



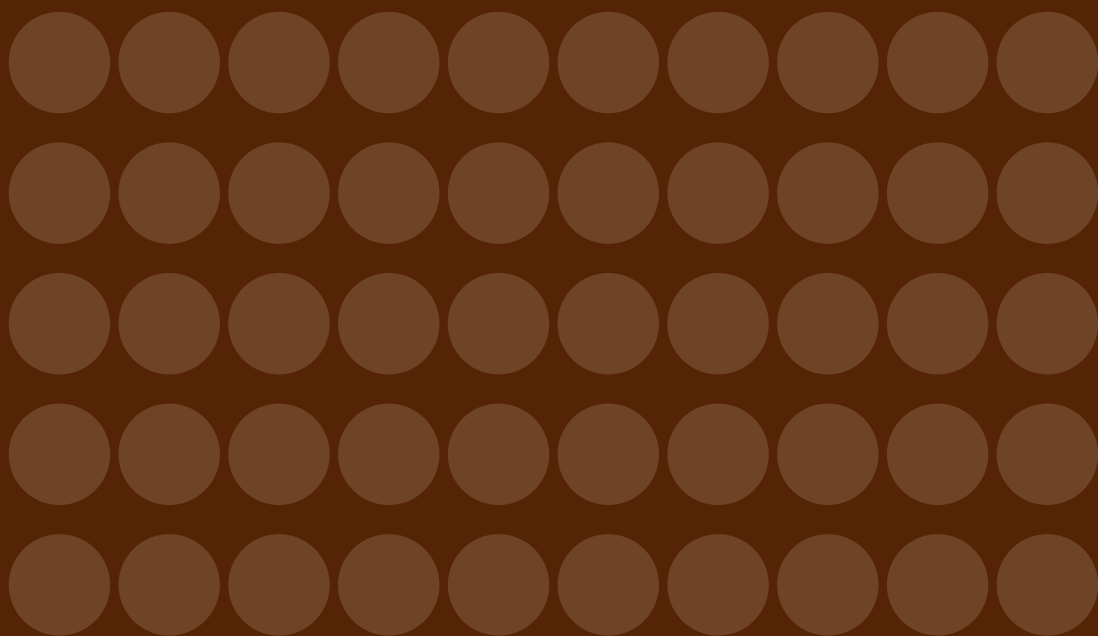
**CENTRO DE
ESTUDIOS
MONETARIOS
LATINOAMERICANOS**

Asociación Regional de Bancos Centrales

MONEY AFFAIRS

Volume XXII, Number 1

January-June 2009



CEMLA

ASSEMBLY

Associated Central Banks (*vox et votum*)

Collaborating Members (*vox*)

BOARD OF GOVERNORS, 2009-2011

President:

Banco de la República (Colombia)

Members:

Banco Central de la República Argentina

Banco Central do Brasil

Banco de México

Banco Central de Nicaragua

Central Bank of Trinidad and Tobago

Banco Central de Venezuela

EDITORIAL COMMITTEE

Kenneth Coates

Director General

Fernando Sánchez Cuadros

Central Bank Technical Meetings

Ana-Laura Sibaja Jiménez

Information Services

MONEY AFFAIRS is a biyearly publication of the Centre for Latin American Monetary Studies (CEMLA), Durango n° 54, Mexico City, D. F., 06700. Printed in Alejandro Duplancher Press, Av. Mariano Escobedo n° 114-3B, México, D. F., 11320. 310 copies. ISSN 0187-7615.

MONEY AFFAIRS

VOLUME XXII, NUMBER 1, JANUARY-JUNE 2009

Sherene A. Bailey

- 1 Investigating the market-structure, performance relationship in the commercial banking sector: evidence from Jamaica

Evridiki Tsounta

- 27 What attracts tourists to paradise?

Trevor Campbell

- 51 A look at imported construction materials by Barbados

Ignacio Lozano

- 65 Budget deficit, money growth and inflation: evidence from the Colombian case

Brian Francis

Troy Lorde

Kimberly Waithe

- 97 Balance of payments adjustment in Barbados

MONEY AFFAIRS disseminates research by the central banks and international financial institutions, as well as studies of a more theoretical and quantitative nature on specialized topics in the financial and monetary fields. The opinions expressed by contributing authors are not necessarily those of the Centre for Latin American Monetary Studies (CEMLA).

Sherene A. Bailey

Investigating the market-structure, performance relationship in the commercial banking sector: evidence from Jamaica

1. INTRODUCTION

The Jamaican commercial banking sector underwent significant structural changes subsequent to the period of financial sector distress during the late 1990s. This period of reform engendered changes in the ownership structure and the degree of concentration within the sector. At the start of the crisis period in 1996, there were nine banks in operation, however, this number declined to six at the end of the crisis period in 1999. A previous study on the impact of increased concentration on competition in the banking system, found that there was declining competition over the period 1988 to 2002.¹ However, the nature of the relationship between concentration and performance in the sector remains unexplored.

¹ See Duncan (2002).

Paper prepared by S. A. Bailey, Financial Stability Department, Bank of Jamaica; and presented at the XIII Meeting of the Central Bank Researchers Network of the Americas, in CEMLA, Mexico, D. F., Mexico, November 5-7, 2008. The views expressed are those of the author and do not necessarily reflect those of The Bank of Jamaica.

Proponents of the structure-conduct-performance (SCP) hypothesis posit that market players in concentrated industries have the capacity to raise prices through monopolistic conduct and that these firms may gain large market shares and earn super-normal profits. At the same time, increased profitability may be evidence of increased efficiency within an industry due to lower costs of production, enabling some firms to compete more aggressively and capture a bigger market share. Since the consolidation in the sector subsequent to the crisis period, intermediation margins have fluctuated within a band of 10.0% to 15.0%, despite the trend decline in policy rates since 2000. This has raised concerns for policymakers and has resulted in various efforts to increase competition in the sector.

It is important to note that the alternative hypotheses have opposing policy implications. If banks' profitability were driven by increased concentration, regulators would find it beneficial to enforce antitrust regulation to move prices towards competitive levels and allocate resources more efficiently. Alternatively, if greater profitability is attributable to increased efficiency, then regulation geared at dismantling efficient firms and/or preventing mergers may raise costs and lead to less favourable prices for consumers. As such, the paper explores whether reductions in domestic interest rates should be accompanied by reforms such as the reduction of entry barriers in order to improve the competitive structure in the commercial banking sector.

The link, if any, between market concentration and bank performance received considerable attention during the 1990s, given substantial financial sector consolidation across a large number of industrialized countries. Regulators in concentrated markets have been faced with the issue of determining whether profitability is influenced by increased efficiency or the monopolistic behaviour of the more dominant market players and the resulting implications for consumer welfare. Civelek and Al-Alami (1991) noted that the banking sector is important to the economy and hence empirical evidence on the concentration-performance relationship can inform regulatory policies that govern the banking system. Increasing banking sector concentration may raise the cost of funds, thereby reducing the level of intermediation in the economy and impairing economic growth.

The issues outlined above raises an important policy question:

Did the increased concentration in the sector beginning in the latter part of the 1990s lead to reduced efficiency and increased profitability in the sector? As such, the purpose of the empirical investigation is two-fold. First, efficiency estimates are derived for dominant banks in the Jamaican banking sector.² Second, these estimates are employed, through a VAR framework, in assessing the concentration-performance relationship in the banking sector. The results of the study will inform the direction of policy for the commercial banking sector as it relates to the safeguarding of consumer welfare and regulating competition within the sector in order to engender lower costs for bank services.

The paper is organized as follows: section 2 examines the theoretical underpinnings of the link between market concentration and performance. Section 3 provides a brief outline of the structure-performance relationship in the commercial banking sector. Section 4 discusses the methodology and the data employed. Section 5 presents the findings of the model. The policy implications of the results and the conclusion are outlined in section 6.

2. PREVIOUS LITERATURE

2.1 The relationship between market structure and performance

Evaluating bank performance is a complex process that involves assessing the interaction between a bank's internal operations and external environment. An important aspect of the assessing the impact of the external environment is by examining the influence of market structure on bank performance. The relationship between market structure and bank performance has been examined at length in the literature, particularly by assessing the implications of industry concentration for operational efficiency in the sector. The relationship between industry concentration and commercial bank profitability or performance is explained by two contrasting hypotheses. Alternative explanations provided by the traditional SCP hypothesis and efficient market

² The dominant banks used in the study are the two largest commercial banks.

hypothesis (EMH), give insight on the direction and nature of this relationship.³

Proponents of the traditional paradigm posit that there is a one-way relationship between concentration and profitability, due to the fact that market concentration lowers the cost of collusion between firms, influencing increases in prices and higher than normal profits.⁴ The key issue here is that higher seller concentration fosters explicit collusion on the part of firms, allowing all firms in the market to earn monopoly rents. This suggests that where markets are conducive to monopolistic conduct, due to barriers to entry and market concentration, firms have greater autonomy to raise prices above their costs, resulting in excess profits. As a consequence, the leitmotiv of the traditional paradigm is that market structure influences bank performance through the institution's pricing policy or pricing behaviour. The theoretical implication of the traditional framework is that in concentrated markets consumers face less favourable prices due to the non-competitive behaviour that generally exists in these markets. Hence, lower levels of profitability are anticipated in markets where there is perfect demand elasticity compared to all other markets. Berger and Hannan (1989) posit that if the SCP hypothesis reflects anti-competitive pricing, then this means that banks will be able to apply lower deposit rates and/or higher loan rates.⁵

This relationship has been widely tested in the field of industrial economics. Bain (1951) found evidence of a positive and significant relationship between concentration and profitability based on US manufacturing data. However, later studies using banking sector data have revealed mixed results. The specification of the SCP model in banking is based on a profit-concentration relationship that is defined as follows:⁶

$$(1) \quad \pi_i = f(CR, X_i),$$

where, π_i , is a profit measure of the i_{th} bank, this can be captured by the rate of return on capital or assets (ROC or ROA), CR, is the

³ The structure-conduct-performance theory is also known as the collusion hypothesis.

⁴ See Chirwa (2003).

⁵ See Goldberg and Rai (1996).

⁶ See Chirwa (2001).

banks' index of concentration and X_i , denotes a vector of control variables that account for firm-specific and market-specific characteristics which affect prices through market or cost considerations. The mixed empirical results on the SCP model have undermined the importance of the model in explaining bank behaviour.

The EMH emerged from criticism of the traditional paradigm. Rather than being a random event, the efficiency theory bases increased market concentration on the superior productivity or efficiency of the leading firms. This occurs because increased productivity and profitability enables firms to offer competitive rates on loans or deposits, inducing them to gain larger market shares and further increase profitability. According to the EMH, firm-specific efficiencies encourage unequal market shares and high levels of concentration.

Molyneux and Forbes (1995) and Smirlock (1985) posited that the EMH is specified as a market share – profitability relationship. The market share variable captures firms' superior efficiency in obtaining a larger portion of the market and equation (1) is re-specified as follows:

$$(2) \quad \pi_i = f(CR, MS, X_i)$$

Tests of both hypotheses are captured in equation (3):

$$(3) \quad \pi_i = \beta_0 + \beta_1 CR + \beta_2 MS + \sum_{i=1}^m \alpha_i X_i$$

where the significance of MS in equation (3) would imply support for the efficient structure hypothesis; while the significance of the concentration ratio would support the traditional hypothesis. However, Sheperd (1986) pointed out that the validity of the market share variable in testing for efficiency is dependent on whether the variable can be considered as a proxy for the efficiency of larger firms rather than as measure of market power. Given the spurious nature of this relationship, empirical findings based on these two market structure-performance hypotheses have been inconclusive.

The Berger and Hannan Model

Berger and Hannan (1993) developed a model to directly include

efficiency in examining the relationship between market structure and performance. The model captures efficiency from two perspectives: Scale efficiency and X-efficiency. A simultaneous test of the competing hypotheses is presented in equation (4).

$$(4) \quad P_i = f(X - EFF_i, S - EFF_i, CONC_m, Z_i) + e_i$$

where, P_i , represents measures of firm performance, $X - EFF_i$, and $S - EFF_i$ represent measures of technical efficiency and scale efficiency, respectively, and, Z_i , is a vector of control variables. The scale efficiency version of the efficient structure hypothesis indicates that some firms produce at a more efficient scale than others, which could result in lower interest margins and increased market shares. This measure captures whether the banking firm operates at an optimal scale of production at which the per unit average production cost is minimized.

Under the X-efficiency hypothesis, it is important to determine whether a firm is producing as efficiently as it can, given its size. Hence, firms with superior management or production processes can operate at lower costs and subsequently reap higher profits. This encourages growth in market share and fuels increased industry concentration.

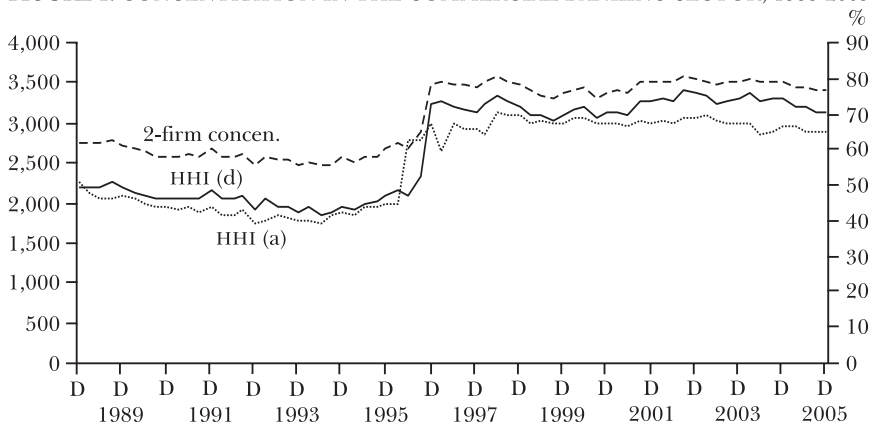
Generally, empirical studies on bank efficiency revealed that X-efficiency is more important in explaining differences in bank costs than scale efficiencies (see Berger, Hunter, and Timme 1993). As such, the paper focuses solely on X-efficiency estimates in investigating the relationship specified in equation (4). The methodology for deriving efficiency estimates is discussed in section 4.

