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The Importance of Financial Sector Reform:
Development and Efficiency in Caribbean Banking

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The Importance of Financial Development for Economic Growth and Financial Efficiency in Barbados, Jamaica and Trinidad and Tobago (draft)

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Abstract

This paper conducts causality tests between financial development and real GDP for Barbados, Jamaica and Trinidad and Tobago using time series techniques. Our results provide support for the view that finance is a leading sector in the process of economic development and that financial development contributes to economic growth for all three countries. We find that a long-run equilibrium relationship between financial development and economic growth (supply-leading response) exists for only Barbados and Trinidad and Tobago. In all cases evidence of bi-directional causality was also uncovered, implying that a demand-following response exists in these countries, at least in the short-run.

I. Introduction

In recent times both developed and developing countries have become increasingly interested in the influence of financial sector reform for development, growth and efficiency. Interest in the financial sector begin with its intermediate role such as mobilization of savings for investment; facilitating and encouraging inflows of foreign capital (foreign direct investment (FDI), portfolio investment and bonds, and remittances); and optimizing the allocation of capital between competing agents as well as ensuring efficient allocation of capital. Similarly Levine (1997) shows that savings mobilization, risk management, acquiring information about investment opportunities, monitoring borrowers and exerting corporate control and facilitating the exchange of goods and services are the five basic functions of financial intermediaries which link the financial sector to development, growth and efficiency.

While the connection between economic growth and financial development was not widely considered in the literature of the 1950s and 1960s, partly due to the Modigliani-Miller theorem and its final implication of a separation of the financial and real sectors of the economy, the theoretical underpinnings of the financial development/economic growth nexus can be traced to the work of Schumpeter (1911) and more recently to Mackinnon (1973) and Shaw (1973). The Mackinnon/Shaw school of thought argues that government intervention in the banking system (interest rate ceilings, high reserve requirements and directed credit programmes) slow the impetus of financial development and consequently economic growth.

Increasingly, this topic is being discussed within the framework provided by the endogenous growth literature. This literature which explicitly models the services provided by financial intermediaries also reaches the same conclusions as Mackinnon and Shaw. It finds that financial intermediation has a positive effect on steady-state growth (Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991) and that government intervention in the financial system has a negative effect on the growth rate (King and Levine, 1993b).

Further, it has been argued that a more efficient financial system promotes growth (see Dornbusch and Reynoso, 1989; and Pagano, 1993). First, a larger financial penetration of funds through the financial intermediaries, as defined by the World Bank (1989), guarantees that funds be allocated to those projects characterised by higher rates of return. A less developed financial system may cause agents to finance less risky but also less profitable activities (Saint Paul, 1992; Bencivenga and Smith, 1991). In addition, according to Greenwood and Jovanovic (1990), a more developed financial system helps the process of gathering information that connects lenders and borrowers and thus reduces the informational asymmetries that arise in capital markets (Diamond, 1984). Second, if the system is more efficient, the amount of funds allocated to productive investments will be larger since the intermediation margin retained by the financial institutions will be smaller. This margin may in turn reflect inefficiencies and market power of the financial intermediaries and also government regulations such as reserve requirements or taxes. Roubini and Sala-i-Martin (1992) show that governments may artificially repress the development of the financial system in order to foster money demand and this raise more revenues through the inflation tax, for example, or obtain a cheaper source of finance for public debt. The implication being that financial repression inhibits growth.

Empirical studies in this area have provided evidence of a relationship between financial development and economic growth. Goldsmith (1969) finds evidence for such a relationship over long periods and shows that periods of rapid economic growth have often been accompanied by an above-average rate of financial development. Further evidence of the strong, positive relationship between the various financial development indicators and growth has also been provided by (Gelb, 1989; Roubini and Sala-l-Martin, 1992; King and Levine, 1993a and 1993b). Yet, a recent study by Calderon and Liu (2003) suggests that bi-directional causality exists between growth and financial sector reform but the impact of the latter is stronger in the case of developing countries where it explains 84% of the overall relationship over a 10-year period. Implied here is that financial sector under-development is more likely to hold growth back in the developing countries. However, Favara (2003) provides only a weak evidence for this relationship. Demetriades and Hussein (1996) also found that the nature of the relationship can indeed vary among countries.

