the behaviour of a number of these variables, such as financial development and financial liberalisation, have been discussed in other parts of this thesis and therefore not expounded upon in any detail here.

The GDP chart shows Barbados as having an impressive output performance over the last four decades. Over the period 1960 to 2004, real GDP rose from Bds$363.8 million (US$212.2 million) to Bds$1.2 billion (US$604.7 million), which represents an average annual growth rate of roughly 2.5 percent. In per capita terms, output increased over the period from Bds$1574.9 (US$$918.7) to Bds$4214.7 (US$2107.3), which is approximately 2.1 percent per annum. Four recessionary periods can also be identified from the chart: 1974-75, 1981-82, 1990-92, and 2000-01. The first was occasioned by rising international oil prices, while the others are associated with recessions in the international economy.

Like many developing countries, the government of Barbados has played a major role in the economic and social development of the country. As such, government consumption expenditure as a share of GDP rose steadily from 7 percent in 1960 to 21.3 percent in 2004. Moreover, the government has invested heavily in education, training, health, nutrition, social security/welfare, housing and other social services. Indeed, government expenditure on productive services has been rising over time. For example, 1960/61, the government's current expenditure on education was Bds$4 million or 18.3 percent of total expenditure and this has risen over the years to reach Bds$389.1 million or 23.3 percent in 2004/05. Similarly, the share of government expenditure channelled into social development (health, social welfare,

Figure 1: Output, Its Possible Determinants and Financial Liberalisation in Barbados



housing and other social services) rose from Bds$5.15 million or 23.8 percent in 1960/61 to Bds$550.6 million or 30.2 percent in 2004/05. In terms of expenditure spent on economic services (agriculture, water/post office, roads/transport), the share declined from 27 percent to 14.3 percent. However, this is still a major contribution to developing the economic infrastructure, as in absolute amounts it represent an increase from Bds$5.83 in 1960/61 to Bds$259.87 million in 2004/05, making it the third largest expenditure category. Government is also the single largest employer, providing employment for approximately 19 percent of the labour force.

It appears that the strategy of investment in education has been a successful one, as Barbados boasts a literacy rate of over 90 percent and has consistently been the highest ranked country in the LAC region on the UNDP's Human Development Index. This investment has also been accompanied by policies to ensure that each member of the population gets access to at least a basic level of education. Such policies included the abolition of fees at secondary schools and a compulsory school-leaving age of 16 years. The charts on educational attainment indicate that the percentage of the population whose highest level of education is at the secondary or tertiary levels have risen significantly over the sample period. Thus, the quality of its human capital has been increasing over time and as such we would expect to find a positive effect on growth.

The services sector (tourism, distribution, business, and Government services) is the cornerstone of the Barbadian economy, with tourism and financial services playing a particularly important role. In 1965, the services sector accounted for 35 percent of real GDP, while in 2004 it represents 67 percent. As such, the economy is quite open and vulnerable to external shocks, as seen by the depth and duration of the 1990-92 and 2001-02 recessions. In the first case, the slowdown in the international economy impacted on the export sectors and real output fell 4.8 percent in the first and continued sliding for another two years. In the second instance, the external shock came from the impact of the Gulf War and tourist travel. Consequently, real value added in tourism declined by roughly 6 percent in 2001 and the economy contracted by 2 percent in real terms.

Traditionally, trade policy focused on an import-substitution strategy for promoting economic development, which was implemented through a system of tariff and non-tariff barriers designed to protect producers in the manufacturing and agricultural sectors. In addition, a licensing system restricted the importation of competing imports. However, in recent years considerable effort has been made to liberalise and simplify the trade regime. In the context of the *CET* reduction programme, tariffs were reduced between 1993 and 1999, as was reliance on quantitative import restrictions. A surtax of 100% on imported goods that compete directly with locally produced goods was introduced in 1994 but progressively reduced and abolished in April 2000. A VAT was introduced in 1997 to replace multiple taxes and levies. The Customs Act was amended in 1999 to implement the WTO Agreement on Customs Valuation. However, although these reforms have simplified Barbados' trading regime considerably, the level of protection offered to domestically produced goods is still relatively high by international standards. Such goods are subject to tariffs ranging from 60 to 240 percent (the high end is normally on poultry and agriculture produces), plus import licensing is still very much in practice. Exports, on the other hand, are not normally taxed or restricted and take place mostly under trade preferences. In addition, the government promotes exports via various duty and tax concessions and financial assistance measures, several of which have been notified to the WTO as export subsidies.

Given the service-dependency of the Barbadian economy, we separate exports into exports of services and exports of goods, expressed in real terms and also as ratios to GDP (see Figure 1). Both series are trending upwards prior to 1984 but since then exports of goods have been on the decline while exports of services have continued to rise. The growth in exports of goods prior to 1984 reflects the prominence of electrical components in the export mix, which rose from Bds$9.5 million in 1975 to Bds$336 million in 1984. However, these components were produced by large multinational companies such as Intel and CORCOM, but these companies relocated their businesses in 1986 and this category of exports has since been on the decline. The decision to relocate largely reflected changes in production technology in the industry. The other indicators of openness (also shown in Figure 1) are imports of goods and services and merchandise exports and import, also expressed as ratios to GDP. The latter shows a sharp decline between 1985 and 1987, which reflects the

drop in exports. We also construct a *de jure* 'trade liberalisation' policy dummy with the hope of capturing changes in the trading regime over time. It takes the value of 1 (which becomes 0 went transformed into natural logarithms) for the 1960 – 92 periods of import substitution, and then changes by 1 unit for every policy change indicated above.

Econometric results

We begin by examining the temporal properties of the variables. Appendix B contains the unit root tests and indicate that inflation can be considered as *I(0)*, while the other variables are *I(1)*. Thus, we proceed to derive the DOLS estimates of the long-run parameters by regressing real GDP on the level of the other *I(1)* variables, lags and leads of their first difference up to the second order and our *I(0)* variable, the inflation rate. We also include interaction terms between financial liberalisation and financial development, and between financial liberalisation and trade liberalisation (or openness when the openness proxy is used instead of trade liberalisation). Note that in order to conserve degrees of freedom, we assume our liberalisation indicators are weakly exogenous and thus do not include their lead first difference. We view this as a reasonable assumption given that these are *de jure* policy variables.

The long-run estimates for real GDP are given in the upper panel of Table 3 and supporting parsimonious DOLS results are in Appendix A under the respective heading. Before discussing the results we should note that when the regression is estimated without an openness variable but including our trade liberalisation dummy, the coefficient on the trade liberalisation indicator turned out to positive but insignificant and thus the variable was subsequently excluded for the model. Similarly, the export of goods to GDP ratio is significant in every case and thus we have concentrated on export of services. Also, when the model is estimated with the variables re-specified in real terms, the sizes of the coefficients change very slightly but the general results are the same.

The results suggest that in the long-run, gross domestic investment, financial development, the stock of human capital and trade openness exert a positive influence on the level of real GDP, while financial liberalisation and government

consumption expenditure have a negative affect. Finding the gross domestic investment rate to be a significant determinant of economic growth is consistent with the central role given to investment in physical capital in growth literature. Its coefficient indicates that a 1 percent rise in physical capital accumulation leads to an approximately 0.33 percentage point increase in output over time.

The positive effect of human capital on steady-state output is one of the fundamental predictions of the endogenous growth models and is of no surprise here given Barbados' impressive education track record. The coefficient on secondary level attainment implies that 1 percent rise in the percentage of the population, 15 years and above, who have successfully completed secondary schooling increases long-run real output by roughly 0.20 percentage points. Moreover, the effect at the tertiary level is even greater, where a 1 percent increase raises long-run output by about 0.24 percentages points. Indeed, it is at the tertiary level that much of the investment has taken place with the three largest tertiary institutions on the island opening within the sample period of this study: the Cave Hill Campus of the University of the West Indies in 1962; the Barbados community College in 1969; and, the Samuel Jackman Prescod Polytechnic in 1970.

The findings suggest that while the removal of restrictions on the functioning of the domestic financial system and on the flow of international finance has lowered the long-run level of real GDP, the development of the system, in terms of greater intermediation and more efficient use of information, has served to raise it. The financial liberalisation effect can thus be interpreted as a direct effect, which is independent from any indirect effects that occur through financial development.