3. DEVELOPMENTS IN CONCENTRATION AND PERFORMANCE IN THE COMMERCIAL BANKING SECTOR: 1988 - 2005

The process of economic liberalization in the Jamaican economy during the late 1980s and early 1990s engendered structural changes involving the deregulation of the financial sector. This process of reform led to rapid expansion in the number of commercial banks in the industry due to the liberalization of licensing requirements in the sector. Against this background, there was a marked decline in concentration in the sector, as measured by the

Herfindahl–Hirschman index (HHI) and the two-firm concentration ratio (see Figure 1).⁷

FIGURE 1. CONCENTRATION IN THE COMMERCIAL BANKING SECTOR, 1988-2005

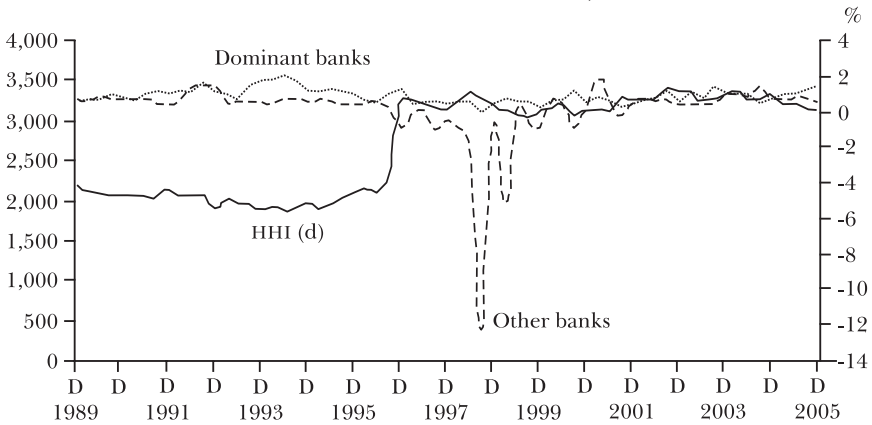


The concentration indices were computed on a quarterly basis over the period March 1988 – December 2005 and displayed a similar pattern during this period (see Figure 1). The movement in these indices was primarily driven by the performance of the two most dominant banks, as the two-firm concentration ratio exceeded industry concentration for most of the sample period (see Figure 1). This implies that industry concentration was largely influenced by the duopolistic behaviour present in the industry.

The decline in the HHI that was observed during the liberalization era continued into the 1992 – 1995 post-liberalization period (see Figure 1). The HHI (deposits) fell to a low of 1,857 at end June 1994, from approximately 2,185 at the end of 1989, representing a 15% decline over this period. The profitability of the dominant market players was inversely related to industry concentration during this period.

Figure 2 shows that for the similar period, the ROA of the two most dominant banks increased from 0.6% to a high of 2%. This

⁷ The Herfindahl-Hirschman index is a widely used measure of concentration. It is computed as the sum of all the banks' squared market shares, where market share is based on either deposits or assets, while the two-firm concentration ratio is represented as the % of deposits held by the two most dominant banks. Return on assets is utilized as an overall measure of performance and is captured by net profits as a proportion of average total assets.

FIGURE 2. CONCENTRATION AND RETURN ON ASSET, 1989-2005

contradicts the findings of the structuralist theory, which is suggestive that a decline in concentration is associated with reduced profitability for the dominant banks.

Rather, this improvement in performance is suggestive of reductions in the costs of production and increases in productivity of the dominant banks due to the increased competition in the sector. Figures 3 and 4 also show that the improvement in the ROA of these banks was driven by strong increases in net interest margin and non-interest income as a proportion of total assets during the post-liberalization period. This occurred relative to much weaker growth in operating expenses as a proportion of assets. In fact, operating costs as a proportion of average total assets

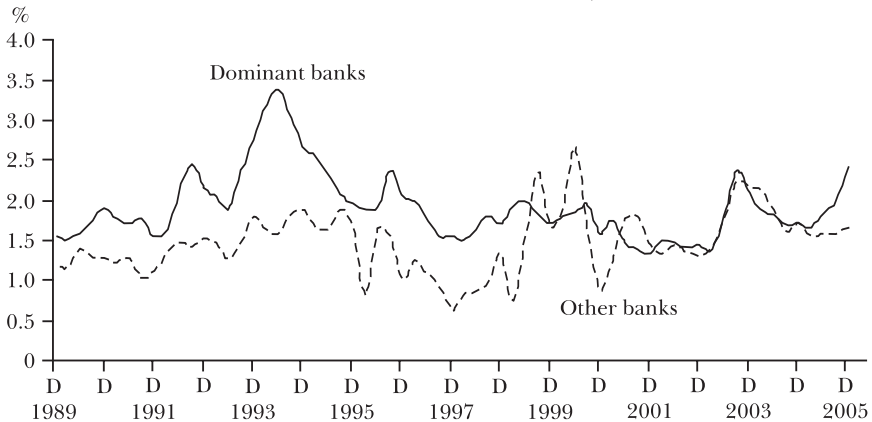
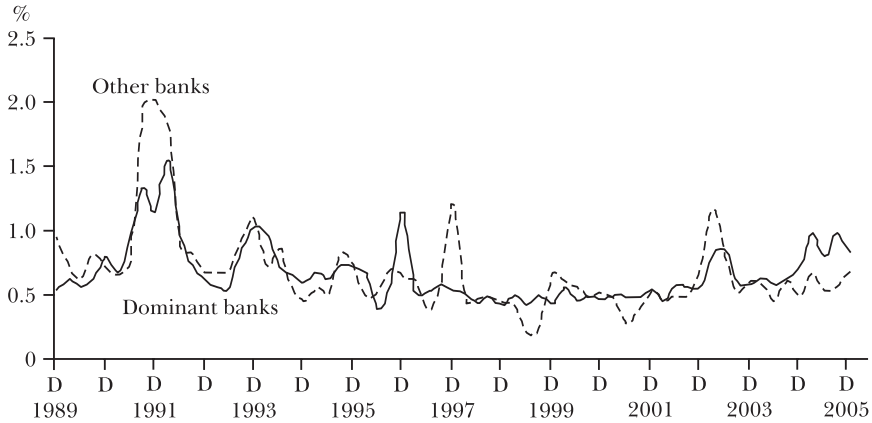
FIGURE 3. NET INTEREST MARGIN TO TOTAL ASSETS, 1989-2005

FIGURE 4. NON-INTEREST INCOME TO TOTAL ASSETS, 1989-2005



were relatively stable averaging 4% over the period 1992 to 1995.

The containment in operating costs as a proportion of total assets was reflective of a moderation in the growth of interest costs (see Figures 5 and 6).

During the crisis period of the late 1990s, the return on assets for the dominant banks averaged 0.6% relative to an average ROA of negative 1.5% for the other banks over the period. There was also a slower pace of growth in operating expenses as a proportion of average total assets relative to other banks during the period of distress. Nonetheless, this performance was largely due to greater efficiency in the operations of one dominant bank.

Subsequent to the distress period, there was substantial consolidation in the sector following the restructuring of a number of

FIGURE 5. OPERATING COSTS TO TOTAL ASSETS, 1989-2005

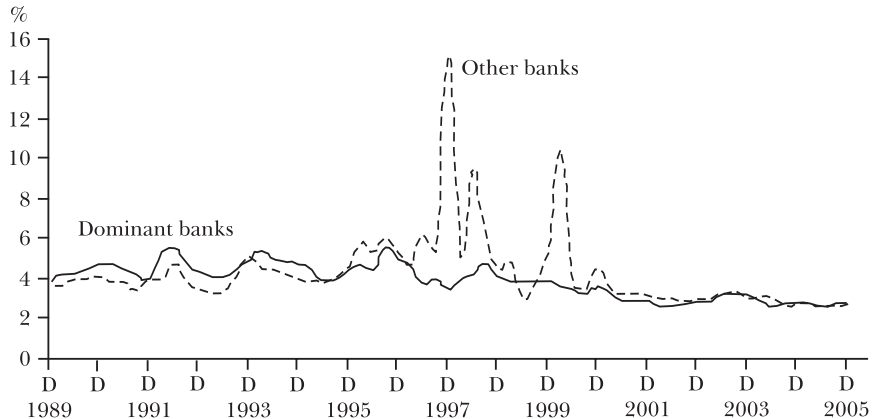
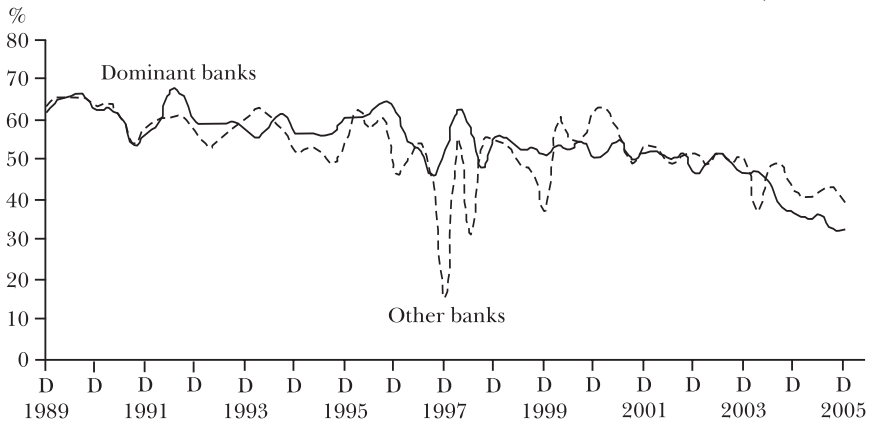


FIGURE 6. INTEREST EXPENSE AS A PROPORTION OF OPERATING COSTS, 1989-2005

failed banks.⁸ Against this background, the HHI increased to an average of 3,241.4 for the post-crisis period of 2000 to 2005 relative to an average of 2,999.6 during the crisis period (see Table 1). At the same time, the ROA and NIM of the dominant banks reflected respective averages of 0.8% and 1.7% during the post-crisis period relative to 0.6% and 1.2% during the crisis period. Additionally, there was a positive, albeit marginal, correlation between the HHI index and the NIM of the dominant banks during 2000 to 2005 (see Table 1). This performance is somewhat consistent with the structuralist theory, which indicates a positive

TABLE 1. MEAN PERFORMANCE RATIOS (%) AND CONCENTRATION MEASURES, 1989-2005

<i>Sub-periods</i>	<i>1989-91</i>	<i>1992-95</i>	<i>1996-99</i>	<i>2000-2005</i>
Concentration				
HHI - deposits	2,118.2	1,969.9	2,999.6	3,241.4
Performance				
ROA	0.8	1.3	0.6	0.8
NIM to total assets	1.2	1.6	1.2	1.7
Correlation				
HHI & ROA	-0.6	-0.5	-0.3	-0.1
HHI & NIM to total assets	-0.1	-0.4	-0.2	0.1

⁸ The restructuring process was spearheaded by the Financial Sector Adjustment Company (FINSAC), which was established by Government in 1997 to resolve the difficulties in the financial sector.

association between concentration and profitability. Nonetheless, the improvement in performance of the dominant banks could be reflective of improvements in efficiency relative to the crisis period, which would imply support for the EMH.

Therefore, despite the positive relationship between concentration and performance during this period, the exact nature of this relationship remains uncertain. This underscores the relevance of explicitly accounting for efficiency, in order to ascertain a more precise relationship between concentration and performance.

4. METHODOLOGY AND DATA

4.1 Measures of efficiency

4.1.1 Technical efficiency

Technical efficiency or X-efficiency is a measure of how effectively banks utilize inputs to produce a given level of output. The bank's effectiveness in achieving the optimal mix of cost-minimizing inputs can be specified by an efficient cost frontier. Given the likelihood of bank-by-bank deviations in the efficient cost frontier, it is necessary to specify a stochastic cost function. As such, this paper employs the stochastic cost frontier proposed by Aigner et al. (1977), where deviations from the efficient cost frontier are captured by a random noise, v_i , and an inefficiency component, u_i .⁹

The cost function is represented as:

$$(5) \quad \ln tc = f(y_i, p_i) + \varepsilon_i,$$

where $\varepsilon_i = u_i + v_i$; y_i , is the output i of each bank; p_i , is the cost of input i and; v_i , is statistical noise distributed normal $(0, \sigma_v)$.¹⁰ U_i is an inefficiency measure which can follow a truncated or half-normal distribution and measures the individual firm's deviation from the efficient cost frontier, due to non-optimal employment of the quantity or mix of inputs given their prices as a result of management errors. This variable is referred to as 'technical

⁹ Aigner et al. utilized the approach to investigate cost efficiencies.

¹⁰ Maximum likelihood estimation techniques are utilized in estimating the coefficients.

inefficiency'. However, it relates to both technical inefficiencies from using too much of the inputs to produce the same output and allocative inefficiencies from failing to react optimally to the relative prices of inputs. The variable v_i is an exogenous component which is due to data or measurement error or unexpected and uncontrollable factors such as labour strikes and war that are not under the influence of management.

Estimates of u_i or technical inefficiency are derived from the stochastic frontier for each bank. In investigating the concentration-performance relationship outlined in equation (4), u_i is substituted for the efficiency variable, X-EFF. The predicted relationship between u_i and profitability is negative when the performance measure is defined by the return on assets, since lower inefficiency is associated with larger profits. While for the net interest margin, the relationship is positive since higher inefficiency implies a larger net interest margin.