Results of the direction of causality between financial development and growth for Caribbean countries have been mixed. Wood (1993) examined this link using data from 1946–1990 on Barbados. His results, based on causality tests, found that a bi-directional relationship existed between financial development (measured as broad money, M2, to GDP) and economic growth. His examination of the stage-of-development hypothesis of Patrick (1966) found that the bi-directional relationship was stronger during the 1946–1968 period than the 1969–1990 period. On the other hand, Craigwell *et al.* (2001) using a multivariate VAR framework on data for the period 1974–1998 found only evidence of a one-way causal relationship (using three measures) from financial development to economic growth for Barbados.

We try to add to the literature by examining the relationship between financial development indicators and growth in Barbados, Jamaica and Trinidad and Tobago (T&T).

II. Methodology

Patrick (1966) posits two alternative hypotheses for the possible causal directions between financial development and growth. A causal relationship from financial development to growth is labeled as the *supply-leading hypothesis*. It suggests that increases in the supply of financial services stemming from the intentional creation of financial institutions and markers leads to real economic growth. Conversely, a causal relationship from economic growth to financial development is labeled the *demand-following hypothesis*. Here, as the real economy grows, an increasing demand for financial services might induce an expansion of the financial sector. Patrick (1966) also postulates a further hypothesis known as the *stage-of-development hypothesis*, that is, the direction of causality between financial development and growth changes over the course of development. Here, the supply-leading impetus enables real investment in the earlier stages of economic development – the development of new financial institutions, financial services, products and other innovations promotes economic growth. As both financial and economic growth occurs, the supply-leading impetus becomes less important and the demand-following response becomes dominant.

Many macroeconomic time-series contain unit roots (Nelson and Plosser, 1982). Testing for unit roots in time-series is important because a nonstationary regressor invalidates many results and thus needs special treatment. Several tests for unit roots exist in the literature (see for example, Dickey and Fuller, 1979, 1981; Phillips and Perron 1988, Kwiatkowski *et al.* 1992). In this study the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used to test for unit root.

We test for a cointegrating relationship using Engle and Granger's (1987) two-step procedure where the variables are integrated of order one, I(1). Cointegration signifies the existence of a long-run equilibrium relationship among variables. If cointegration for a particular formulation is established, we retrieve the error correction term (ECT) construct the corresponding error correction model (ECM). Such a procedure allows us to simultaneously model the short-run dynamic behaviour of the two variables, the equilibrating role of the ECT and test for the direction of causality. The Granger Representation Theorem says that evidence of cointegration implies causality in at least one direction. If no long-run relationship can be established for the periods under study for any country, then tests for the direction of short-run causality are employed following Granger (1969).

The following model (*constant and trend*) by Dickey *et al.* (1986) is examined for unit roots using the ADF and PP tests:

$$\Delta X_t = \alpha_o + \alpha_1 X_{t-1} + \sum_{i=1}^{k} \lambda_i \Delta X_{t-i} + bt + \varepsilon_t \qquad (1)$$

where Δ is the first-difference operator and ε_t is Gaussian white noise. The Akaike Information Criterion (AIC) is employed to determine the lag length k.

If unit roots have been confirmed for the data series the question is whether some long-run relationship exists between financial development and economic growth. The first step of the Engle-Granger (1987) two-step procedure estimates the following regression in order to establish if a long-run equilibrium relationship between the two variables exists:

$$LY_t = a + bL X_t + e_t \qquad (2)$$

where LY_t is the natural log of the variable that represents economic growth, LX_t is the variable is the natural log of the variable that represents financial development and e_t is the error term. According to Granger (1986) and Engle and Granger (1987), if both LY_t and LX_t are integrated of order 1, then any linear combination of these two series may be I(0), that is, stationary. If this is the case then a long-run relationship exists between LY_t and LX_t. The error term e_t, or equilibrium error, measures the deviations of LY_t and LX_t from their long-run equilibrium relationship.