The positive coefficient on our various proxies of openness can be taken as suggesting that greater openness to international trade has allowed the economy to raise its output levels over the years. Admittedly, these are only outcome indicators and as such may be capturing other policy actions that encourage trade but that are unrelated to openness. More so in the case of Barbados, since exports of services is mainly tourism and have little to do with actual openness to trade in the traditional sense. It is possible to have trade controls in place but invest heavily in tourism product development and marketing. It is more likely that our proxy is

Table 3: Growth and Liberalisation in Barbados

Long-run estimates of LRGDP	(1)	(2)	(3)
Investment: L(GDI/GDP)	0.331***	0.308***	0.347***
	(8.116)	(6.359)	(7.222)
Human Capital:	0.201***	0.208***	0.209***
L(secondary level attainment)	(9.999)	(9.600)	(10.709)
L(tertiary level attainment)	0.243***	0.255***	0.258***
	(14.773)	(12.632)	(13.124)
Financial Development:	0.358***	0.359***	0.379***
L(M2/GDP)	(4.345)	(4.218)	(5.485)
Government Policy:	-0.140***	-0.116*	-0.108*
L(Gov'tCon/GDP)	(-2.106)	(-1.817)	(-1.975)
Financial Liberalisation:	-0.095***	-0.100***	-0.097***
TFL	(6.569)	(-7.095)	(-8.521)
Openness:			
L(exports of services/GDP)	0.088***		
	(1.985)		
L(imports/GDP)		0.114*	
		(1.925)	
ΔL(MerTrade/GDP)$_t$			0.078*
			(1.865)
Growth Equation			
ECM$_{t-1}$	-0.557***	-0.554***	-0.618***
	(-5.987)	(-5.480)	(-6.095)
ΔLRGDP$_{t-1}$	0.326***	0.366***	0.359***
	(3.563)	(4.080)	(3.991)
ΔL(GDI/GDP)$_t$	0.174***	0.151***	0.201***
	(5.030)	(3.273)	(3.856)
ΔL(secondary level attainment)$_{t-1}$	0.084***	0.083***	0.078***
	(3.305)	(3.210)	(3.323)
ΔL(tertiary level attainment)$_t$	0.122**	0.105**	0.104**
	(2.243)	(2.195)	(2.072)
ΔL(Gov'tCon/GDP)$_t$	0.087**	0.113***	0.114***
	(2.730)	(3.296)	(2.796)
ΔTFL$_{t-1}$	0.039**	0.044**	0.061***
	(2.909)	(2.447)	(2.797)
ΔL(exports of services/GDP)$_t$	0.081*		
	(1.838)		
ΔL(imports/GDP)$_t$		0.075*	
		(1.920)	
ΔL(MerTrade/GDP)$_t$			----
R^2	0.67	0.64	0.66
DW	2.11	2.07	2.28
AR	0.204[0.816]	0.228[0.797]	1.649[0.208]
RESET	0.176[0.678]	0.117[0.734]	0.068[0.796]
Norm	4.502[0.105]	1.877[0.391]	2.027[0.363]
ARCH	0.442[0.511]	0.614[0.439]	2.539[0.121]
HET	0.663[0.792]	0.425[0.953]	0.530[0.885]
Chow (1983)	1.459[0.244]	1.627[0.184]	1.634[0.174]
Chow (2000)	0.957[0.446]	1.393[0.260]	1.574[0.206]

Notes: *, **, *** indicates significance at the 10, 5 and 1 percent level, respectively. The F-statistic for the respective diagnostics tests are shown (unless indicated otherwise) and the associated p-value in square brackets. *DW* is the

Durbin-Watson statistic. *AR* is the Lagrange multiplier test for *p-th* order residual autocorrelation correlation (see Godfrey, 1978). *RESET* is the Ramsey's (1969) RESET test for incorrect functional form using the square of the fitted values (χ^2 (1)). *Norn* is the test for normality of the residuals based on the Jarque-Bera test statistic (χ^2 (2)). ARCH is the autoregressive conditional heteroscedasticity for up to *p*-th order (see Engle, 1982a). *HET* is the unconditional heteroscedasticity test based on the regression of squared residuals on squared fitted values (See Koenker, 1981). Finally, *Chow (n)* is Chow's (1960) test for parameter constancy based on breakpoints in the sample (two breakpoints are tested - the sample mid-point, *50th*, and the sample 90th percentile, *90th*).

capturing such effects. When we use our dummy variable for trade liberalisation it is positive but insignificant, which lends support to the hypothesis that Barbados is not sufficiently open (in the sense of lower tariff and non-tariff barriers to trade) for there to be a strong trade to growth linkage.

Finally, the evidence indicates that government consumption expenditure has reduced the long-run level of output. Lewis and Craigwell (1998) suggest that it is likely that government spending occurred at the expense of private investment and to the extent that this spending is not productive, fiscal policy will have a negative impact on growth. It does not necessarily mean that all categories of government spending reduce output but that in the aggregate it does.

The error-correction model for the growth process is presented in the lower panel of Table 3 along with a number of diagnostic tests, which confirm that the model is well specified in a statistical sense. The model also has a behavioural interpretation as it incorporates both the long-run information concerning growth (in the form of the lagged error-correcting term, ECM_{t-1}). Indeed, the significance of the *ECM* term confirms the existence of a stable equilibrium (cointegrating) relationship between real GDP and its determinants in the long-run for Barbados. Its coefficient, ranging from 0.55 to 0.60 across the regressions, suggests that it takes approximately two years for economic growth to return to the long-run steady state growth path when disequilibrium occurs. This is consistent with what actually occurred during the recessionary periods in Barbados. In each case, growth resumed within roughly a two-year period, depending the severity of the shock. We also find that growth encourages further growth, where the gains from the pervious period (say a 1 percentage point increase in output) contribute to current period growth (boosts current period growth by roughly 0.33 percentage point).

Our findings also indicate that improvements in the stock of human capital have a contributory effect to growth but with a lag. Here, the evidence suggests that a 10 percent rise in the percentage of the adult population attaining some form of tertiary training, be it at the university or vocational level, will within a two-year period lead to roughly a 1.2 percentage rise in economic growth. If the same increase in educational attainment occurs at the secondary school level (that is, a rise the number of persons entering the work force having attained secondary schooling as their highest training), there is still a positive impact on growth but the contribution is just over half the gains that can be have if such persons go on to tertiary training. Similarly, increases in the physical capital stock have had a contributory role in the growth process.

Similar to our long-run analysis, we find that raising the level of openness to international rate had a favourable impact on growth and, despite the lack of evidence of a significant trade liberalisation effect (since our trade liberalisation dummy is insignificant), this lends credence to an export-led growth strategy. In the case of financial liberalisation, the evidence suggests that in the short-run the easing of restrictions on the financial system actually raised economic growth. Also, our investigation did not reveal any interaction effects between greater financial liberalisation and trade openness, or between the former and financial development. Indeed, financial development seems not to have had any significant influence on the rate of economic growth, although we find that it did contribute to raising the level of output in the long-run.

Finally, the findings indicate that neither inflation nor macroeconomic uncertainty had a significant impact on economic growth, which is not surprising giving that Barbados has often been lauded as having one of the most stable macroeconomic environments in the region. Also, government consumption expenditure did not prove significant in explaining growth.