The log-likelihood function for equation (5) is specified as:

$$(6) \quad \ln L = \frac{N}{2} \ln \frac{2}{\pi} - N \ln \sigma - \frac{1}{2\sigma^2} \sum_{i=1}^N \epsilon_i^2 + \sum_{i=1}^N \ln \left[\psi \left(\frac{\epsilon_i \lambda}{\sigma} \right) \right]$$

with N denoting number of banks and ψ is the standard normal cumulative distribution. Equation (7) shows that the ratio of variability, σ , can be used to measure a firm's mean inefficiency by:

$$(7) \quad E(u_i / \epsilon) = \left[\frac{\sigma \lambda}{1 + \lambda^2} \right] \left[\frac{\varphi(\epsilon_i \lambda / \sigma)}{\psi(\epsilon_i \lambda / \sigma)} + \frac{\epsilon_i \lambda}{\sigma} \right]$$

where $\sigma^2 = [\sigma_u^2 + \sigma_v^2]$, $\lambda = \sigma_u / \sigma_v$, and $\varphi(\cdot)$ is the standard normal density function.

This paper employs two variations of the model specified in equation (5), in estimating a cost frontier for banks in Jamaica. A translog cost function is considered because of its flexibility in allowing for input substitutability (see equation (8)) as well as a simpler Cobb-Douglas cost function which is specified in equation (9).

$$(8) \quad \ln tc = \alpha_0 + \sum_{i=1}^2 \alpha_i \ln(y_i) + \sum_{j=1}^3 \beta_j \ln(p_j) + 1/2 \sum_{i=1}^2 \sum_{k=1}^2 \alpha_{ik} \ln(y_i) \ln(y_k) + \\ + 1/2 \sum_{j=1}^3 \sum_{h=1}^3 \beta_{jh} \ln(p_j) \ln(p_h) + \sum_{i=1}^2 \sum_{j=1}^3 \delta_{ij} \ln(y_i) \ln(p_j) + \epsilon$$

$$(9) \quad \ln tc = \beta_0 + \beta_1 \ln(y_{1i}) + \beta_2 \ln(y_{2i}) + \beta_3 \ln(p_{1i}) + \beta_4 \ln(p_{2i}) + \beta_5(p_{3i}) + (u_i + v_i),$$

where the subscripts i and t refer to the i^{th} bank and the t^{th} period.

In both models, the term, U_i , represents non-negative random variables that are assumed to be independently distributed as truncations of the $N(\delta Z_i, \sigma_u^2)$ distribution, where Z_i are factors that affect firm efficiency, while δ is a vector of parameters to be estimated. As a consequence, inefficiency is modelled using the auxiliary model specified in equation (10).

$$(10) \quad U_i = Z_i \delta = \delta_0 + \delta_1 z_{1i} + \delta_2 z_{2i} + w_i,$$

where z_1 = total assets and z_2 = return on assets.

Additionally, for the two models considered, TC represents total operating and interest costs. Two outputs are employed in the model; loans, which is the primary output, y_1 , and all other earning assets, y_2 , is included as a secondary output. There are three inputs, with prices defined as the price of labour, p_1 , price of fixed capital, p_2 , and borrowed funds, p_3 . P_1 is defined as personnel expenses divided by total assets, P_2 is defined as capital and occupancy expenses divided by fixed assets, and P_3 is defined as total interest expenses divided by interest bearing liabilities. Consistent with linear homogeneity conditions, TC and the prices of all inputs are normalized by the price of labour (p_1). Therefore, the transformed variables are denoted as TC^* , p_2^* and p_3^* .

The cost functions defined by equations (8) and (9) are estimated using FRONTIER[®], an econometric software package designed to provide maximum likelihood estimates of a variety of stochastic frontiers.¹¹ FRONTIER follows a three-step estimation procedure. First, ordinary least squares (OLS) estimates of the function are obtained as starting values, and then a two-phase grid search is conducted to refine these starting values.¹² Final estimates are obtained iteratively using the Davidson, Fletcher, and Powell Quasi-Newton Method. Cost efficiency estimates derived from the model range over the interval $[1, \infty]$, with a score of one

¹¹ See Coelli (1996) for a complete discussion of FRONTIER.

¹² These estimates (except for the intercept) are unbiased.

indicating full efficiency, which means that the firm is operating on its efficient cost frontier. The amount by which the score deviates from 1 is a measure of technical inefficiency.

4.2 Data

The model utilizes quarterly commercial banking system data covering the period March 1989 to December 2005. Average inefficiency measures are derived for dominant banks for each quarter over the sample period. The bank performance measures utilized in the empirical analysis are return on assets and the net interest margin.

Return on assets is computed as the ratio of net income to average total assets while net interest margin is the interest revenue less interest expenses, as a proportion of total assets and is used as a proxy for the pricing ability of banks. The HHI index computed for the banking sector is used as a measure of concentration. A dummy variable is included to capture the financial crisis that occurred during the second half of the 1990s. A dynamic VAR framework is utilized in analysing the nature of the concentration–profitability relationship by incorporating inefficiency estimates, performance and concentration measures and the dummy variable as endogenous variables.¹³

5. ESTIMATION RESULTS

5.1 Technical inefficiency estimates

5.1.1 Translog cost function estimates

The maximum likelihood estimates of the translog cost function defined by equation (8) are presented in Table 2. The value of the γ parameter, which captures the variability related to the technical inefficiency component, is significant. This indicates that the translog model is a significant improvement over the standard OLS function. Additionally, output variables, y_1 and y_2 , and the price variable p_3^* along with various interaction variables are

¹³ Inefficiency estimates included in the VAR model are based on the cost function which best fits the data.

positive and significant at the 10% level (see Table 2). However, asset size and ROA were found to be statistically insignificant indicating that increases in these variables were not influential in determining technical inefficiency.

TABLE 2. MODEL PARAMETERS OF THE STOCHASTIC TRANSLOG COST FUNCTION

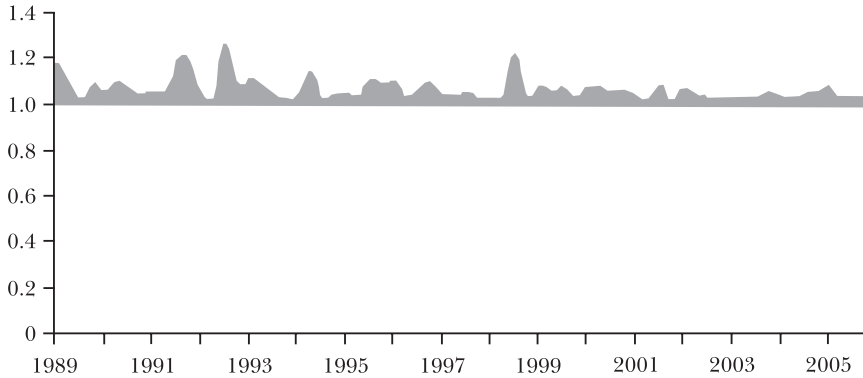
<i>Variable</i>	<i>Coefficient</i>	<i>t-ratio</i>
Dependent variable: ln (cost)		
Constant	-48.2 ^a	-5.30
ln(Y1)	7.6 ^a	6.50
ln(Y2)	-2.1 ^a	-3.90
ln(P2 ^a)	-0.10	-0.10
ln(P3 ^a)	-1.4 ^a	-1.90
ln(Y1)ln(Y1)	-0.30	-3.70
ln(Y1)ln(Y2)	-0.03	-0.35
ln(Y2)ln(Y2)	0.1 ^a	5.10
ln(P3 ^a)ln(P3 ^a)	0.5 ^a	4.80
ln(P3 ^a)ln(P2 ^a)	0.3 ^a	2.40
ln(Y1)ln(P3 ^a)	0.04	0.30
ln(Y1)ln(P2 ^a)	-0.2 ^a	-3.00
ln(P3 ^a)ln(P3 ^a)	0.10	1.30
ln(Y2)ln(P3 ^a)	0.2 ^a	4.40
ln(Y2)ln(P2 ^a)	-0.03	-0.70
Gamma	0.98 ^a	5.70
Constant (delta0)	7.90	0.86
Asset size	-0.38	-0.85
ROA	-38.1	-0.69

^a Significance at 10% level.

Based on the results from the estimated translog cost frontier, technical inefficiency for the dominant banks averaged 6.8% over the sample period. This indicates that on average, dominant banks were incurring 6.8% higher costs than necessary. Additionally, Figure 7 shows that for most of the period, these banks operated close to their efficient cost frontier. Nonetheless, the results indicate that there was a marked increase in technical inefficiency during the pre-liberalization period due to absence of strong competition in the sector. However, this performance improved substantially in the post-liberalization period. Not surprisingly, technical inefficiency also increased sharply to 23% during

the crisis period before moderating to fluctuate in a band of 3 to 7% over the rest of the sample period.

FIGURE 7. COST EFFICIENCY ESTIMATES AND TECHNICAL OR X-INEFFICIENCY AVERAGES FOR DOMINANT BANKS, 1989-2005 (at March of each year)



5.1.2 Cobb-Douglas cost function estimates

The results in Table 3 are based on the Cobb-Douglas cost frontier and indicate that all coefficients are significant at the 5% level. In particular, gamma is statistically significant indicating that the proportion of the one-sided error component in the total variance of the error terms in the model is approximately 99%. As

TABLE 3. MODEL PARAMETERS OF THE STOCHASTIC COBB-DOUGLAS COST FUNCTION

<i>Variable</i>	<i>Coefficient</i>	<i>t-ratio</i>
Dependent variable: ln (cost)		
Constant	2.1 ^a	14.25
ln(Y1)	0.43 ^a	40.26
ln(Y2)	0.56 ^a	57.46
ln(P1 ^a)	0.61 ^a	26.71
ln(P2 ^a)	0.02 ^a	18.33
Dependent variable: Ineff		
Constant (delta0)	2.92 ^a	8.04
Asset size	-0.11 ^a	-7.37
ROA	-8.52 ^a	-3.77
Gamma	0.99 ^a	149.36

^a Significance at 5% level.

such, technical inefficiency is the main source of random error in the model. The coefficients on asset size and ROA are negative and statistically significant indicating that increased asset size and profitability contribute to declines in technical inefficiency.

FIGURE 8. COST EFFICIENCY ESTIMATES AND TECHNICAL OR X-INEFFICIENCY AVERAGES FOR DOMINANT BANKS, 1989-2005 (at March of each year)

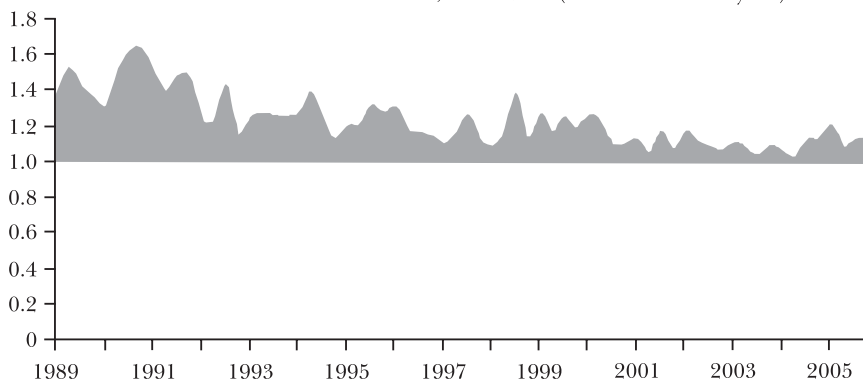
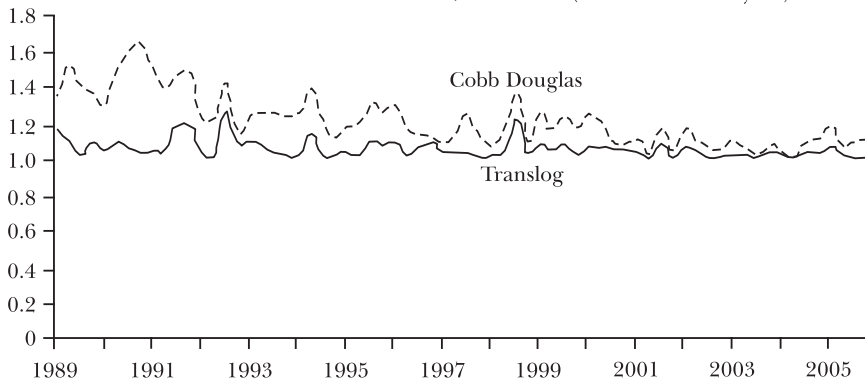


Figure 8 shows that the pattern of the technical inefficiency estimates are similar to that observed based on the translog function. Nonetheless, technical inefficiency estimates based on the translog and Cobb-Douglas functions deviated sharply prior to the crisis period but were more closely related subsequent to this period (see Figure 9 and Table 4). Estimates for both cost functions are compared in order to ascertain which model is a more appropriate fit for the data. The likelihood ratio test statistic was compared to the Chi-square critical value at the appropriate degrees of freedom.¹⁴ The null hypothesis of the more restrictive Cobb-Douglas cost function was rejected at the 5% level. As such, inefficiency estimates from the translog cost function were used as inputs in the VAR framework.

5.2 Impulse response analysis

Figure 10 plots the impulse responses of ROA, HHI and NIM with

¹⁴ The test statistic was computed based on the likelihood function values for the Cobb-Douglas and translog cost functions. Since the test statistic follows a mixed Chi square distribution, critical values were based on Kodde and Palm (1986).

FIGURE 9. COST EFFICIENCY ESTIMATES, 1989-2005 (at March of each year)

respect to a one standard deviation increase in technical inefficiency over a horizon of thirty-six months. The VAR coefficient and standard errors from the model are computed by the Monte Carlo method with 1,000 repetitions (of 2 standard deviations).