The second step of the Engle-Granger (1987) procedure involves estimating the following equations:

$$\Delta L Y_t = \beta_0 + \sum_{i=1}^{m} \beta_i \Delta L Y_{t-i} + \sum_{j=1}^{n} \beta_j \Delta L X_{t-j} + \alpha \varepsilon_{t-1} + u_t \qquad (3)$$

$$\Delta L X_t = \gamma_0 + \sum_{i=1}^{k} \gamma_i \Delta L X_{t-i} + \sum_{j=1}^{l} \gamma_j \Delta L Y_{t-j} + \varphi \varepsilon_{t-1} + v_t \qquad (4)$$

where ε_{t-1}, the ECT, is the lagged estimated residual from equation (2). The ECT should be negative and statistically significant if the relevant variables are cointegrated. These conditions provide further evidence and confirmation of the long-run and dynamic short-run relationships between the variables. In all other cases, the non-cointegrated cases, the inter-temporal causality will be examined by estimating equations 3 and 4 without the ECT.

We test for the short-run dynamics by using a VAR procedure and applying Granger's (1969) causality procedure in an attempt to uncover a possible causal relationship between the relevant variables for each formulation if our results fail to reject the null-hypotheses of no

long-run relationship. We use Akaike's Minimum Final Prediction Error (FPE) Criterion with Hsiao's (1979, 1981) synthesis to choose the optimal lag length and also to test for Granger causality. Akaike's Minimum FPE is formulated as follows:

$$FPE = \frac{(T+K)}{(T-K)} * \frac{SSR}{T} \qquad (5)$$

where T is the sample size, and K is the number of parameters estimated. SSR is the sum of the squared residuals. First, we compute the minimum FPE by regressing the series in question on its own past for the univariate series and determine the optimum lag structure for this series. Then, we regress the series in question on the number of its own lags already determined in the first step and the past of the other variable in the bivariate case until the optimum lag for the other variable is determined. After obtaining the optimum lag structure for both variables, we test for Granger causality. Specifically, LX_t Granger causes LY_t if the minimum FPE(LX_t, LY_t) is less than or equal to the minimum FPE(LY_t).

III. Data and Empirical Results

Proxies of financial efficiency related to technological advances naturally suggest themselves as candidates for empirical analysis. Such indicators, however, will not be considered in this paper. King and Levine (1993a, 1993b) suggest the following: M4/GDP, bank assets/GDP, deposits/GDP and cash/deposits. We use the ratio of broad money, M2 to GDP (M2/GDP) and the ratio of credits provided by financial intermediaries to the private sector (C/GDP). The first measure is a monetization variable that shows the real size of the financial sector in a growing economy. A higher M2/GDP ratio is interpreted as a larger financial sector and hence greater degree of financial penetration. The second measure (C/GDP) excludes credits issued to the public sector and credits issued by the central bank. De Gregorio and Guidotti

(1995) argue that credit more accurately represents the actual volume of funds to the private sector than monetary aggregates like M1, M2, M3 and M4. A higher C/GDP ratio is viewed as an indication of greater financial intermediary development.

Our measures of financial development also address the stock-flow problem of balance sheets being measured at the end of the year whereas nominal GDP is measured over the year. Following Levine *et al.* (2000), the problem is addressed by dividing end-of-year financial balance sheet items by end-of-year CPI, computing the average of these items in year t and t-1 and dividing by real GDP in year t (see appendix for a detailed description).

The data for the financial measures are taken from various issues of the International Financial Statistics of the International Monetary Fund (IMF). Our measure of economic growth is the real GDP per capita growth rate taken from the Heston, Summers and Bettina (2002) database.

Table 1 reports the results for all 3 countries. Critical values taken from Mackinnon (1991) (not reported) imply that nonstationarity cannot be rejected for the levels of the variables for all islands.[1] However, one difference of the data results in nonstationarity being rejected in all cases. Since unit roots have been confirmed for the data series the question is whether some long-run relationship exists between financial development and economic growth.