1.4.2 Trinidad and Tobago

Output and its possible determinants for Trinidad and Tobago are presented in Figure 2. Trinidad is predominantly an oil producing country and, as such, many of the country's macroeconomic variables mirror what is happening in the energy sector

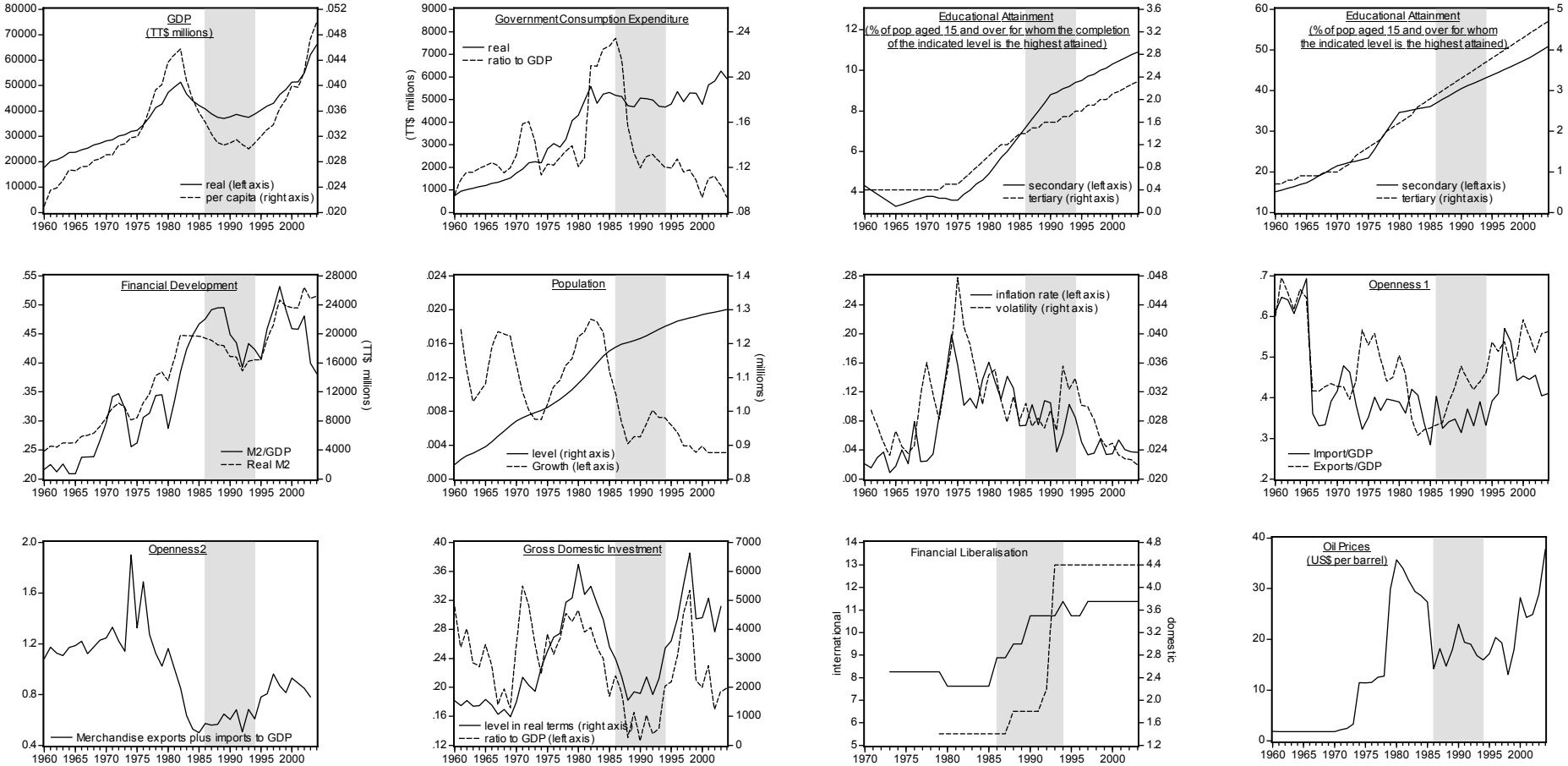
and, in particular, developments in the world oil market. Indeed, the GDP chart shows the economy growing at an average annual rate of 3.5 percent over the period 1960 to 1973. However, between 1974 and 1982 output rose at almost 6 percent per year while per capita GDP expanded by an average rate of 4.4 percent per annum. With the decline of oil prices following the peak of 1982 and a corresponding drop in crude oil production, the economy went into a sharp decline with real output falling by almost 30 percent between 1982 and 1989, an average rate of 4.82 percent per year. The economy recovered in 1994 and has since expanded at a rate of approximately 4 percent per annum. The recovery can perhaps be attributed to the subsequent upturn of the world oil market, plus the stabilisation and structural adjustment programme which the government commenced around 1988 and which included the liberalisation of both the real economy and the financial sector.

The significance of the former (the improvement in the world oil market) can not be understated. In fact, the temporary recovery in economic growth in 1990 and 1991, by 1.5 and 2.7 percent respectively, mirrors the temporary jump in oil prices from US$17.91 per barrel in 1989 to US$22.99 in 1990 before sliding to US$19.37 the next year. The influence of oil prices on growth comes mainly through increasing the incomes of the government and private sector, but also boosting investment in both the oil and non-oil sectors. Both charts show a pattern of evolution similar to that of GDP.

Government consumption expenditure, both in real terms and as a proportion of GDP, rose dramatically during the pre-1982 period. In fact, the latter measure, which can be taken as indicating the relative size of government to the economy, rose from 9.6 percent in 1960 to 21.1 percent by 1982 and suggests an increased role of government in economy activity.

After 1982, government expenditure as a ratio to GDP continued to rise until 1986 when the country signed up to the IMF and World Bank structure adjustment programme. Part of the conditionalities meant reducing the size of the public sector in order to allow the private sector to play a more active role in economic development. Measures included a 10 percent reduction in wages and salaries, and

Figure 2: Output, Its Possible Determinants and Financial Liberalisation in Trinidad and Tobago



in transfers and subsidies, cuts in the public sector work force, and a programme to restructure and privatise many of the state enterprises which the government had acquired during the previous two decades.[12] Nonetheless, government remained involved in a wide range of activities, including petroleum and natural gas, chemicals, electricity, and telecommunications. In addition, the government has continued to invest heavily, mainly via joint ventures, in the energy sector and in particular, in the hydrocarbons and natural gas industries, which saw the establishment of a number of large-scale projects including two new liquefied natural gas plants. Thus, given the significant role that government has played in the economy and that it continues to do so, we expect to find that government expenditure had a contributory effect to growth. Similarly, gross domestic investment is expected to have a positive impact on growth.

As a part of the programme of structural adjustment, great emphasis was place on trade reform and liberalisation. As such, the CET was adopted in 1991 and customs duties were gradually reduced to 20 percent. Trinidad and Tobago has also bound all of its tariffs in WTO. The bound rate for almost all agricultural goods was set at 100 percent (seven items were bound at higher rates), while most industrial products have been bound at 50 percent, with certain exceptions at 70 percent. Import surcharges were also introduced under the Miscellaneous Taxes Act to replace the existing quantitative restrictions and to provide temporary protection for locally produced goods in the period of transition to complete tariffication of the trade regime.

Our proxies for openness all suggest that since 1986 the TT economy has become more liberalised and open to trade. Since this corresponds with the period of rising output levels, we expect to find a positive and, most likely, a significant openness impact on growth.

[12] By 1987, the government had acquired significant interest in 87 companies of which 37 were wholly-owned, 17 majority-owned, 2 minority-owned and 17 indirectly owned. In addition, the government held investments in the four statutory public utilities supplying water, power, transport and port facilities. Collectively these accounted for roughly one fifth of GDP, 30 percent of capital investment, 9.8 percent of employment and over 50 percent foreign exchange earnings (World Trade Organisation, 2005 Trade Policy Review of Trinidad and Tobago).

With respect to financial liberalisation, Figure 2 shows real GDP falling over most of the liberalisation period before rising towards the end. Thus, we do not expect to find a short-run positive impact on growth from the liberalisation process, but most probably a long-run positive effect. In addition, as discussed in Greenidge (2006), financial liberalisation appears to have resulted in greater financial intermediation, with significant growth of the non-bank institutions, increased alliances between banks and insurance companies, and the emergence of a number of financial conglomerates diversifying their business product range in both the domestic and regional financial markets. Again, we hypothesise that this has contributed to economic growth.

The charts on human capital indicate that significant improvements in this area have occurred over the period under review. Indeed, universal primary education (up to age 12) was achieved 1961 and over the next two decades access to secondary education expanded from 22 percent to 70 percent of the 12–18 age group, which can be attributed to the government's 1972 'New Sector' initiative to expand secondary education access, both in academic and technical/vocational areas (World Bank, 1995). Universal Secondary Education was attained in 2000, with an enrollment of 106,637 students in 132 public secondary schools and another 7,766 in government supported private secondary institutions, which amounts to a net enrolment rate of 72.2 percent. In addition, as part of its Vision 2020 objective,[13] the government of Trinidad and Tobago is making a considerable effort to develop its human capital with its goal of creating a virtually seamless educational system from the primary to the tertiary level, with increasing emphasis on information technology and other related subjects.