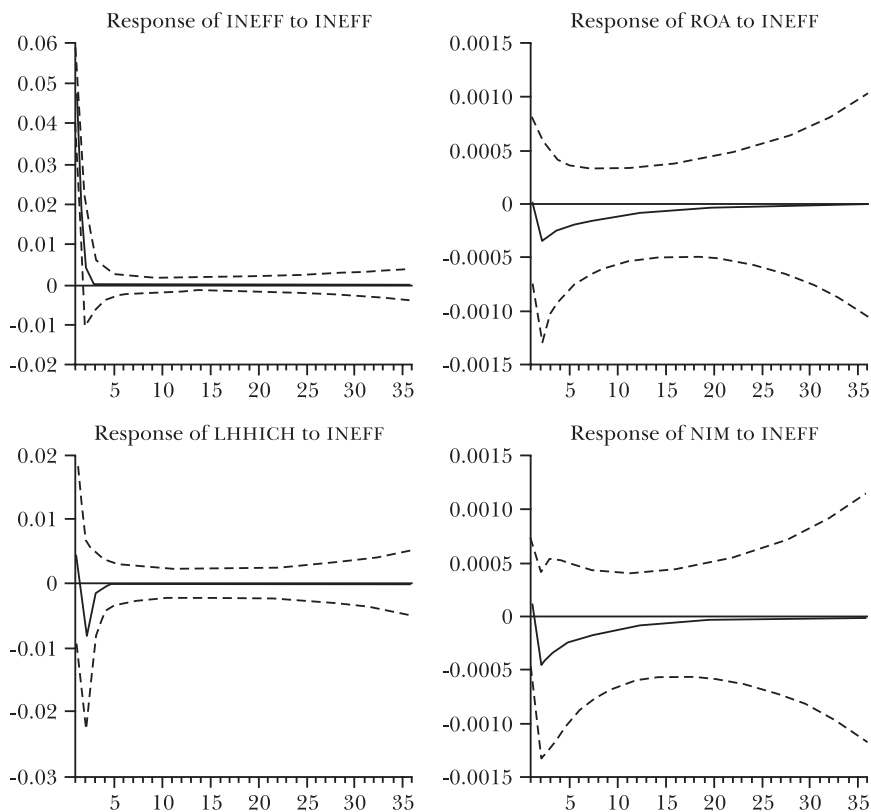
Generalized impulse response analysis is utilized, as it is invariant to the ordering of the variables in the VAR, resulting in a unique solution. A lag order of one was selected based on the Schwarz information criterion and the Hannan-Quinn information criterion.¹⁵

TABLE 4. AVERAGE X-INEFFICIENCY ESTIMATES OVER DIFFERENT SUB-PERIODS

<i>Sub-periods</i>	<i>Average X-ineff Estimates (per cent)</i>	
	<i>Translog</i>	<i>Cobb-Douglas</i>
Pre liberalization 1989-91	10.0	46.7
Post liberalization 1992-95	8.0	25.4
Crisis period 1996-99	7.0	18.7
Post crisis 2000-2006	5.0	10.6
Entire sample 1989-2005	6.7	22.3

¹⁵ See Table 5 in Appendix.

FIGURE 10. RESPONSE TO GENERALIZED ONE S.D. INNOVATIONS ± 2 S.E.



The impulse response suggests that shocks in inefficiency influences declines in overall profitability within the first three months, based on the ROA. Thus, profitability is inversely related to increases in inefficiency.

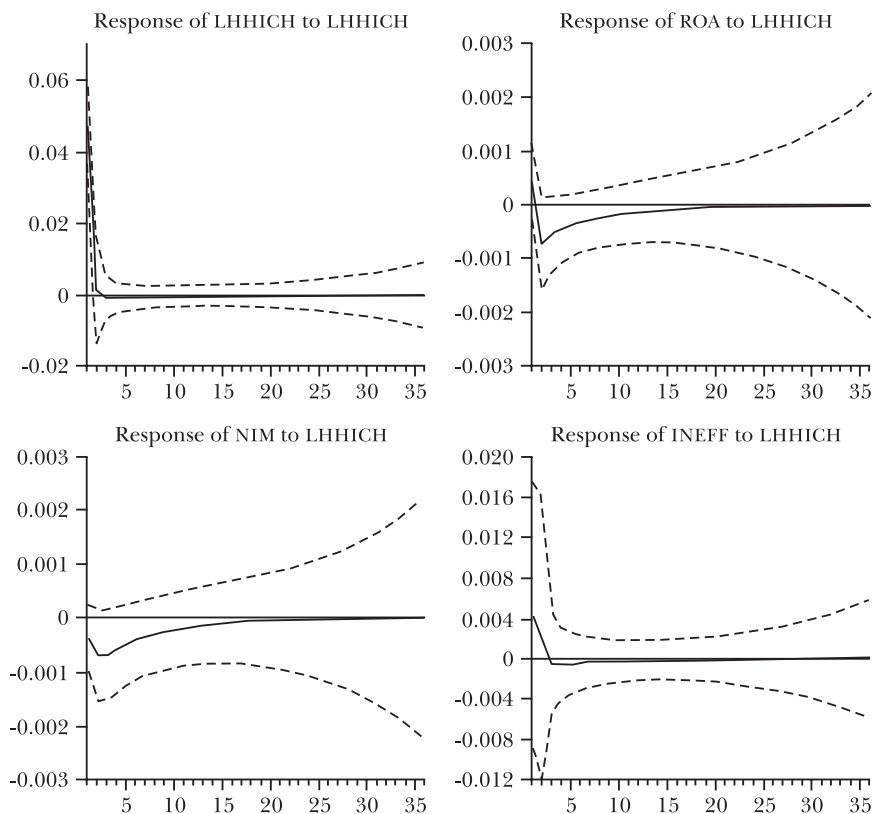
This finding supports the EMH, which indicates that increases in efficiency are associated with increases in profitability. It is also observed that increases in inefficiency contribute to declines in concentration, suggesting that efficient firms are likely to gain larger market shares.

However, increases in inefficiency result in a decline in NIM, implying that lower inefficiency is associated with increases in NIM. This implies that declines in inefficiency are not translated into lower net interest margins being applied by the dominant banks. A possible explanation for this finding is that dominant

banks have limited incentive to translate productivity improvements into lower interest margins because of the weak competition in the sector. As such, the relatively high interest margins in the domestic banking sector are indicative of the absence of strong competition rather than unfavourable pricing due to the presence of a large degree of inefficiency in the operations of dominant market players.

Figure 11 shows the response of technical inefficiency (ineff), ROA and NIM to a 1.0 unit shock in concentration. The findings do not support the SCP hypothesis. The results indicate that increases in concentration are associated with strong declines in both the profitability measures within the first three months. The results also show that increased concentration contributes to lower inefficiency.

FIGURE 11. RESPONSE TO GENERALIZED ONE S.D. INNOVATIONS ± 2 S.E.



7. CONCLUSION AND POLICY RECOMMENDATIONS

The results suggest that dominant banks are operating with a high degree of efficiency. Based on findings from the translog cost function, dominant banks would only need to reduce costs by 7% to achieve their optimal level of efficiency. This estimate compares favourably to findings in the US banking industry.¹⁶

The pattern of technical inefficiency estimates for the dominant banks indicates that there was increased inefficiency prior to the liberalization period as well as during the crisis period. Both cost frontier approaches indicate that technical inefficiency has remained relatively stable subsequent to the crisis period, fluctuating in narrow band of 3% to 5%.

Results from the VAR framework reject the SCP hypothesis, indicating that profitability of the dominant banks in the industry is not driven by monopolistic conduct. While the profitability of the dominant banks is driven by the efficiency in their operations, this performance is not reflected in the pricing policies of these banks. This suggests that despite gains in productivity, dominant banks are unlikely to administer lower net interest margins in the absence of greater competition in the banking system.

There is further need for regulatory authorities to engineer continued incremental reductions in policy rates in an effort to increase competition in the banking sector and avoid destabilizing the system. The lower interest rate environment could stimulate increased competition in the sector, as commercial banks reduce their reliance on earnings from Government debt issues and realign their asset portfolios towards core business activities. Additionally, continued improvement in the fiscal position and Government's debt sustainability should further reduce the banking sector's reliance on earnings from debt instruments.

Reductions in domestic interest rates should be accompanied by moral suasion by regulatory authorities. Policymakers can promote a competitive environment by encouraging dominant banks to increase performance by expanding business volumes by narrowing their interest margins. The increased competitiveness of the dominant market players could influence greater competition in the supply of loanable funds in the sector.

¹⁶ See Kwan (2001).

There is some debate as to the competitive structure that optimizes efficiency and financial stability. Market power can contribute to stability by mitigating risk-taking behaviour and providing incentives to screen and monitor loans, which can improve the quality of banks' portfolios. In this context, rather than pursuing efforts to minimize market power, regulatory authorities should seek to facilitate an environment that promotes competitive behaviour. Regulatory authorities can stimulate competition by promoting the establishment of independent credit rating agencies, as the lack of accurate, reliable information about borrowers' ability to pay increases credit risk and hence lending rates.

It is also important to ensure that the regulatory framework is accommodative of product innovations, as strong restrictions on new products and services can decrease competitiveness in the banking industry. Claessens and Laeven (2003), estimated competitiveness indicators for a large cross-section of countries and found evidence that fewer activity restrictions in the banking sector can increase competitiveness in the system. Additionally, regulatory authorities must carefully evaluate the costs and benefits of mergers and acquisition in order to safeguard consumer welfare and promote competition in the sector.

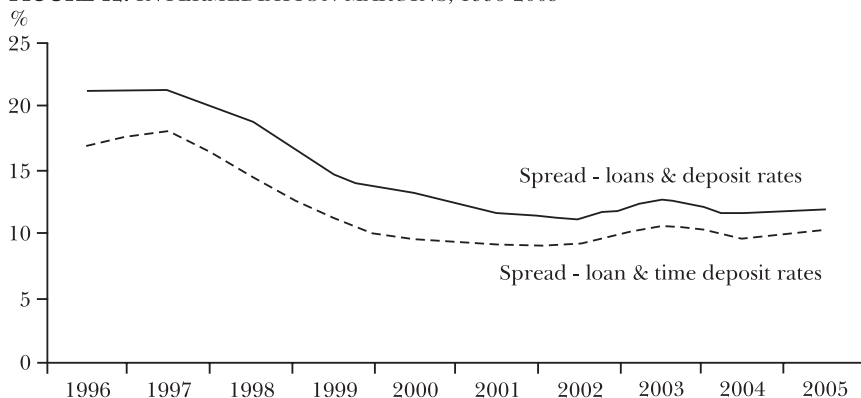
Appendix

TABLE 5. VAR LAG ORDER SELECTION CRITERIA

<i>Lag</i>	<i>LogL</i>	<i>LR</i>	<i>FPE</i>	<i>AIC</i>	<i>SC</i>	<i>HQ</i>
0	692.6106	NA	1.11E-16	-22.54461	-22.37159	-22.4768
1	797.674	189.4586	8.09e-18 ^a	-25.16964 ^a	-24.13150 ^a	-24.76278 ^a
2	811.1723	22.1284	1.20E-17	-24.79254	-22.88929	-24.04663
3	821.3654	15.03893	2.03E-17	-24.30706	-21.5387	-23.22212
4	856.0405	45.47558	1.61E-17	-24.62428	-20.99081	-23.20029
5	868.7244	14.5553	2.79E-17	-24.22047	-19.72189	-22.45744
6	920.2128	50.64437 ^a	1.47E-17	-25.08895	-19.72525	-22.98686

NOTES: LR: sequential modified LR test statistic (each test at 5% level); FPE: final prediction error; AIC: Akaike information criterion; SC: Schwartz information criterion; and HQ: Hannan-Quinn information criterion.

^a Indicates lag order selected by the criterion.

FIGURE 12. INTERMEDIATION MARGINS, 1996-2005

REFERENCES

- Aigner, D., C. A. K. Lovell, and P. Schmidt (1977), "Formulation and Estimation of Stochastic Frontier Production Function Models", *Journal of Econometrics*, vol. 6, pp. 21-37.
- Bain, J. S. (1951), "The Relation of Profit Rate to Industry Concentration: American Manufacturing", *Quarterly Journal of Economics*, vol. 65, pp. 293-324.
- Berger, A. N. (1995), "The Profit-Relationship in Banking-Tests of Market-Power and Efficient-Market Hypotheses", *Journal of Money, Credit and Banking*, vol. 27, pp. 405-31.
- Berger, A. N., and T. Hannan (1989), "The Price-Concentration Relationship in Banking", *Review of Economics and Statistics*, vol. 71, pp. 291-99.
- Berger, A. N., and T. Hannan (1993), *Using Efficiency Measures to Distinguish among Alternative Explanations of the Structure-Performance Relationship in Banking*, Board of Governors of the Federal Reserve System (Finance and Economics Discussion Series, n^o 93-18).
- Berger, A. N., W. C. Hunter, and S. G. Timme (1993), "The Efficiency of Financial Institutions; A Review and Preview of Research Past, Present, and Future", *Journal of Banking and Finance*, vol. 17, n^{os} 2-3, pp. 221-49.
- Cebenoyan, A. S., E. S. Cooperman, C. A. Register and S. C. Hudgins (1993), "The Relative Efficiency of Stock versus Mutual S&Ls: A Stochastic Cost Frontier Approach", *Journal of Financial Services Research*, vol. 7, n^o 2, June.