Table 2 reports the results of the cointegrating regressions. Regression 1 is LY on LM, regression 2 is LY on LC and regressions 3 and 4 are LM and LC respectively on LY. The variable M2/GDP should display a positive correlation with economic growth as it implies a

[1] If results of the ADF and PP tests conflicted for tests on the levels of the series, we concluded that the series was likely nonstationary and differenced the data again to test for stationarity.

higher degree of financial penetration. The sign of this coefficient is positive and significant for Barbados only. For Jamaica, the sign is positive, but the coefficient is not significant at conventional levels of significance. A possible interpretation on the lack of significance for this coefficient is its potential correlation with inflation, which is harmful for economic growth. For Trinidad and Tobago, we observe the seemingly paradoxical result that higher levels of financial penetration cause a regression in economic growth. This suggests a degree of inefficiency in the financial sector. Certainly, the ratio M2/GDP may be high if agents retain a big percentage of money as cash and, therefore, not necessarily devoting it to productive activities. It may also be the case of insufficient entrepreneurial innovation to mobilize these funds. However, there is evidence of a long-run equilibrium relationship between financial development and economic growth when financial development is measured using (M2/GDP) for Barbados and Trinidad and Tobago[2] for regression 1.

When financial development is proxied by C/GDP, the results are qualitatively and almost quantitatively identical to the results for the M2/GDP proxy, except that no evidence of a long-run relationship is observed for any of the three countries.

Results for the direction of Granger-causality are shown in table 3. In every instance there is evidence of bi-directional causality. The long-run results for both Barbados and Trinidad imply that financial development and economic growth are linked temporally over the long-run, with the direction of causality running from financial development to growth.

These results indicate a supply-leading relationship exists in Barbados and Trinidad and Tobago. The evidence of bi-directional causality for Barbados is also in agreement with the

[2] We inferred evidence of a cointegrating relationship if both the CRDW and DF/ADF tests were significant.

findings of Wood (1993). The results, which also show that in the short run, economic growth leads financial development, are evidence of a demand-following relationship. For Barbados and Trinidad and Tobago, these results run counter to the stage-of-development hypothesis of Patrick (1996), since it appears that in the short-run economic growth stimulates the development of the financial sector, while over the long-run, financial development stimulates economic growth. For Jamaica, where there is only short-run causality, results imply a contemporaneous feedback between economic growth and financial development. Overall, we suggest that economic growth is dependent on financial development for all three countries.

IV. Summary and Conclusions

The purpose of this paper was to contribute to the debate on the financial development/economic growth nexus from a Caribbean perspective and to examine the efficiency of the banking sectors in selected countries. We examined whether financial development causes growth or vice-versa employing aggregate annual time-series data on Barbados, Jamaica and Trinidad and Tobago. Annual data on deposit and lending rates were employed to analyse the relative efficiency of the banking sectors in these countries.

First, the stationarity properties of the data and the order of integration were examined using Augmented Dickey-Fuller and Phillips-Perron tests. Second, the two-step Engle and Granger (1987) cointegration and error-correction procedures and the Granger (1969) causality procedure were utilized in an attempt to uncover if a long-run equilibrium relationship exists between financial development and economic growth, and if not, whether there is short-run causal relationship between the two variables. The results indicate that a long-run equilibrium relationship between financial development and economic growth (supply-

leading response) exists for Barbados and Trinidad and Tobago. In all cases evidence of bi-directional causality was also uncovered, implying that a demand-following response exists in these countries, at least in the short-run. However, our empirical results do not support the stage-of-development hypothesis of Patrick (1999).

Appendix

M2/GDP is calculated using the formula $0.5*[M2_t/CPI_t + M2_{t-1}/CPI_{t-1}]/GDP_t$ where M2 is the sum of money and quasi-money from the International Financial Statistics (IFS). *C/GDP* is calculated using the formula $0.5*[Credit_t/CPI_t + Credit_{t-1}/CPI_{t-1}]/GDP_t$ where private credit is line 32d from the IFS. The CPI and nominal GDP are from the IFS while real GDP per capita growth is taken from Heston, Summers and Bettina Penn World Tables 6.1

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Table 1. ADF and Phillips-Perron (PP) Unit Root Tests