Econometric results

The results for the stationarity properties of the series are given in Appendix B under the respective heading. Here, the three tests are in agreement that the output, financial development, population, human capital[14] and merchandise trade to GDP

[13] Vision 2020 is a 15-year National strategic plan produced by the Government of Trinidad and Tobago at the end of 2005. It is downloadable from http://vision2020.info.tt/plans/National_Plan.pdf.

[14] Note that because of the high correlation between education attainment at the secondary and tertiary levels (0.975), we combine the two variables into one using the sum of the principal components to capture at least 97 percent of the variation in the two variables.

variables are *I(1)*. However, while the ADF and PP tests suggest that inflation, government consumption to GDP and the remaining openness variables are *I(1)*, the KPSS test indicates that the null hypothesis of stationarity can not be reject. We thus proceed under the assumption that each series can be characterised as an *I(1)* process.[15]

The long-run estimates for the real GDP are presented in the top panel of Table 4 and the supporting DOLS equations are in Appendix A. The results indicate that gross domestic investment, financial development, human capital and openness exert significant and positive effects on output in the long-run. The openness variable has the largest effect, and suggests that the pursuit of a more open trade strategy has raised the equilibrium level of output by almost one-third of a percentage point.

Note that openness is measured by the sum of merchandise exports and imports as a proportion of GDP, as the other two proxies, though positive, proved insignificant in the regressions. The financial liberalisation variable also turned out to be positive but insignificant and thus did not survive the model reduction process. Hence, after controlling for investment and financial development, financial liberalisation has not resulted in raising long-run output levels.

The estimates for the growth equation are in the lower panel of Table 4 along with a full set of diagnostic statistics, which indicates that the model is adequately specified and well-behaved. The error-correcting term is negative and statistically significant, thus confirming that there exists a long-run equilibrium relationship between output and its determinants. It also implies that shocks to the economy will eventually dissipate and output will gravitate towards this equilibrium position. Moreover, the size of the coefficient indicates that roughly one-fifth of deviations in output from its long-run determinants are corrected each year. We also find that past growth is significant in explaining current growth. If growth had increased by 1 percentage point in the previous year, then *ceteris paribus*, growth in the current year will rise by

[15] Recall that the unit root tests are informative to the extent that they guide us as to which variables in the DOLS regression need to be augmented with lags and lead changes to account for possible autocorrelation and endogeneity. In this regard, it is best to err on the side of caution and assume the variable to be *I(1)*. In any case, unwarranted lags and leads will not survive the general-to-specific reduction process.

0.4 percent. Past investment in physical capital is also a significant driver of growth. Here, it takes approximately two years for such investments to bear fruit.

Table 4: Growth and Liberalisation in Trinidad and Tobago

Long-run estimates of LRGDP		
Investment: L(GDI/GDP)	0.140^{***} (5.563)	
Financial Development: L(M2/GDP)	0.177^{**} (2.345)	
Human Capital: L(avg. of secondary & tertiary level attainment – prim.comp)	0.130^{***} (8.132)	
Openness: L(MerTrade/GDP)	0.288^{***} (6.585)	
Growth Equation		
ECM_{t-1}	-0.182^{***} (-6.288)	-0.183^{***} (-6.939)
$\Delta LRGDP_{t-1}$	0.400^{***} (4.264)	0.323^{***} (3.761)
$\Delta L(GDI/GDP)_{t-2}$	0.056^{***} (3.120)	0.058^{***} (3.519)
$\Delta L(\text{human capital})_t$	0.290^{***} (4.849)	0.253^{***} (4.726)
$\Delta(\text{terms of trade})_{t-1}$	0.020^{***} (3.982)	0.022^{***} (4.704)
$\Delta L(Gov'tCon/GDP)_t$	0.053^{*} (1.725)	0.077^{**} (2.331)
Dummy- oil shock 1978/79	0.043^{*} (1.849)	0.047^{**} (2.188)
$\Delta L(MerTrade/GDP)_t$	0.076^{**} (2.455)	
$\Delta L(\text{exports of goods \& services/GDP})_t$		0.092^{***} (2.837)
R^2	0.826	0.85
DW	2.19	2.36
AR	0.424[0.659]	0.793[0.462]
RESET	0.683[0.415]	0.365[0.551]
Norm	0.281[0.869]	1.891[0.389]
ARCH	1.836[0.186]	0.174[0.680]
HET	0.323[0.983]	0.633[0.811]
Chow (1983)	0.671[0.789]	0.493[0.919]
Chow (1999)	0.771[0.554]	0.412[0.799]

Notes: same as Table 3 above.

The results also indicate that improvements in the stock of human capital have been a prime determinant of growth. Specifically, a 1 percentage point increase in the percentage of the adult population entering the work force having successfully completed education training at the secondary level or higher, leads to approximately one-quarter of a percentage increase in economic growth. To place this in perspective, since the government stepped up its efforts to raise the quality of the education system and ensure that a high proportion of the populace has access to a secondary education, the proportion of the population attaining and completing the secondary level increased from 3.6 percent in the mid-1970s to 10.9 percent in 2004. The proportion completing the tertiary level has risen from 0.5 in 1975 to 2.3 percent in 2004.

Our findings suggest that fluctuations in the terms of trade[16] have played an important role in the determination of output growth. The strength of this link is not surprising given that Trinidad is an oil producing country and as such benefits from any oil boom. In fact, the effects of such oils shocks are so strong that it was necessary for us to include a dummy to account for the one of 1978/79. Even though the effect of that oil shock would have been transmitted through other variables in the model (such as the terms of trade and investment), it was of such a magnitude (133 percent rise) that it needed explicitly accounting for in order to ensure normality of the residuals. Similarly, we find that greater openness to international trade has had a positive affect on growth, as two of our three proxies, merchandise trade volume to GDP and exports of goods and services to GDP, proved significant. The third, imports of goods and services to GDP, though positive was insignificant. As noted earlier, this latter measure is perhaps a closer approximation to a trade liberalisation measure since it is usually imports that are restricted under a protectionist regime. The insignificance of the imports of goods and services to GDP ratio suggests that competition in the domestic market from imports or from access to new technology was not a significant driver of growth. However, the positive and significant effect of the exports of goods and services to GDP ratio is in line with the

[16] This variable can be seen as a proxy for world demand and is the ratio of the export price index to the import price index. The data is obtained from the World Development Indicators and is unfortunately only available for Trinidad and Tobago.

export-led hypothesis, where growth benefited from competition in the export sectors or from possible economies of scale.

The share of government consumption in GDP also exerts a positive influence of growth. Thus, the contributory effects of government spending in providing infrastructure and other productive services such as police, defence and health, outweigh any distortionary effects it may have on the tax side. Finally, our analysis failed to uncover any significant effects from financial development or financial liberalisation on growth. In each case the coefficient is positive by highly insignificant and thus eliminated from the regression.

1.4.3 Jamaica

The data on output and its possible determinants are graphed in Figure 3. During the 1960s, the Jamaican economy recorded an impressive performance, with output expanding at an annual average rate of 5.7 percent between 1960 and 1972, while inflation was contained to an average of 4.7 percent. Growth was driven by high levels of investment, particular in the mining and tourism industries, both of which were doing well: Jamaica had become the largest producer and exporter of bauxite, while the tourism industry had evolved from one based on exclusivity to one of mass tourism. Indeed, over this period gross domestic investment increased at an average rate of 8.9 percent per annum, with an average share in GDP of 29.6 percent (see the GDP, investment and inflation charts).

However, during the period 1973 to 1980 real GDP contracted at an average rate of 3.2 percent each year, the investment share dropped from 31.5 percent in 1973 to 15.9 percent and inflation climbed to 27.3 percent. A number of factors have been cited for this deterioration. First, there was the election of a nationalist and populist government in 1972 (Worrell *et al.*, 2000) whose main objective was the redistribution of income. To this end, the government adopted a policy of "Jamaicanisation", which saw it taking control of the "commanding heights of the economy": it acquired one of the largest commercial banks operating at the time and nationalised the telecommunications, electricity and public transportation.