- Chirwa, Ephraim W. T. (2001), *Market Structure, Liberalization and Performance in the Malawian Banking Industry*, Nairobi: African Economic Research Consortium (Research Paper, n° 108).
- Chirwa, Ephraim W. T. (2003), "Determinants of Commercial Banks' Profitability in Malawi: A Cointegration Approach", *Applied Financial Economics*, vol. 13, pp. 565-71.
- Civelek, M. M., and M. W. Al-Alami (1991), "An Empirical investigation of the Concentration-Profitability Relationship in the Jordanian Banking System", *Savings and Development*, vol. 15, pp. 247-59.
- Claessens, Stijn, and L. Laeven (2003), *What Drives Bank Competition? Some International Evidence*, World Bank (Policy Research Paper, n° 3113).
- Coelli, T. J. (1996), *A Guide to Frontier Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation*, Centre for Productivity and Efficiency Analysis, University of New England, Armidale.
- Coelli, T. J., S. Singh, and E. Fleming (2000), *Measurement of Technical and Allocative Efficiency in Indian Dairy Processing Plants: An Input Distance Function*, CEPA (Working Papers, n° 3/2000).
- Duncan, D. (2002), *Testing for Competition in the Jamaican Banking Sector: Evidence from Bank Level Data*, Available via the Internet: <http://www.boj.org.jm>.
- Frame, W. S., and T. J. Coelli (2001), "U.S. Financial Services Consolidation: The Case of Corporate Credit unions", *Review of Industrial Organization*, vol. 18, pp. 229-42.
- Goldberg, L. G., and A. Rai (1996), "The Structure-Performance Relationship for European Banking", *Journal of Banking and Finance*, vol. 20, pp. 745-71.
- Katib, M. Nasser (2004), *Market Structure and Performance in the Malaysian Banking Industry: A Robust Estimation*, Available via the Internet: <http://papers.ssrn>.
- Kodde, D. A., and F. C. Palm (1986), "Wald Criteria for Jointly Testing Equality and Inequality Restriction", *Econometrica*, vol. 54, pp. 1243-48.
- Kwan, Simon H. (2001), *The X-Efficiency of Commercial Banks in Hong Kong*, FRB of San Francisco (Working Paper, n° 2002-14).
- Limam, Imed, *Measuring Technical Efficiency of Kuwait Banks*,

- Available via the Internet: <http://www.arab-api.org/jodep/products/delivery/wps0101.pdf>.
- Molyneux, P., and W. Forbes (1995), "Market Structure and Performance in European Banking", *Applied Economics*, vol. 27, pp. 155-59.
- Rai, A. (1996), "Cost Efficiency of International Insurance Firms", *Journal of Financial Services Research*, vol. 10, pp. 213-33.
- Robinson, J. (2002), *Commercial bank Interest Rate Spreads in Jamaica: Measurement, Trends and Prospects* (unpublished; Bank of Jamaica, Kingston).
- Shepherd, W. G. (1986), "Tobin's q and the Structure-Performance Relationship: Comment", *American Economic Review*, vol. 76, n^o 5, pp. 1205-10.
- Smirlock, M. (1985), "Evidence on the (Non) Relationship between Concentration and Profitability in Banking", *Journal of Money, Credit and Banking*, vol. 17, pp. 69-83.
- Worthington, A. (1998), "The Determinants of Non-bank Financial Institution Efficiency: A Stochastic Cost Frontier Approach", *Journal of Econometrics*, vol. 8, pp. 279-89.

Evriliki Tsounta

What attracts tourists to paradise?

I. INTRODUCTION

Tourism is one of the main economic activities in the Eastern Caribbean Currency Union (ECCU) region.¹ Tourism receipts account for a large portion of each country's GDP (ranging from around 40% in Antigua and Barbuda, Grenada, and St. Lucia to around 25% economies of Dominica and St. Vincent and the in the traditional agricultural Grenadines). The tourism sector is among the main drivers of economic growth, both directly and

¹ The ECCU includes the six Fund-member countries of Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia and St. Vincent and the Grenadines, and the two U.K. territories of Anguilla and Montserrat. In this paper the ECCU region refers to the six Fund-member countries.

Paper prepared by E. Tsounta. © 2008 International Monetary Fund. The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. The author is grateful to Paul Cashin, Nancy Wagner, Catherine Pattillo, Ana-Lucia Coronel, Emilio Pineda, Murma Morgan, and seminar participants at the International Monetary Fund, Eastern Caribbean Central Bank, and Caribbean Development Bank, for valuable comments on this paper. Cleary Haines, Joan Hewitt and Hildi WickerDeady provided excellent research and production assistance.

through the tourism-related construction activity. Economic cycles and the performance of the tourism sector are also highly correlated, more so for the economies which are more reliant on tourism, such as Antigua and Barbuda (Figure 1). While detailed studies for all ECCU countries are not available, a study by the Caribbean Tourism Organization (CTO, 2000) finds that each Eastern Caribbean (XCD) dollar spent on tourism in St. Lucia in 1998 had generated XCD 0.65 in income—64% through the direct effect (provision of hotel and restaurant services, recreation, transportation and retail trade), 23% through the indirect effect (suppliers' provision of inputs to the tourism sector and retailers) and the remaining 13% through the multiplier effect (second-round effects through the spending of household income derived from the aforementioned effects).

The tourism sector is also an important source of government revenue. While data on tourism-related tax receipts are not readily available, calculations which include estimated revenues from corporate and income tax, custom duties, departure taxes and hotel room taxes, suggest that tax revenues from the tourism sector account for a significant portion of each country's tax revenues.² The importance of the tourism sector as a source of public finance is only expected to intensify in the future, as more economies introduce VAT systems and as some tax concessions are gradually phased out.³

The tourism sector is also an important employer in the region. While labor data deficiencies hinder the proper analysis of

TABLE 1. ECCU: TOURISM EXPENDITURE, 2004 (in percent of GDP)

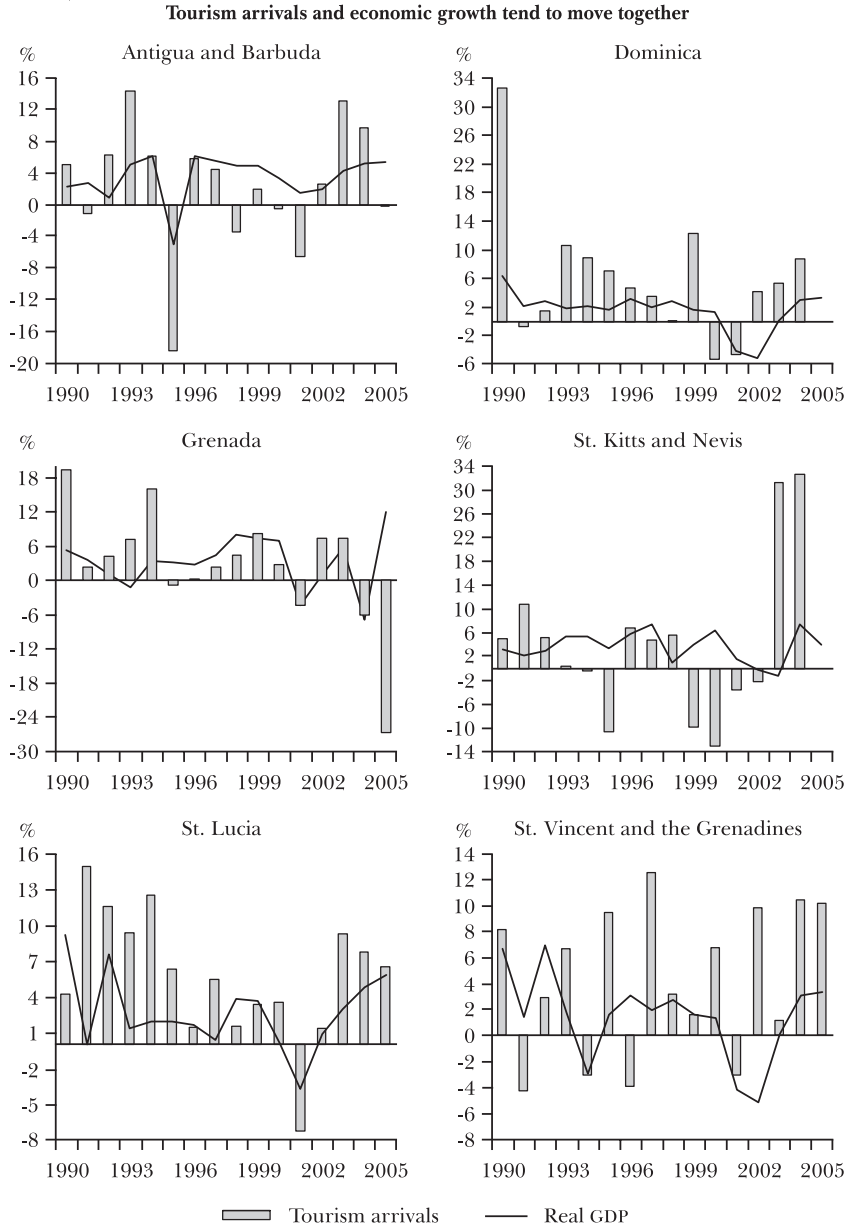
Antigua and Barbuda	41.2
Dominica	22.2
Grenada	36.8
St. Kitts and Nevis	26.4
St. Lucia	42.7
St Vincent and the Grenadines	23.4

SOURCES: Caribbean Tourism Organization; and Fund staff estimates.

² According to the CTO (2000), the tourism sector was estimated to account for around 20% of government revenues in St. Lucia in 1998.

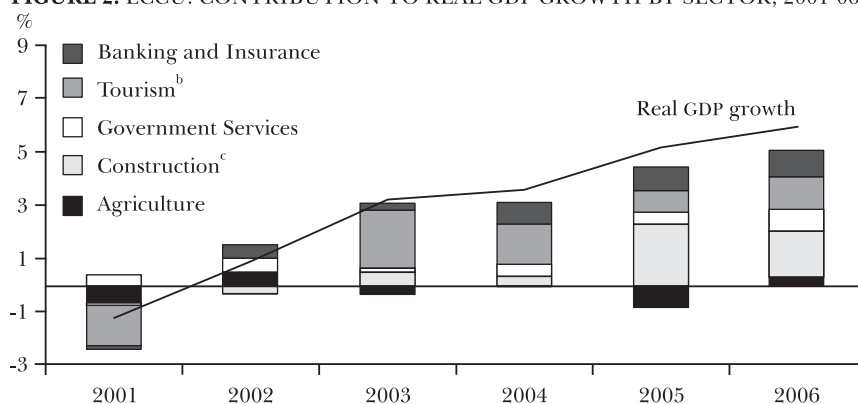
³ Chai and Goyal (2006, 2008) estimate that revenue losses from concessions on import-related taxes and corporate income tax range between 9½ and 16% of GDP a year.

FIGURE 1. ECCU: ANNUAL GROWTH RATE IN TOURISM ARRIVALS AND REAL GDP, 1990-2005^a



SOURCES: Caribbean Tourism Organization and Fund staff estimates.

^a Data for stayover arrivals in Dominica and St. Kitts and Nevis are up to 2004 due to data limitations.

FIGURE 2. ECCU: CONTRIBUTION TO REAL GDP GROWTH BY SECTOR, 2001-06^a

SOURCES: ECCB; and Fund staff projections.

^a Excludes Anguilla and Montserrat. ^b Includes wholesale and retail trade, hotel and restaurant, air transport, and half of local transport. ^c Includes mining and quarrying.

the contribution of the tourism sector to employment, the CTO (2000) estimated that it accounted for around 20% of all St. Lucian jobs in 1998. Official data on employment in the accommodation sector and the National Tourism Offices, as reported by the CTO, understate the importance of the tourism sector in the labor market since they do not take into account tourism-auxiliary sectors (such as goods and services providers and retailers).

TABLE 2. ECCU: TOURISM-RELATED TAX REVENUE, 2005 (in percent of total tax revenue)

Antigua and Barbuda	55.7
Dominica	51.0
Grenada	58.2
St. Kitts and Nevis	41.6
St. Lucia	40.5
St Vincent and the Grenadines	41.4

SOURCES: Country authorities; Caribbean Tourism Organization; and author's estimates.

Tourism activity contributes decisively to attenuate the current account deficit of the balance of payments. For example, around 75–80% of the exports of goods and services of Grenada and St. Lucia were related to tourism expenditures in 2004. In addition, most of the region's current account deficit is financed by tourism-related foreign direct investment.

TABLE 3. ECCU: EMPLOYMENT IN TOURISM SECTOR, 2004

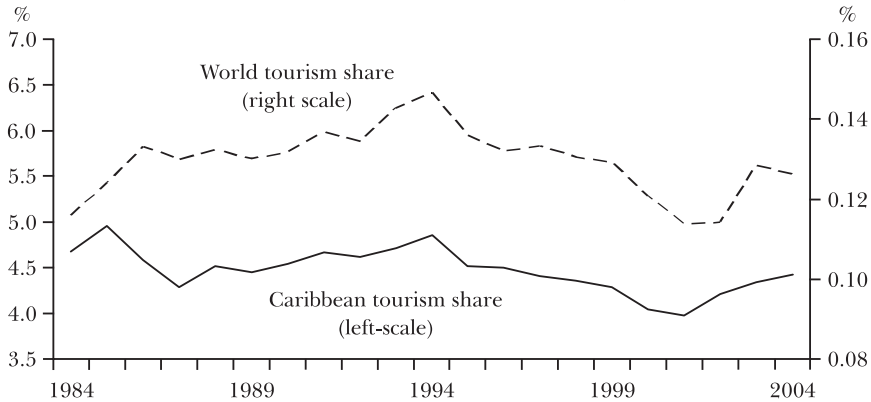
	<i>Employment in accomodation establishments^a</i>	<i>Employment in National Tourism Offices</i>
Antigua and Barbuda	3,649	110
Dominica	929	29
Grenada	1,200	44
St. Kitts and Nevis	1,599	29
St. Lucia	5,200	580
St Vincent and the Grenadines	...	21

SOURCE: Caribbean Tourism Organization.

^a Data refer to 2003.

A better understanding of the determinants of tourism demand could help policymakers design the appropriate strategies needed to develop this sector further, and correct the slippages that have caused tourism growth to stagnate in recent years. An appropriate policy response is particularly timely at present, given increasing competition from other exotic destinations and the declining agricultural sector, following the erosion of European Union (EU) preferential trade arrangements.

FIGURE 3. TOURISM STAY-OVER ARRIVALS IN THE ECCU, 1984-2004



SOURCES: Caribbean Tourism Association; and Fund staff estimates.

The purpose of this study is to analyze the determinants of stayover tourism demand in the ECCU. Although the importance of tourism in the Caribbean is widely recognized, little attention has been given to explain systematically its determinants. Randall (2006) provides a detailed description of the main trends in the ECCU tourism sector and uses Spearman’s rank correlation

coefficients to examine the importance of various variables (e.g., cost of international calls, telecommunication costs) on tourism demand. However, the analysis does not provide a complete estimate of the tourism demand function. Mwase (2008) and Romeu (2008) recently analyzed tourism demand on a wider Caribbean level, while Faria (2005) analyzes tourism demand determinants in The Bahamas.