Variable	ADF Statistic (Level)	PP Statistic (Level)	ADF Statistic (First Difference)	PP Statistic (First Difference)
		Barbados (1966 – 2000)		
LM	-0.7598 (3)	-0.0945	-3.8845 (4) *	-5.9735 $^{\Upsilon}$
LC	-0.4916 (2)	-0.3300	-4.0967 (1) *	-2.7958
LY	-1.5212 (2)	-3.0275 *	-5.8467 (1) $^{\Upsilon}$	-11.1321 $^{\Upsilon}$
		Jamaica (1960 - 2000)		
LM	-2.1653 (2)	-2.5304	-4.3083 (1) $^{\Upsilon}$	-2.0114
LC	-2.9594 (2)	-2.1950	-4.2991 (1) $^{\Upsilon}$	-2.4755
LY	-0.1218 (6)	-3.0627	-5.3235 (5) $^{\Upsilon}$	-5.9087 $^{\Upsilon}$
		Trinidad and Tobago (1960 - 2000)		
LM	-4.0602 (6) *	-2.5038	-2.7653 (7)	-3.3057 $^{\otimes}$
LC	-3.2067 (1) $^{\otimes}$	-2.5957	-3.7082 (3) *	-3.5169 $^{\otimes}$
LY	-2.9803 (2)	-5.3463 $^{\Upsilon}$	-5.5738 (0) $^{\Upsilon}$	-7.2409 $^{\Upsilon}$

Notes: LM is the log of (M2/GDP), LC is the log of (C/GDP) and LY is the log of real GDP per capita growth rates.
Critical values for the tests are taken from MacKinnon (1991).
The terms in parentheses are the optimal number of lags chosen by the Akaike Information Criterion (AIC).
$^{\Upsilon}$ denotes significance at the 1% level ; * denotes significance at the 5% level; and $^{\otimes}$ denotes significance at the 10% level.

Table 2. Engle-Granger Cointegrating Regressions

Dependent Variable	Coefficient of Explanatory Variable	CRDW	Calculated DF/ADF(*) for tests on residuals	MacKinnon 5% Critical Values
Barbados (1966 – 2000)				
LY	0.395 *	1.641 *	-3.9220 *	-3.5872
LY	0.364 *	1.659 *	-3.2515	-3.5872
LM	0.783	0.579	-2.1226	-3.5872
LC	0.857	0.597	-2.0919	-3.5872
Jamaica (1960 – 2000)				
LY	0.104	1.440 *	-3.1280	-3.5609
LY	0.103	1.444 *	-3.1572	-3.5609
LM	0.340	0.056	-2.1004	-3.5609
LC	0.378	0.062	-2.2295	-3.5609
Trinidad and Tobago (1960 - 2000)				
LY	-0.024 *	1.838 *	-5.5712 *	-3.5609
LY	-0.014	1.838 *	-1.5960	-3.5609
LM	-0.030 *	0.030	-4.4447 *	-3.5609
LC	-0.015	0.044	-1.2197	-3.5609

Notes: CRDW stands for Cointegration Regression Durbin-Watson.
The 5% critical value for the CDRW is 0.78 (Engle and Yoo, 1987).
The terms in parentheses are the optimal number of lags determined by the Akaike Information Criterion (AIC).
Critical values for the Engle-Granger test are from MacKinnon (1991).
* denotes significance at the 5% level.

Table 3. Granger Causality Test Results using Hsiao's (1979, 1981) stepwise Granger-Causality Technique

Dependent Lag	Number of lags	Independent Lag	Number of lags	ECT	Inference From → To
		Barbados (1966 – 2000)			
(1) LY and LM					
LY	2	LM	1	-1.035	LM→LY
LM	1	LY	1		LY→LM
(2) LY and LC					
LY	2	LC	1		LC→LY
LC	1	LY	3		LY→LC
		Jamaica (1960 – 2000)			
(1) LY and LM					
LY	3	LM	1		LM→LY
LM	2	LY	3		LY→LM
(2) LY and LC					
LY	3	LC	2		LC→LY
LC	3	LY	3		LY→LC
		Trinidad and Tobago (1960 – 2000)			
(1) LY and LM					
LY	3	LM	3	-0.868	LM→LY
LM	2	LY	3		LY→LM
(2) LY and LC					
LY	3	LC	1		LC→LY
LC	2	LY	1		LY→LC

Notes: Lags lengths are chosen using the FPE criterion.
ECTs are only reported for Barbados because this was the only island where this formulation showed evidence of a cointegrating relationship.