Government also increased its expenditure on health, education, housing and other social services.

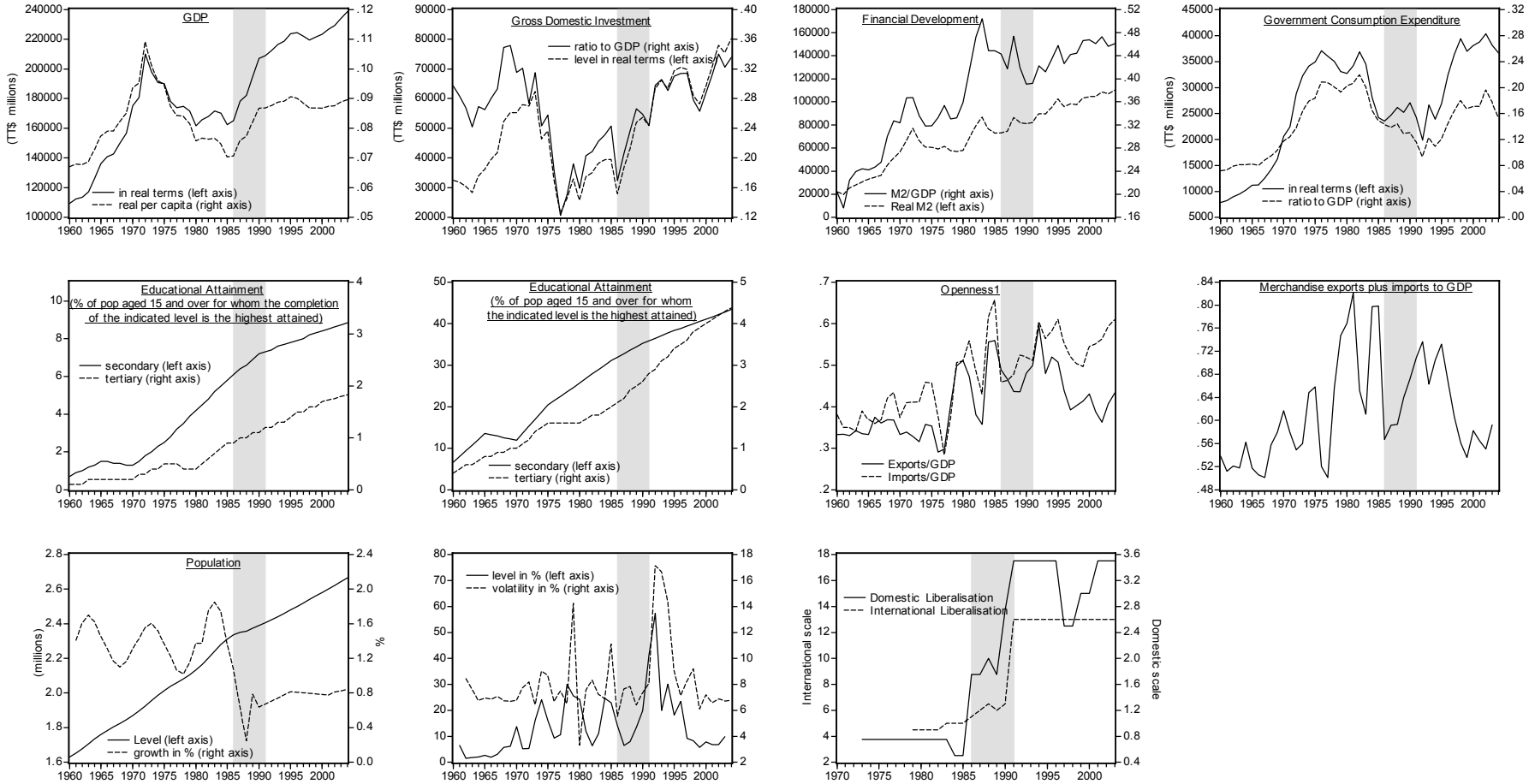
Consequently, by 1980 the government was involved in basically all areas of the economy, with ownership of roughly 350 entities,[17] and its consumption expenditure as a ratio of GDP ballooned from 13.6 percent of GDP to 20.3 percent over the period, while the consolidated public accounts stood at 46.3 percent.[18] This period also saw the government introducing a number of policies that severely restricted international trade (World Bank, 1994, 1996, 2003), as part of a strategy of import substitution. Restrictions on the flow of international capital also increased significantly. In addition to these internal factors were some adverse external ones, including: the oil shocks of 1973 and 1979; deterioration in the terms of trade, occasioned by falling export prices; and, a shift in world demand from bauxite and alumina.

1980 saw a change in government and a refocusing of macroeconomic policies, under the guidance of IMF and World Bank agreements, towards structurally adjusting the economy, increasing exports and resuming growth. However, for the first eight years (1981-88), real GDP growth averaged just 1.5 percent per annum, which included two years of contracted output: 0.86 and 4.6 percent in 1984 and 1985. The World Bank (1996) attributes this limited performance to "discontinuous and incomplete adjustment" with little effort in "removing the deeper structural constraints placed by inadequate regulatory frameworks in critical sectors, rigidities in the capital and labour markets, weakness in governance and public administration, and inadequate economic and social infrastructure" (pp. 1). Thus, although there were some attempts at restructuring the economy, they appear not to have been sufficient.

[17] See the World Bank (1996).

[18] In summing up this period in Jamaican history, King (2000) refers to it as the "zenith of government intervention and the nadir of economic performance" (pp. 11), where "international trade was severely restricted by the combination of high tariffs, license requirements, and capital controls. Domestic economic productivity was hampered by domestic price controls, financial repression, and labor market regulations. ... The economy produced a per capita output that was 26 percent below its peak of seven years earlier."

Figure 3: Output, Its Possible Determinants and Financial Liberalisation in Jamaica



For example, in the case of trade liberalisation, the government eliminated the import license requirement from a number of items in order to comply with the World Bank Structural Adjustment Loan (SAL) agreements.[19] However, import tariffs on those items were raised proportionately and basically maintained the effective level of protection (World Bank, 1994; King, 2000). In addition, more items were designated as requiring a license. With respect to financial liberalisation, very little occurred expect the introduction of a managed option for the allocation of foreign exchange. In terms of the dominance of the public sector in economic activity, by 1986 government had only privatised two entities for a combined value of US$1.7m, while at the same time acquiring four others totalling US$56.7 million (King, 2000). Thus, the government's ownership of productive assets actually rose during those years. Nevertheless, government consumption expenditure as a ratio to GDP fell from 20.3 percent in 1980 to 14.4 in 1988, mainly on account of a 5.5 percentage point reduction in wages and salaries from the high of 13.7 percent in 1980.

In 1989 a new government took the helm and there were renewed efforts towards structurally adjusting the economy, reducing the size of the public sector and raising the level of private sector activity. Economic output subsequently expanded at an average rate of 2.08 percent over the remainder of the sample, interrupted only in 1996 and 1997 when output declined by 1.1 and 1.2 percent respectively. Gross domestic investment expanded at a much faster rate that output' its ratio to GDP rising from 23.6 percent in 1988 to 33.6 in 2004. In real terms this represents an investment rate of 4.4 percent each year and is somewhat high when compared to the GDP growth rate. The World Bank (2003) refers to this as an apparent paradox, which can be attributed to the underutilisation of capital, the investment to protect against crime, and the concentration of investment in non-traded sectors, particularly housing construction.[20] Nonetheless, we expect to find the gross investment has made a significant contribution to growth over the sample period.

[19] There were three such SALs -1982, 1983 and 1984 – with the main objective of foster export-led growth development and a greater role for the private sector (World Bank, 1990).

[20] The study also notes that it is very likely that GDP is underestimated primarily because output estimates in the services sector, particularly in tourism, may not be taking account of incomes booked offshore, plus it has proved difficult to measure the income from housing and banking services. Nevertheless, even after an attempt to adjust for such, the study concludes that the resulting growth rates are still low.