We consider both demand factors (e.g., income in the main trading partners and relative prices) and supply factors, such as airline availability and foreign direct investment, in explaining the attraction of tourism inflows. We utilize a panel dynamic ordinary least squares (DOLS) estimation approach, which allows for country-specific effects and also captures the long-term tendencies of tourism movements, while correcting for unit root considerations.

The remainder of this paper is structured as follows. Section II provides an overview of the tourism sector in the ECCU.⁴ Section III undertakes a brief literature review on the methodologies used in analyzing the demand for tourism. Section IV presents the sample and model specification. The results are presented in Section V, while the final section concludes.

II. OVERVIEW OF THE TOURISM SECTOR IN THE ECCU

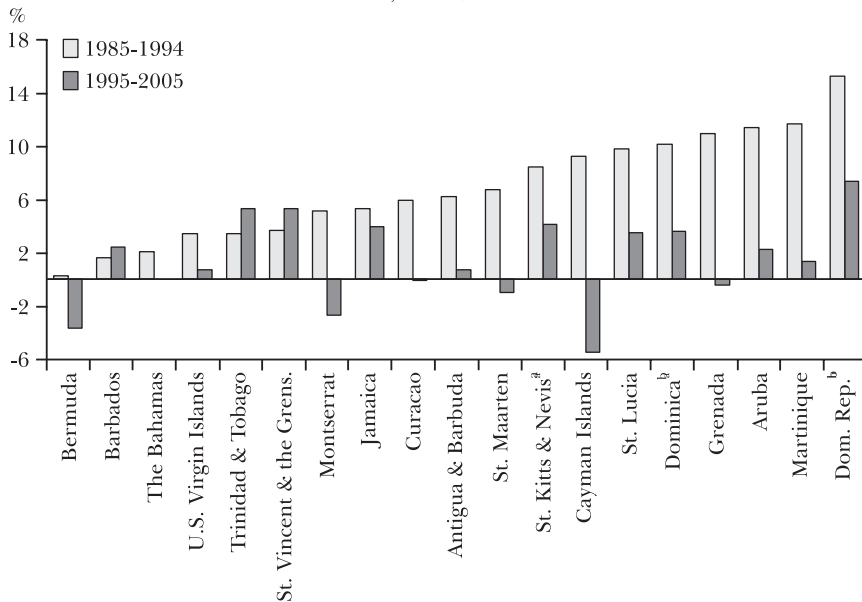
ECCU tourism growth has decreased significantly since the late 1990s. With the exception of St. Vincent and the Grenadines, all ECCU countries that used to be among the best performers (in regional comparisons) in attracting stayover tourists experienced significant declines in their tourist growth rates since the mid-1990s.⁵ While the declining tourism growth rates had been a rather widespread phenomenon in the Caribbean region as a whole, there were some notable exceptions; the Dominican Republic remained the top performer in both decades (in terms of annual growth rates in tourism arrivals), while Trinidad and Tobago,

⁴ For an analysis of recent tourism developments, also see Randall (2006) and Mwase (2008).

⁵ Grenada's negative growth rates since the mid-1990s primarily reflect the devastating Hurricane Ivan of 2004, which destroyed a large portion of the country's tourism infrastructure.

St. Vincent and the Grenadines, and Barbados outpaced their past performances.

FIGURE 4. AVERAGE ANNUAL GROWTH RATES IN STAY-OVER TOURIST ARRIVALS IN SELECT CARIBBEAN COUNTRIES, 1985-2005

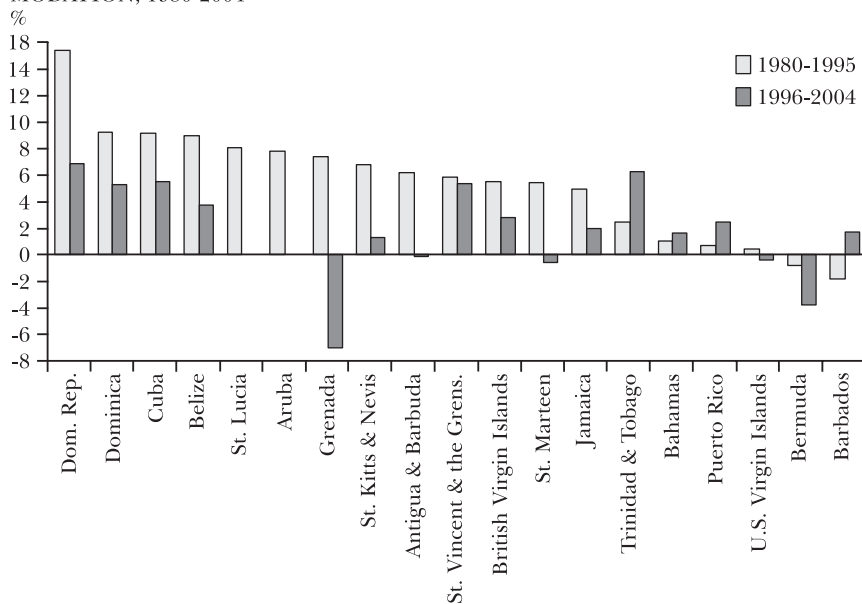


SOURCES: Caribbean Tourism Association and Fund staff estimates.

^a Data are up to 2004. ^b Data missing for 1988-91.

Tourism growth has been facilitated by accommodation establishments in the early 1980s and 1990s.⁶ Since the mid-1990s, capacity growth was subdued, while in some countries (notably Grenada given the impact of Hurricane Ivan), accommodation capacity has actually fallen. Room capacity is expected to rise significantly within the next few years, given the ongoing construction boom in several ECCU islands—mostly in the form of condo-hotel type facilities—partly reflecting the desire of European and American retirees to own a second home in the Caribbean,

⁶ Most of these establishments have been in the form of large international hotels. For example, based on data from the Caribbean Tourism Organization, more than 70% of all rooms in St. Lucia, and around 50% of all rooms in Antigua and Barbuda, are located in hotels with 100 rooms or more. However, disparities in room allocations do exist among the ECCU—for instance, there are no large hotels (capacity above 100 rooms) on St. Vincent and the Grenadines.

FIGURE 5. AVERAGE GROWTH RATE IN NUMBER OF ROOMS IN TOURIST ACCOMMODATION, 1980-2004

SOURCE: Caribbean Tourism Association.

and, for the former, the strong euro appreciation against the XCD.

Tourism development varies across the ECCU. Antigua and Barbuda and St. Lucia boast the highest development in the region while Dominica and St. Vincent and the Grenadines are at the other end of the spectrum. The former are known worldwide as prime honeymoon destinations; almost three quarters of their arrivals stay in a hotel and around half of them are at the age 20–39 years (Caribbean Tourism Organization, 2004). In contrast, only one in five of Dominica's and St. Vincent and the Grenadines' visitors stay in a hotel; most of the vacationers are actually from neighboring islands and are visiting family and friends. To enhance tourism development in Dominica and St. Vincent and the Grenadines—two islands with tropical terrain suitable for ecotourism development—the authorities have started or are considering the construction of an international airport.

The main tourism source markets for ECCU tourism are the United States, the United Kingdom and the larger Caribbean countries of Barbados, Jamaica and Trinidad and Tobago. The reliance on just a few markets, which are themselves highly

interlinked, provides an additional vulnerability to the non-sectorally diversified ECCU economy.⁷ This reliance on a few tourism source countries varies by country, with Dominica attracting numerous tourists from other smaller Caribbean islands and few Europeans and North Americans, while St. Kitts and Nevis is primarily reliant on US tourists. In contrast, Antigua and Barbuda attracts mostly visitors from the United Kingdom (Figure 6).

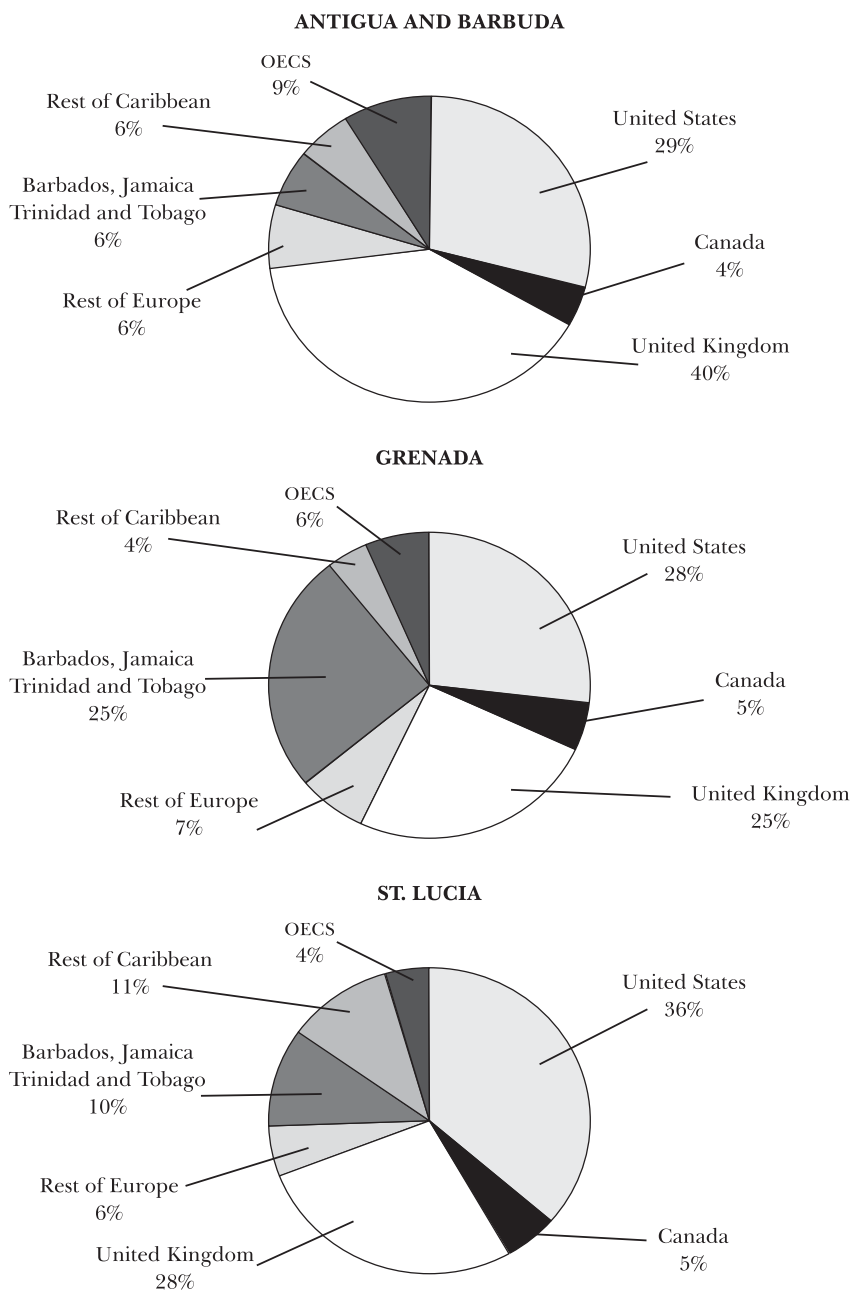
III. THE DEMAND FOR TOURISM: A LITERATURE REVIEW

The number of tourist arrivals, the number of nights spent by visitors, and tourism expenditure are the most widely-used measures of tourism demand.⁸ Gonzales and Moral (1995), modeling Spain's tourism demand, use tourism spending as the dependent variable, defined as the product of three factors: the number of tourists, the length of their stay and their daily average spending. Gonzales and Moral (1995), Cunha (2001), Tse (1999) and Lathiras and Siriopoulos (1998) all note that tourism spending is the most appropriate measure of tourism demand; simply using the number of tourist arrivals ignores the importance of duration and spending behavior. However, according to Crouch and Shaw (1992), almost 70% of the studies that estimate tourism demand functions have used the number of visitors as the dependent variable since data on tourism spending are less frequent and reliable (see Qui and Zhand, 1995; Morris et al., 1995; Kulendran, 1996; and Akis, 1998). Ledesma-Rodriquez and Navarro-Ibanez (2001) use the number of visitors lodged (housed overnight) in the destination country as the dependent variable in a panel study of the demand for tourism. Given the data limitations, this study will also use the number of stayover tourist arrivals as the dependent variable and assume that they are all lodged.

Tourism studies using panel data are rare (Mwase, 2008; Proenca and Soukiazis, 2005; Chase et al., 1998; Ledesma-Rodriguez et al., 2001). Most of the studies use time series data for only one country, where the problem of non-stationarity has

⁷ Cashin (2006) finds that the ECCU's main trading partners exhibit synchronized business cycles.

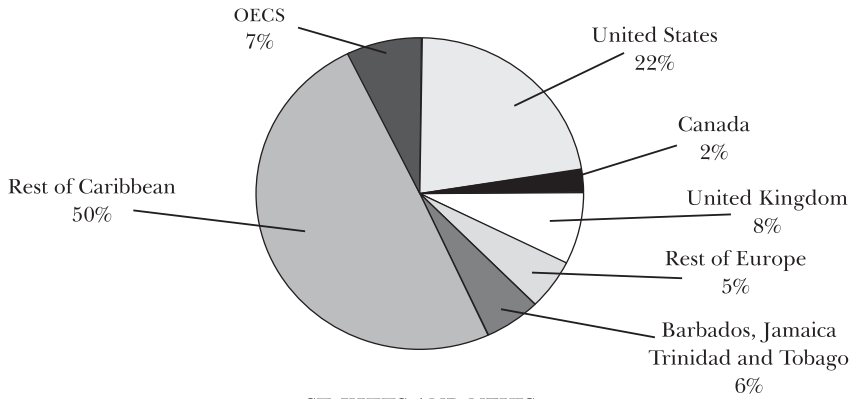
⁸ The review of the literature draws from Proenca and Soukiazis (2005).

FIGURE 6. ECCU: TOURISM ARRIVALS BY COUNTRY OF ORIGIN, PERCENT, 2004

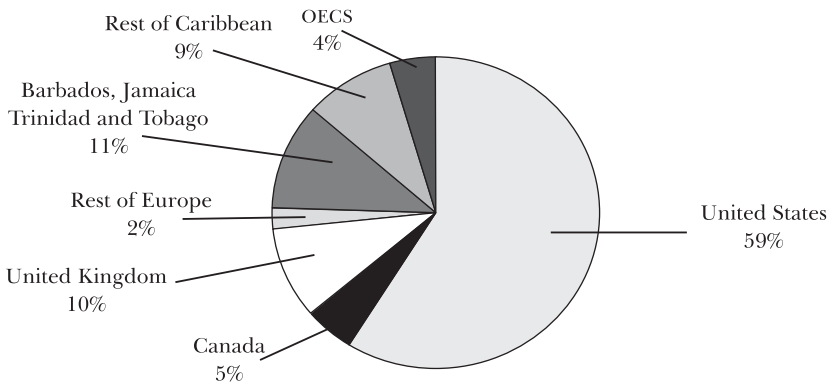
SOURCES: Caribbean Tourism Organization and Fund staff estimates.

(Sources of tourism vary considerably across the ECCU)

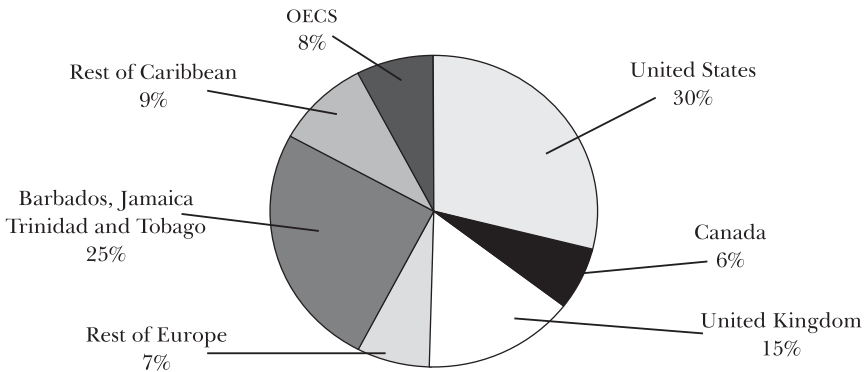
DOMINICA



ST. KITTS AND NEVIS



ST. VINCENT AND THE GRENADINES



often been detected. Thus, various techniques have been used from autoregressive integrated moving average and Holt-Winters univariate modeling (Kim, 1999), to two-stage and three-stage least-squares (Tse, 1999) and error-correction models (Kulendran and Wilson, 2000; Lathiras and Siriopoulos, 1998). While some studies have used the gravity model approach (e.g., Witt and Martin, 1989; Mwase, 2008), others point out that the gravity model approach lacks a firm theoretical foundation (Witt and Martin, 1989).

There are numerous factors that could affect tourism demand; and the specification varies according to the countries considered, the time period of study and the type of data (Crouch, 1994a). Most of the studies include variables related to economic factors (such as the income level in the source country, relative prices in the origin and destination countries) and random factors related to external shocks such as hurricanes and terrorists attacks. More specifically:

- *Income Factor.* Many studies use per capita income as the most appropriate indicator to measure the purchasing power of the source country. It is expected that tourism demand will depend positively on income. According to Witt and Witt (1992), tourism is a luxury good with an expected income elasticity of demand above unity. Typical results range between one and two for the income elasticity, however, some studies have found the income elasticity to be well above two, according to a review by Crouch (1995). *We will examine the importance of the income factor for the ECCU countries using a weighted average of real GDP per capita in the most important source countries (United States, United Kingdom, Canada, Trinidad and Tobago, Jamaica, and Barbados).*⁹
- *Price Factor.* The most frequent price considered is the relative price between the receiving and sending country, adjusted by the bilateral exchange rate (Kulendran and Wilson, 2000; Lathiras and Siriopoulos, 1998; Chadee and Mieczkowski, 1987; EIU, 1975), and relative prices between the receiving country and other competitors (Turner et al., 1998; Lathiras and Siriopoulos, 1998; Edwards, 1987).¹⁰ In both measures, it

⁹ Details of all the variables used are provided in the Appendix.

¹⁰ Ideally, data in the form of a tourist price index would be preferable

is expected that the higher the relative price level in the receiving country, the lower will be the demand for tourism. Price elasticities vary considerably across studies, and in many cases unexpected signs or insignificant values have been recorded (Crouch, 1994b). *We will examine the importance of price movements using competitor-based and customer-based indices of the real effective exchange rate. We also investigate whether oil price changes influence tourism demand, since they would clearly affect the cost of transportation.*

- *Tourism Shocks.* Dummy variables have been frequently introduced to account for the effect of external shocks that might have a transitory influence on tourism demand. Political instability and social conflict, terrorism, travel restrictions, oil crises, world fairs and sporting events are often included as dummy variables. *We include dummy variables for hurricanes, the September 11 terrorist attacks and the wars in Iraq in the early 1990s and 2003, and Afghanistan in 2001.*
- *Supply Factors.* Supply factors from the point of view of the host country could be important in attracting more tourists. However, the inclusion of supply factors is rare in estimating tourism demand. Proenca and Soukiazis (2005) consider two supply factors in estimating tourism inflows to Portugal (accommodation capacity and public investment as a ratio to GDP), but find that only accommodation capacity is important (elasticity of 1.3). *In this analysis we investigate two supply factors: foreign direct investment as a measure of accommodation capacity, and the number of airlines flying into a destination country.*

The log linear specification is most commonly used in estimating the tourism demand function. Witt and Witt (1995) in a review article concluded that 75% of the models considered used a log linear functional form, 18% a linear specification and the

(Martin and Witt, 1987). However, given data limitations we instead use consumer price indices. The discrepancy is not expected to be large since Martin and Witt (1987) found that the differential explanatory power of an estimated tourists' cost of living index is not sufficiently large with respect to a simple consumer price index to justify the additional effort required to collect the former data.

remaining are probit-logit models or semi-log specifications. The straightforward interpretation of the results is the main reason for the popularity of the log-linear form (Kulendran, 1996), which we also follow in this analysis.

IV. DATA AND MODEL SPECIFICATION

A panel data approach is used to estimate the demand for tourism in the ECCU. Annual data for the period 1979–2005 for the six Fund-member ECCU countries are used. We choose annual data so as to avoid seasonality problems (Proenca and Soukiazis, 2005), and due to limitations on the availability of high-frequency data. Throughout the analysis total stayover tourism arrivals are used and no distinction is made between business and leisure tourism. Given that most variables used exhibit unit roots, we follow the DOLS procedure of Stock and Watson (1993), which allows for variables integrated of alternative orders and tackles the problem of simultaneity amongst the regressors.¹¹ The DOLS approach adds leads and lags of first differences of right-hand side variables to the set of regressors in order to remove the correlation of the residuals with the stationary component of the unit root processes of the explanatory variables. We employ one lead and lag, but we also explore robustness to more leads and lags.

1. Unit Root Tests

In order to test the integration properties of the series considered we perform unit root tests. Using the Dickey-Fuller (DF) tests of Dickey and Fuller (1979, 1981) and the non-parametric Phillips-Perron (PP) tests of Phillips (1987), Phillips and Perron (1988) and Perron (1988) we find that most variables considered exhibit unit roots; exceptions include competitor-based real effective exchange rate (REER) which is $I(0)$. Information on the definition of the variables is provided below and in the Appendix.

¹¹ Based on Monte Carlo evidence, Stock and Watson (1993) show that DOLS is more favourable, particularly in small samples, compared to a number of alternative estimators of long run parameters, including those proposed by Engle and Granger (1987), Johansen (1988) and Phillips and Hansen (1990), as noted in Masih and Masih (1996).

TABLE 4. PANEL UNIT ROOT TESTS

	<i>Augmented Dickey-Fuller test</i>		<i>Phillips-Perron test</i>	
	<i>Level</i>	<i>First difference</i>	<i>Level</i>	<i>First difference</i>
Visitor arrivals	5.4	41.9 ^a	1.8	54.7 ^a
Customer-based REER	15.9	31.9 ^a	9.8	47.7 ^a
Competitor-based REER	26.1 ^b	66.7 ^a	21.8 ^b	61.5 ^a
Oil	1.6	17.9	0.6	49.6 ^a
FDI	12.7	62.4 ^a	17.2	138.0 ^a

SOURCE: Fund staff calculations.

NOTES: The ^a (^b) indicates rejection of the null hypothesis of a unit root at the 1 (5)% significance level. The respective lag lengths were selected based on the Akaike information criteria and the Schwartz criteria.

2. Estimation: Stock-Watson Dynamic OLS

Expanding the specification of Proenca and Soukiazis (2005), the following demand equation is estimated:

$$\begin{aligned} \ln TD_{it} = & \beta_{0i} + \beta_1 \ln y_{it} + \beta_2 \ln p_{it} + \beta_3 \ln p_{it}^* + \beta_4 \ln FDI_{it} + \beta_5 \ln OIL_t + \\ & \beta_6 \ln(airlines)_{it} + \sum_{j=1}^n \beta_{6+j} d_{ijt} + \sum_{k=-m_1}^{M_1} \beta_k \Delta \ln(y_{it-k}) + \sum_{k=-m_2}^{M_2} \beta_k \Delta \ln(p_{it-k}) + \\ & \sum_{k=-m_3}^{M_3} \beta_k \Delta \ln(p_{it-k}^*) + \sum_{k=-m_4}^{M_4} \beta_k \Delta \ln(FDI_{it-k}) + \sum_{k=-m_5}^{M_5} \beta_k \Delta \ln(OIL_{it-k}) + v_{it} \end{aligned}$$

with $t=1, \dots, 27$ (1979-2005) and $i=1, \dots, 6$, and M 's represent the number of lead and lags; where:

- TD_{it} is the number of tourist arrivals in island i at time t ;
- y_{it} is the weighted average of the real GDP per capita of the source countries related to country i at time t , with weight being the tourist arrivals shares from each country;
- p_{it}^* and p_{it} are the customer-based and competitor-based real effective exchange rates, respectively;
- FDI_{it} is the foreign direct investment inflow to country i at time t (expressed in USD terms);
- OIL_t is the average oil price at time t ;
- $airlines_{it}$ is the number of airlines serving destination i at time t ;

- d_{ijt} is a dummy variable to capture the wars in Iraq in the early 1990s and 2003, and Afghanistan in 2001; the September 11, 2001 terrorist attack in the United States; and category 3 and above hurricanes in each country;
- Δ denotes the first-difference operator;
- β_{0i} is country fixed effect;
- v_i is an error term.

Additional information on the derivation and definition of the data is provided in the Appendix.

V. MODEL ESTIMATION

The estimation results are shown in Table 5.

TABLE 5. DETERMINANTS OF TOURISM ARRIVALS IN THE ECCU^a

	<i>Preferred specification</i> ^b		<i>Other specifications</i>	
	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i> ^b	<i>Coefficient</i>
Per capita GDP of source countries	1.50 ^c	1.58 ^c	0.95 ^d	1.25 ^c
Customer-based real effective exchange rate	-1.27 ^c	-1.12 ^c	-0.31	-0.01
Competitor-based real effective exchange rate	-0.83 ^c	-1.09 ^c	-1.41 ^c	-0.86 ^c
FDI	0.08 ^c	0.08 ^c	0.06 ^d	-0.03
Oil		-0.08	0.01	
Wars		-0.13 ^d	-0.09	
Hurricanes	-0.13 ^c	-0.12 ^c	-0.08	-0.03
Sep. 11 terrorist attack	-0.13 ^c	0.03	-0.01	-0.10 ^c
Number of airlines				0.08 ^d
Constant	6.18	6.25	9.80	3.15
R-square	0.99	0.94	0.96	0.99
N ² observations	125	125	125	87

SOURCE: Fund staff calculations.

NOTES: ^a Specifications (if not stated otherwise) include one year leads and lags of the difference of the regressors to correct for unit roots. ^b including 2 year lags, which were not found to be statistically significant. ^c (^d) implies significance at the 1 (5)% significance level.

- *As expected we find that the income elasticity is above one (1.5), suggesting that tourism is a luxury good.* This finding indicates that tourism performance in the ECCU is very dependent on the economic conditions in its main trading partners. When recessions affect the source countries, the impact on tourism arrivals and the economy in general could be detrimental, especially taking into account: *i)* that the ECCU's main trading partners exhibit synchronized business cycles; and *ii)* the ECCU region is heavily dependent on tourism, particularly following the erosion of EU trade preferences for agricultural exports (IMF, 2008a).
- *FDI developments and the number of airlines servicing a destination are important determinants of tourism arrivals.* We find that FDI has a significant impact on tourism arrivals. This is an expected finding, since FDI-related projects (e.g., hotels, infrastructure improvements) should attract tourists. As expected, we also find that the number of airlines serving a destination affects tourism potential. As more airlines fly to a destination, tourism arrivals are expected to rise for two reasons: *i)* the destination becomes more easily accessible; and *ii)* public awareness increases for a destination as more airlines undertake expenditure on advertising campaigns.
- *We also find that demand for tourism is affected by price considerations.* For example, deterioration in the ECCU's competitiveness vis-à-vis its tourism customers or competitors has a large negative impact on tourism arrivals, indicating that tourists compare prices among different destinations when making their choices (e.g., visiting Barbados instead of the ECCU, or comparing the ECCU with destinations within their own country). Surprisingly, we find that oil prices, as a proxy for transportation cost, has only a weak impact on tourism flows to the ECCU.
- *Tourism shocks such as hurricanes and terrorist attacks have a negative impact on tourism.* We find that hurricanes, wars, and the September 11 terrorist attacks could have affected tourism flows.

VI. CONCLUSIONS AND POLICY IMPLICATIONS

Tourism is clearly an important industry for the ECCU, and its importance is only expected to intensify in the future given the erosion of EU preferential trade agreements and the ongoing tourism-related construction boom. Given the prominence of the sector the aim of the paper was to estimate the determinants of the demand for tourism in the ECCU. The key determinants identified are largely consistent with the tourism demand literature surveyed in Crouch (1994a, 1994b).