In terms of human capital, universal primary education was attained in 1989 but, according to the World Bank (2003b), approximately 40 percent of those completing the primary level are functionally illiterate and roughly 8 percent cannot gain access to secondary schools because of a lack of space. Moreover, with an average national pass rate of 60 percent in the English examinations of Caribbean Examination Council and 30 percent in mathematics, the qualifications at the secondary level are among the lowest in the region. This does not augur well for the quality of the human capital in Jamaica. For example, our indices show that in 2000, 41 percent of the population aged 15 and over received a secondary level education as their highest attainment, but of those only 8.4 percent actually completed the level. Similarly, in the same year, 4 percent received a tertiary level education but only 1.7 percent completed the level. Inequality, poverty and low instructional times are some of the reasons cited for this outcome.

Not only is the stock of human capital low but the social returns are even lower than they could be, mainly because of high migration rates among graduates, both at the secondary and tertiary levels. In fact, the World Bank (2003b) study estimates that roughly 80 percent of all tertiary graduates and 30 percent of secondary graduates since 1990 have emigrated. Since growth theory suggests that exit of skill human capital will adversely affect income levels and growth rates in the country from which emigration occurred,[21] we are not likely to find any growth-enhancing effects given the high emigration rates for Jamaica.

In terms of trade reform, all quantitative restrictions and licensing requirements on both imports and exports were removed in 1991, and the degree of openness to international trade rose during the 1990s and onwards, which is also around the time that growth picked up. Thus, it would appear on the surface that greater openness to trade has been associated with faster growth. However, the World Bank (2003a) argues otherwise. The report claims that the "positive impact of the further trade reforms appears to have been more than offset by other factors, resulting in disappointing GDP growth [in the 1990s]. In particular, the banking crisis, deteriorating external conditions, terms of trade shocks and a cyclical reversion from

[21] See for example the endogenous growth model by Haque and Kim (1995).

the high growth of the late 1980s," (pp. 156)[22]; the first two being the most significant. The banking crisis would have prejudiced investible funds to the larger, more established companies and away from start-ups and smaller ones, thereby limiting the gains from trade liberalisation. Greenidge (2006) shows that during this period domestic production had become less profitable.[23] Finally, the falling tariff protection was accompanied by an appreciating exchange rate, which would have adversely impacted on import competing industries. Putting all this together, we are not expecting to find that the trade reforms contributed positively to growth.

Econometric results

The analysis of the stationary properties (in Appendix B) suggests all the variables, with the exception of the inflation rate, can best be considered as *I(1)* processes. In each case the three tests are in agreement except for that of the government consumption to GDP ratio where both the ADF and PP tests point a unit root, while the KPSS test suggests it maybe stationary. However, based in the arguments presented earlier, we proceed as if the government consumption to GDP ratio is *I(1)*.

The long-run estimates are presented in Table 5 and the DOLS parsimonious model is in Appendix A. The results indicate that investment, human capital and government spending have raised the equilibrium level of output, while greater openness to international trade reduced it. Gross domestic investment is the most significant and is also the largest contributor to output. Our findings suggest that a percentage point increase in the gross domestic investment to GDP ratio can lift long-run output by roughly 0.4 percentage points. Human capital has the smallest effect, which given our earlier discussion about conditions in Jamaica is not a surprising result. Here, the coefficient indicates that it will take approximately a 10 percentage points increase in the percentage of the adult population entering the work force having successfully completed education training at the secondary level or higher to raise long-run output by just half a percentage point. The positive contributory effect of government consumption expenditure is consistent with the dominant role the government has played in the conduct of economic activity.

[22] They cite King (2001) and Loayza et al, (2002) as providing evidence, which supports their argument.
[23] The IMF (2000) also calculates that increases in wages exceeded productivity for every year during this period with the exception of 1994.

The negative effect of the various trade openness indicators (note that the merchandise trade volume indicator, though insignificant, was also negative) may reflect the inconsistency of the different trade policy measures over the period, plus other factors not directly related to trade policy such as the loss in competitiveness in the 1980s and early 1990s, occasioned by an appreciating exchange rate and unrealistic wage increases. Our analysis indicates that financial liberalisation had not significant effect on the equilibrium level of output in Jamaica. Neither did financial development.

The results for the growth equation are presented in the lower panel of Table 5 along with a number of diagnostic tests, which confirm that the respective models are well specified: there no significant serial correlation or heteroscedasticity in the residuals; they approximate a normal distribution; and the model is not mis-specified and appears structurally stable. The error-correcting term is negative and statistically significant, thus there exist an equilibrium relation between output and its determinants. The size of the coefficient suggests that one-fifth of output deviation from this underlying steady-state position is corrected each year. Therefore, it takes roughly five years for output to return to its equilibrium path following a shock to the system.

The findings also indicate that growth in the stock of physical capital relative to GDP has been a significant contributor to economic growth. In this regard, a one percent increase in this ratio accelerates growth by approximately 0.13 percentage points. Our estimates also suggest that government consumption expenditure as a ratio GDP has been a significant determinant of growth: a percentage point expansion in government spending relative to GDP, increases growth by between 0.12 and 0.13 percentage points. Similarly to the level effects, we find the growth effects of trade openness to be negative. In the case of financial liberalisation there appears to be a positive and significant growth effect. However, the results suggest that financial development had a negative but insignificant influence on growth.

These results are robust even with the inclusion of a dummy for the 1996 financial crisis and changes in the terms of trade, which both proved to be insignificant. We also construct an average tariff rate series using data from the WTO (2005), the

World Bank (2003) and Gwartney *et al*., (2005). Its effects on the level and growth of output turn out to be positive but insignificant. Nevertheless, this result plus the negative and significant effect of the outcome measures supports the hypothesis that the positive impact of lowering tariff barriers has been more than offset by other trade-related factors.

Table 5: Growth and Liberalisation in Jamaica

Long-run estimates of LRGDP	(1)	(2)	(3)
Investment: L(GDI/GDP)	0.396*** (9.449)	0.476*** (13.052)	0.440*** (11.797)
Human Capital: L(avg. of secondary & tertiary level attainment – prin.comp)	0.061*** (4.995)	0.072*** (5.380)	0.045*** (4.619)
Government Policy: L(Gov'tCon/GDP)	0.250*** (6.404)	0.290*** (9.283)	0.292*** (8.513)
Openness: L(exports/GDP)	-0.145*** (-2.013)		
L(imports/GDP)		-0.218** (-2.710)	
ΔL(MerTrade/GDP)$_t$			-----
Growth Equation			
ECM$_{t-1}$	-0.198*** (-4.044)	-0.211*** (-4.269)	-0.212*** (-4.068)
ΔL(GDI/GDP)$_t$	0.138*** (4.400)	0.124*** (3.951)	0.125*** (3.788)
ΔL(Gov'tCon/GDP)$_t$	0.120*** (2.809)	0.133*** (3.058)	0.129*** (2.811)
ΔTFL$_{t-1}$	0.025** (2.501)	0.023** (2.291)	0.021** (2.026)
Dummy1972	0.136*** (4.513)	0.135*** (4.400)	0.131*** (4.074)
ΔL(exports of services/GDP)$_t$	-0.082** (-2.275)		
ΔL(imports/GDP)$_t$		-0.066* (-1.975)	
ΔL(MerTrade/GDP)$_t$			----
R^2	0.64	0.63	0.59
DW	1.60	1.58	1.62
AR	1.030[0.368]	1.217[0.309]	0.912[0.412]
RESET	0.437[0.513]	0.000[0.990]	0.541[0.467]
Norm	3.821[0.148]	3.364[0.186]	1.573[0.456]
ARCH	0.515[0.478]	0.525[0.474]	1.483[0.232]
HET	0.462[0.908]	0.382[0.950]	0.361[0.943]
Chow (1983)	1.126[0.414]	1.290[0.311]	1.445[0.234]
Chow (2000)	0.369[0.829]	0.200[0.936]	0.110[0.978]

Notes: same as Table 3.

1.5 Conclusion

This paper evaluates the growth effects of financial liberalisation in Barbados, Jamaica and Trinidad and Tobago. The econometric techniques employed allowed us to separate the short- and long-run effects and also capture interaction effects where possible. These countries are chosen primarily because of data availability, but it also happens that they have quite diverse economic structures and have had different experiences with financial liberalisation, and this makes for an interesting comparison.

The evidence suggests that financial liberalisation led to faster growth in Barbados and Jamaica but had no effect in Trinidad and Tobago. However, the positive growth influences in both countries waned and the equilibrium level of output either declined (Barbados) or was unaffected (Jamaica). Note that from an intuitive perspective, the equilibrium level output can be viewed as the potential output of the country..

Apart from the effects of financial liberalisation on the main macroeconomic aggregates, our research also sheds some light on other interesting issues. For example, we find that greater openness to international trade generally had a positive impact on growth, except in the case of Jamaica where it was counteracted by the banking crisis of 1996, deteriorating external conditions and an appreciating exchange rate, occasioned by excessive wage increases. Moreover, we did not find any interaction effects between financial and trade liberalisation: there is no evidence to support the hypothesis that an increasing degree of openness to international trade moderates, either in a positive or a negative way, the effects of financial liberalisation as it pertains to growth. This would suggest that the sequencing of real and financial liberalisation does not matter. In other words, whether a country had opened first to trade and then removed restrictions on the financial sector or whether the reverse occurred did not matter. Arestis (2005), in reviewing the literature, arrives at the same conclusion. In fact Jamaica, the only one of the three countries to embark on trade liberalisation and reform sometime before financial liberalisation, did not fare any better than the others. Actually, it is the only one to suffer a financial crisis, although we cannot infer causality between that and sequencing. This is perhaps an area where further research may be helpful.

APPENDIX A: Unit Root Tests

In the following tables, *, ** and *** are the MacKinnon critical values for rejection of the null hypothesis of a unit root at the 10%, 5%, and 1% levels, respectively, for both the ADF and PP tests. $^{+}$, $^{++}$, $^{+++}$ are the critical values for the LM test statistic of the KPSS test and denotes rejection of the null hypothesis of stationary at the 10%, 5%, and 1%, respectively (based upon the asymptotic results presented in KPSS 1992 Table 1, pp. 166). Δ denotes the first difference of the original series.

Barbados			ADF	PP	KPSS
Gov't consumption expenditure to GDP (*Gov'tCon/GDP*)		Level	-2.390	-2.719*	0.790^{+++}
		Δ	-6.981***	-6.977***	0.435^{+}
Openness:	Merchandise Exports plus Import to GDP (*MerTrade/GDP*)	Level	-1.215	-0.998	0.679^{++}
		Δ	-5.280***	-5.246***	0.134
	Exports of Services to GDP	Level	-3.085**	-3.312**	0.600^{++}
	Total imports to GDP	Level	-1.716	-1.770	0.469^{++}
		Δ	-6.413***	-6.419***	0.098
Population (*POP*)		Level	1.102	1.069	0.857^{+++}
		Δ	-5.226***	-5.138***	0.157
Real GDP		Level	-0.565	-0.781	0.802^{+++}
		Δ	-5.406***	-5.417***	0.038
Financial Development (M2 to GDP)		Level	0.046	-0.363	0.822+++
		Δ	-4.660***	-6.132***	0.082
Inflation		Level	-2.759*	-2.652*	0.253
Human capital: educational level completed	Tertiary (*eduTer*)	Level	-1.337	-0.311	0.825^{+++}
		Δ	-1.905	5.473***	0.210
	Secondary (*eduSec*)	Level	-3.013**	-2.304	0.127
		Δ	2.865**	-2.856**	0.171

Trinidad and Tobago			ADF	PP	KPSS
Gov't consumption expenditure to GDP (*Gov'tCon/GDP*)		Level	-2.160	-1.946	0.152
		Δ	-5.064***	-4.980***	0.158
Openness:	Merchandise Exports plus Import to GDP (*MerTrade/GDP*)	Level	-1.158	-1.650	0.468^{++}
		Δ	-11.25***	-11.10***	0.096
	Total Exports to GDP	Level	-2.160	-2.232	0.197
		Δ	-6.401***	-6.445***	0.168
	Total imports to GDP	Level	-2.873*	-2.606*	0.322
		Δ	-7.293***	-8.153***	0.257
Population (*POP*)		Level	-1.391	-2.013	0.847^{+++}
		Δ	-2.749*	-1.881	0.363^{+}
Real GDP		Level	-0.926	-1.746	0.748^{+++}
		Δ	-2.411	-5.583***	0.236
Financial Development (M2 to GDP)		Level	-1.630	-1.643	0.736^{+++}
		Δ	-5.129***	-4.960***	0.197
Inflation		Level	-2.373	-2. 277	0.195
		Δ	-6.018***	-7.224***	0.246
Human capital: educational level completed	Average[1] of Secondary and Tertiary levels	Level	-0.282	-1.102	0.818^{+++}
		Δ	-4.069***	-4.058***	0.408^{+}

[1] The average is the sum of the principal components in order to obtain at least 97 percent of the variation in the two series.

Jamaica			ADF	PP	KPSS
Gov't consumption expenditure to GDP (*Gov'tCon/GDP*)		Level	-1.845	-1.724	0.274
		Δ	-4.805***	-4.816***	0.180
Openness:	Merchandise Exports plus Import to GDP (*MerTrade/GDP*)	Level	-2.083	-2.866*	0.365^{+}
		Δ	-7.627***	-9.094***	0.335
	Total Exports to GDP	Level	-2.158	-2.455	0.554^{++}
		Δ	-7.763***	-10.25***	0.384^{+}
	Total imports to GDP	Level	-2.184	-1.918	0.782^{+++}
		Δ	-7.293***	-14.92***	0.367^{+}
Population (*POP*)		Level	-1.271	-1.554	0.858^{+++}
		Δ	-2.756*	-2.412	0.271
Real GDP		Level	-2.320	-2.149	0.625++
		Δ	-4.684***	-4.794***	0.190
Financial Development (M2 to GDP)		Level	-2.517	-2.709*	0.755+++
		Δ	-5.465***	-5.465***	0.363+
Inflation		Level	-3.043**	-2.949**	0.306
Human capital: educational level completed	Average[1] of Secondary and Tertiary levels	Level	-2.786*	-2.609*	0.844^{+++}
		Δ	-4.897***	-5.629***	0.387

[1] The average is the sum of the principal components in order to obtain at least 97 percent of the variation in the two series.

APPENDIX B: Parsimonious DOLS Estimates

Notes for the following equations: R^2 is the fraction of the variance of the dependent variable explained by the model, *F()* is the F-statistics for the joint significance of the explanatory variables, *SE* is the standard error of the regression, *DW* is the Durbin Watson statistic, *AR* is the Lagrange multiplier test for *p-th* order residual autocorrelation correlation, *RESET* = Ramsey test for functional form mis-specification (square terms only); *Norm* is the test for normality of the residuals based on the Jarque-Bera test statistic (χ^2 (2)). *ARCH* is the autoregressive conditional heteroscedasticity for up to *p*-th order (see Engle, 1982a). *HET* is the unconditional heteroscedasticity test based on the regression of squared residuals on squared fitted value. Finally, *Chow (n)* is Chow's (1960) test for parameter constancy based on breakpoints in the sample (two breakpoints are tested - the sample mid-point, *50th* , and the sample 90th percentile, *90th*).

Barbados:

Long-run estimates of real output: with export of services to GDP

$$LRGDP_t = 6.776 + 0.332*L(GDI/GDP)_t + 0.2007*L(EduSec)_t + 0.2435*L(EduTer)_t$$
(SE) (0.162) (0.0409) (0.0201) (0.0165)
$$+ 0.3584*L(M2/GDP)_t - 0.09527*TFL_t - 0.1396*L(RGCE/RGDP)_t + 0.1684*\Delta L(GDI/GDP)_{t+1}$$
(0.0825) (0.0145) (0.0663) (0.0405)
$$- 0.3298*\Delta L(M2/GDP)_t - 0.1143*\Delta L(M2/GDP)_{t-1} + 0.04983*\Delta TFL_t + 0.06486*\Delta TFL_{t-1}$$
(0.0927) (0.0737) (0.0167) (0.0201)
$$+ 4.432*\Delta LPOP_t + 0.08748*L(X\_Ser/GDP)_t$$
(1.32) (0.0441)

$R^2 = 0.993$; F(13,28) = 309.4 [0.000]; DW =2.15; AR-F(2,26) = 1.255 [0.302];
ARCH-F(1,26) = 0.060 [0.808]; Norm. -χ^2(2) = 1.106 [0.575]; HET- F(26,1) = 0.0512 [0.9998];
RESET - F(1,27) = 1.397 [0.248]; Chow(1983) = 0.692 [0.761]; Chow(1999) = 2.132 [0.108].

Long-run estimates of real output: with imports of goods and services to GDP

$LRGDP_t$ = 6.735 + 0.3079*L(GDI/GDP)$_t$ + 0.208*L(EduSec)$_t$ + 0.255*L(EduTer)$_t$
(SE) (0.18) (0.0484) (0.0217) (0.0202)
+ 0.359*L(M2/GDP)$_t$ - 0.1007*TFL_t - 0.1162*L(RGCE/RGDP)$_t$ + 0.1773*ΔL(GDI/GDP)$_{t+1}$
(0.0851) (0.0142) (0.064) (0.0412)
- 0.3373*ΔL(M2/GDP)$_t$ - 0.1177*ΔL(M2/GDP)$_{t-1}$ + 0.05689*ΔTFL_t + 0.07868*ΔTFL_{t-1}
(0.0945) (0.075) (0.0165) (0.0187)
+ 4.584*Δ$LPOP_t$ + 0.114***L(imports/GDP)**
(1.35) (0.0592)

R^2 = 0.993; F(13,28) = 297.8 [0.000]; DW =2.12; AR-F(2,26) = 1.584 [0.224];
ARCH-F(1,26) = 0.040 [0.843]; Norm. -χ^2(2) = 0.961 [0.619]; HET- F(26,1) = 0.107 [0.995];
RESET - F(1,27) = 2.276 [0.143]; Chow(1983) = 0.413 [0.948]; Chow(1999) = 2.182 [0.102].

Long-run estimates of real output: with Merchandise exports plus imports to GDP

LRGDP = 6.441 + 0.3474*L(GDI/GDP)$_t$ + 0.2086*L(EduSec)$_t$ + 0.2583*L(EduTer)$_t$
(HACSE) (0.309) (0.0481) (0.0195) (0.0197)
+ 0.3791* L(M2/GDP)$_t$ - 0.09699*TFL_t - 0.1083*L(RGCE/RGDP)$_t$ + 0.1787*ΔL(GDI/GDP)$_{t+1}$
(0.0691) (0.0113) (0.0548) (0.0546)
- 0.3677*ΔL(M2/GDP)$_t$ + 0.05754*ΔTFL_t + 0.08121*ΔTFL_{t-1} + 4.334*Δ$LPOP_t$
(0.0785) (0.0271) (0.0133) (1.293)
- 0.1191*ΔL(M2/GDP)$_{t-1}$ + 0.07777*L{(X_g+M_g)/GDP}$_{t-1}$ - 0.07545***ΔL{(X_g+M_g)/GDP}$_t$**
(0.0573) (0.0417) (0.0369)
HACSE = Heteroscedasticity and autocorrelation consistent standard errors; R^2 = 0.993;
F(14,27) = 273.6[0.000]; DW =2.16; AR- F(2,25) = 1.111 [0.345]; RESET - F(1,26) = 2.727[0.111];.
ARCH- F(1,25) = 0.051[0.823]; Norm. -χ^2(2) = 0.830 [0.660]; HET- χ^2(2) = 33.544[0.216];

Trinidad and Tobago:

Long-run estimates of real output: Merchandise exports plus imports to GDP

$LRGDP_t$ = 9.452 + 0.1404*L(GDI/GDP)$_t$ + 0.1296*LHC_t + 0.1771*(M2/GDP)$_t$
(SE) (0.261) (0.0507) (0.0152) (0.0921)
- 0.1601*ΔL(GDI/GDP)$_{t-1}$ + 1.015*ΔL(HC) + 0.9027*ΔL(HC)$_{t-1}$ - 0.4472*ΔL(M2/GDP)$_t$
(0.0487) (0.141) (0.126) (0.127)
- 0.435*ΔL(M2/GDP)$_{t-1}$ + 0.7962*Δπ_{t-1} + 0.2723*ΔL(RGCE/RGDP)$_t$
(0.124) (0.302) (0.0952)
+ 0.4499*ΔL(RGCE/RGDP)$_{t-1}$ + 0.2879*L{(X_g+M_g)/GDP}$_t$ - 0.2509*ΔL{(X_g+M_g)/GDP}$_t$
(0.107) (0.051) (0.0789)
- 0.1144*ΔL{(X_g+M_g)/GDP}$_{t-1}$
(0.0744)

R^2 = 0.974; F(14,26) = 68.45 [0.000]; DW =1.77; AR-F(2,26) = 0.717 [0.498];
ARCH-F(1,24) = 0.438 [0.515]; Norm. -χ^2(2) = 1.029 [0.598]; χ^2(28)- F(26,1) = 31.30 [0.304];
RESET -F(1,25) = 0.513 [0.480].

Jamaica:

Long-run estimates of real output: with exports of goods and services to GDP

$LRGDP_t$ = 10.77 + 0.3959*L(GDI/GDP)$_t$ + 0.06087*LHC_t + 0.2497*L(GCE/GDP)$_t$
(SE) (0.42) (0.0419) (0.0122) (0.039)

$- 0.186*\Delta L(GDI/GDP)_t - 0.1419*\Delta L(GDI/GDP)_{t-1} + 0.2356*dum72 - 0.08657*dum63$
(0.0536) (0.0483) (0.042) (0.0455)
$- 12.34*\Delta LPOP_t + 0.4536*\pi_t - 0.1457*$ L(exports/GDP)
(2.59) (0.0755) (0.0724)

$R^2 = 0.962$; F(10,30) = 75.76 [0.000]; DW =1.65; F(2,28) = 1.134 [0.336];
ARCH- F(1,28) = 1.081[0.307]; Norm. -$\chi^2(2)$ = 1.365[0.505]; HET- F(18,11) = 0.562 [0.866];
RESET - F(1,29) = 1.413 [0.245]; Chow(1983) = 1.180[0.408]; Chow(1999) = 0.608[0.660].

Long-run estimates of real output: with imports of goods and services to GDP

$LRGDP_t = 10.69 + 0.476*L(GDI/GDP)_t + 0.07246*LHC_t + 0.2905*L(GCE/GDP)_t$
(SE) (0.301) (0.0365) (0.0135) (0.0313)
$- 0.1795*\Delta L(GDI/GDP)_t - 0.1188*\Delta L(GDI/GDP)_{t-1} + 0.2404*dum72 - 0.09109*dum63$
(0.0494) (0.048) (0.0402) (0.0435)
$- 10.43*\Delta LPOP_t + 0.4517*\pi_t - 0.2183*L(exports/GDP)_t$
(2.66) (0.067) (0.0806)

$R^2 = 0.965$; F(10,30) = 83.38[0.000]; DW =1.59; AR- F(2,28) = 0.946[0.400];
ARCH- F(1,28) = 0.163[0.690]; Norm. -$\chi^2(2)$ = 0.669[0.716]; HET- F(18,11) = 0.574[0.857];
RESET - F(1,29) = 1.085 [0.306]; Chow(1983) = 1.552[0.240]; Chow(1999) = 0.499[0.737].

Long-run estimates of real output: Merchandise exports plus imports to GDP

$LRGDP_t = 10 + 0.4403*L(GDI/GDP)_t + 0.04502*LHC_t + 0.2923*L(GCE/GDP)_t$
(SE) (0.182) (0.0373) (0.00975) (0.0343)
$- 0.2428*\Delta L(GDI/GDP)_t - 0.1839*\Delta L(GDI/GDP)_{t-1} + 0.2328*dum72 - 0.07984*dum63$
(0.0478) (0.0456) (0.044) (0.0475)
$- 13.38*\Delta LPOP_t + 0.3671*\pi_t$
(2.66) (0.065)

$R^2 = 0.957$; F(9,31) = 76.23 [0.000]; DW =1.45; AR- F(2,29) = 2.172[0.132];
ARCH- F(1,29) = 0.087[0.771]; Norm. -$\chi^2(2)$ = 4.151[0.126]; HET- F(16,14) = 0.525[0.892];
RESET - F(1,30) = 0.036[0.850]; Chow(1983) = 1.318[0.326]; Chow(1999) = 0.369[0.829].