As expected, we find that source countries' income elasticity of tourism demand is above unity, indicating that tourism is a luxury good. This finding indicates that the tourism sector and the ECCU economy could be particularly vulnerable in the event of an economic downturn in its main tourism-source countries. This vulnerability is enhanced by the high degree of synchronization of trading partners' business cycles, the ECCU's reliance on only a few source countries for the bulk of its tourism (notably the United States, United Kingdom, Canada, and some Caribbean islands), and the lack of diversification in the tourism-based ECCU economies. This finding is particularly topical given the increasingly weak near-term global and North American economic outlook (see IMF 2008a, 2008b, 2008c). Thus, diversifying tourism originating markets, as well as the tourism product (such as, promoting the destination for eco-tourism or honeymoon tourism) could help reduce vulnerability to shocks emanating from the source markets themselves (Mwase, 2008).

We also find that price competitiveness is important in tourists' choices. Unlike popular opinion that the ECCU *targets* niche tourism, and as such is not vulnerable to competition from cheaper destinations, we find that competitiveness is of paramount importance in attracting tourism flows. Both measures of competitiveness indicate that enhancing price competitiveness attracts more tourism inflows. As such, the ECCU could ensure the longterm viability of its tourism industry by implementing measures designed to enhance the industry's price and non-price competitiveness. In that respect, labor reforms, including liberalization of labor markets and productivity-enhancing policies, improvements in the investment climate, and the establishment of regional regulatory frameworks for electricity and telecommunications could lower

some of the price pressures (see World Bank, 2005; and IMF, 2008a).¹² In addition, fiscal consolidation, particularly expenditure restraint, could help alleviate inflationary pressures. Investments in human capital, particularly in the hospitality sector, could also improve non-price competitiveness, facilitate greater quality of the tourism product and attract additional tourist inflows.

We also find that tourism shocks such as hurricanes, wars and the terrorist attack of 2001 also affect tourism demand. Thus enhancing disaster mitigation policies could also be important in facilitating tourism growth (see Rasmussen, 2006).

Regarding supply-side factors, we find that FDI and the number of airlines servicing a destination positively affect tourism flows. These findings call for: *i*) an improvement in the cost of doing business and the investment climate; and *ii*) increased focus on strengthening the regulatory, administrative, and legal impediments to private business activity.

Appendix

Data Sources and Definitions

The data sources and the construction of the variables are as follows:

- *Tourism stayover arrivals* are obtained from the Caribbean Tourism Organization and the Eastern Caribbean Central Bank.
- Data on *per capita real GDP for source countries* were obtained from the International Monetary Fund's *World Economic Outlook* database. The variable used was the weighted average of the real per capita GDP in the countries of origin, where the weights were based on the share of stayover arrivals from the United States, United Kingdom, Canada, Barbados, Jamaica and Trinidad and Tobago for 2004.
- The *oil price index* is the simple average of Brent, Dubai, and

¹² Randall (2006) also indicates that the ECCU has high utility rates.

WTI oil price indices, and is obtained from the International Monetary Fund's *Global Economic Environment* database.

- *Foreign direct investment (FDI)* data are obtained from the International Monetary Fund's *International Financial Statistics* database.
- *Competitor-based REER* are calculated as weighted average of consumer price index in a common currency. Competitor weights (in parentheses): The Bahamas (23.4%), Barbados (8.0%), Dominican Republic (43.5%), Jamaica (19.4%), and Trinidad and Tobago (5.7%). Weights represent the share of tourism arrivals to the Caribbean in 2003.
- *Customer-based REER* are calculated as weighted average of consumer price index in a common currency. Customer weights: Antigua and Barbuda (Canada, UK and US); Dominica (France, UK, US); Grenada (Trinidad and Tobago, UK, US); St. Kitts and Nevis (Canada, UK, US); St. Lucia (Canada, UK, US); St. Vincent and the Grenadines (Trinidad and Tobago, UK, US). Weights are based on the proportion of tourists arriving from each country in 2001.
- The external shock dummy variables capture: the *wars* in Iraq in the early 1990s and 2003, and Afghanistan in 2001; and the *terrorist attacks* on the United States of September 11, 2001; and the *incidence of hurricanes* (data obtained from <http://stormcarib.com/climatology>).
- Data on the *number of airlines* were obtained from: [http://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=260&DB_Short_Name=Air %20Carriers](http://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=260&DB_Short_Name=Air%20Carriers).

REFERENCES

- Akis, S. (1998), "A Compact Econometric Model of Tourism Demand for Turkey," *Tourism Management*, vol. 19, n^o 1, pp. 99–102.
- Caribbean Tourism Organization (2000), "St. Lucia: Economic Impact of Visitor Expenditure—1998," *Tourism Impact Project*

- Draft Report* (August 25), unpublished; Caribbean Tourism Organization, St. Michael.
- Caribbean Tourism Organization (2004), *Market Statistics*, Available at: <http://www.onecaribbean.org/statistics/marketstats/>.
- Cashin, P. (2006), "Key Features of Caribbean Business Cycles," in R. Sahay, D. O. Robinson and P. Cashin (eds.), *The Caribbean: From Vulnerability to Sustained Growth*, International Monetary Fund, Washington, D. C., pp. 83–121.
- Chadee, D., and Z. Mieczkowski (1987), "An Empirical Analysis of the Effects of the Exchange Rate on Canadian Tourism," *Journal of Travel Research*, vol. 26, n° 1, pp.13–17.
- Chai, J., and R. Goyal (2006), "Tax Concessions and Foreign Direct Investment in the Eastern Caribbean Currency Union," in R. Sahay, D. O. Robinson and P. Cashin (eds.), *The Caribbean: From Vulnerability to Sustained Growth*, International Monetary Fund, Washington, D. C., pp. 258–82.
- Chai, J., and R. Goyal (2008), *Tax Concessions and Foreign Direct Investment in the Eastern Caribbean Currency Union*, International Monetary Fund, Washington, D. C. (IMF Working Paper, n° 08/257).
- Chase, L. C., D. R. Lee and W. D. Schulze (1998), "Ecotourism Demand and Differential Pricing of National Park Access in Costa Rica," *Land Economics*, vol. 74, n° 4, pp. 466–82.
- Crouch, G. (1994a), "The Study of International Tourism Demand: A Survey of Practice," *Journal of Travel Research*, vol. 33, n° 4, pp. 41–55.
- Crouch, G. (1994b), "The Study of International Tourism Demand: A Review of Findings," *Journal of Travel Research*, vol. 33, n° 1, pp. 12–23.
- Crouch, G. (1995), "A Meta-Analysis of Tourism Demand," *Annals of Tourism Research*, vol. 22, n° 1, pp. 113–18.
- Crouch, G., and R. Shaw (1992), "International Tourism Demand: A Meta-Analytical Integration of Research Findings," in P. Johnson and B. Thomas (eds.), *Choice and Demand in Tourism*, Cassell, London, pp. 175–207.
- Cunha, L. (2001), "Introducao ao Turismo," cited in S. A. Proença and E. Soukiazis (2005), *Demand for Tourism in Portugal: A Panel Data Approach*, Centro de Estudos da Uniao Européia, Coimbra (Discussion Paper, n° 29).
- Economic Intelligence Unit (EIU, 1975), "Currency Changes,

- Exchange Rates, and Their Effects on Tourism,” *International Tourism Quarterly*, Special Article, vol. 18, n° 4, pp. 34–45.
- Edwards, A. (1987), *Choosing Holiday Destinations: The Impact of Exchange Rates and Inflation*, The Economist Intelligence Unit Ltd, London (Special Report, n° 1109).
- Engle, R. F., and C. W. J. Granger (1987), “Co-Integration and Error Correction: Representation, Estimation, and Testing,” *Econometrica*, vol. 55, n° 2, pp. 251–76.
- Faria, A. (2005), “The Determinants of Tourism Demand in The Bahamas,” in *The Bahamas: Selected Issues and Statistical Appendix*, International Monetary Fund, Washington, D. C. (IMF Country Report, n° 05/224, pp. 6–16).
- Gonzales, P., and P. Moral (1995), “An Analysis of the International Tourism Demand in Spain,” *International Journal of Forecasting*, vol. 11, pp. 233–51.
- International Monetary Fund (2008a), *Eastern Caribbean Currency Union: 2007 Discussion on Common Policies of Member Countries - Staff Report*, International Monetary Fund, Washington, D. C. (IMF Country Report, n° 08/94).
- International Monetary Fund (2008b), *World Economic Outlook: Housing and the Business Cycle*, International Monetary Fund, Washington, D. C.
- International Monetary Fund (2008c), *Regional Economic Outlook: Western Hemisphere*, International Monetary Fund, Washington, D. C.
- Johansen, S. (1988), “Statistical Analysis of Cointegration Vectors,” *Journal of Economic Dynamics and Control*, vol. 12, pp. 231–254.
- Kim, J. (1999), “Forecasting Monthly Tourist Departures From Australia,” *Tourism Economics*, vol. 5, n° 3, pp. 277–91.
- Kulendran, N. (1996), “Modeling Quarterly Tourist Flows to Australia Using Cointegration Analysis,” *Tourist Economics*, vol. 2, n° 3, pp. 203–22.
- Kulendran, N., and K. Wilson (2000), “Modeling Business Travel,” *Tourism Economics*, vol. 6, n° 1, pp. 47–59.
- Lathiras, P., and C. Siriopoulos (1998), “The Demand for Tourism to Greece: A Cointegration Approach,” *Tourism Economics*, vol. 4, n° 2, pp. 171–85.
- Ledesma-Rodriquez, F. J., and M. Navarro-Ibanez (2001), “Panel Data and Tourism: A Case Study of Tenerife,” *Tourism Economics*, vol. 7, n° 1, pp. 75–88.

- Martin, C. A., and S. F. Witt (1987), "Tourism Demand Forecasting Models: Choice of Appropriate Variable to Represent Tourists' Cost of Living," *Tourism Management*, vol. 8, n° 3, pp. 223–45.
- Masih, A. M., and R. Masih (1996), "Empirical Tests to Discern the Dynamic Causal Chain in Macroeconomic Activity: New Evidence From Thailand and Malaysia Based on a Multivariate Cointegration/Vector Error-Correction Modeling Approach," *Journal of Policy Modeling*, vol. 18, pp. 531–60.
- Morris, A., K. Wilson and S. Bakalis (1995), "Modeling Tourism Flows From Europe to Australia," *Tourism Economics*, vol. 1, n° 2, pp. 147–67.
- Mwase, N. (2008), "Tourism Demand in Small-Island Economies," in *2007 ECCU Selected Issues*, International Monetary Fund, Washington, D. C. (IMF Country Report, n° 08/96, pp. 55–67).
- Phillips, P. C. B., and B. Hansen (1990), "Statistical Inference in Instrumental Variables Regression With I(1) Processes," *Review of Economic Studies*, vol. 57, pp. 99–125.
- Proenca, S. A., and E. Soukiazis (2005), *Demand for Tourism in Portugal: A Panel Data Approach*, Centro de Estudos da Uniao Européia, Coimbra (Discussion Paper, n° 29).
- Qui, H., and J. Zhang (1995), "Determinants of Tourist Arrivals and Expenditures in Canada," *Journal of Travel Research*, vol. 34, n° 2, pp. 43–49.
- Randall, R. (2006), "Eastern Caribbean Tourism: Developments and Outlook," in R. Sahay, D. O. Robinson and P. Cashin (eds.), *The Caribbean: From Vulnerability to Sustained Growth*, International Monetary Fund, Washington, D. C., pp. 285–306.
- Rasmussen, T. (2006), "Natural Disasters and Their Macroeconomic Implications," in R. Sahay, D. O. Robinson and P. Cashin (eds.), *The Caribbean: From Vulnerability to Sustained Growth*, International Monetary Fund, Washington, D. C., pp. 181–205.
- Romeu, R. (2008), *Vacation Over: Implications for the Caribbean of Opening U.S.-Cuba Tourism*, International Monetary Fund, Washington, D. C. (IMF Working Paper, n° 08/162).
- Stock, J., and M. W. Watson (1993), "A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems," *Econometrica*, vol. 61, n° 4, pp. 783–820.

- Tse, R. (1999), "A Simultaneous Model of Tourism Flow, Spending and Receipts," *Tourism Economics*, vol. 4, n^o 3, pp. 233–40.
- Turner, L., Y. Reisinger, and S. Witt (1998), "Tourism Demand Analysis Using Structural Equations Modeling," *Tourism Economics*, vol. 4, n^o 4, pp. 301–23.
- Witt, S. F., and C. A. Martin (1989), "Demand Forecasting in Tourism and Recreation," *Progress in Tourism, Recreation, and Hospitality Management*, vol. 1, pp. 4–32.
- Witt, S., and C. Witt (1992), *Modeling and Forecasting Demand in Tourism*, Academic Press Limited.
- Witt, S., and C. Witt (1995), "Forecasting Tourism Demand: A Review of Empirical Research," *International Journal of Forecasting*, vol. 11, pp. 447–75.
- World Bank (2005), *A Time to Choose: Caribbean Development in the 21st Century*, World Bank, Washington, D. C.

Trevor Campbell

A look at imported construction materials by Barbados

1. INTRODUCTION

Over the years, construction activity has played a significant role in the development of Barbados, especially with the generation of output, creation of employment and the redistribution of income. In a small economy such as Barbados, the construction sector requires significant volumes of imported construction materials. Although some of these materials will help to boost foreign exchange receipts, for example, when purchased for hotel construction, most of these construction materials are for domestic use, which suggest that the importation of such materials will put pressure on the external current account of the balance of payments (BOP) and the foreign reserves. On the other hand, construction materials, despite putting pressure on the external current account of the BOP and the foreign reserves, provide Government with higher revenue from import duties and value-added taxes (VAT), which will boost the fiscal position of the country.

Paper prepared by T. Campbell, former Senior Economist of the Central Bank of Barbados. All mailed correspondence should be sent to Gazettes Terrace, St. Michael, BB 12034, Barbados, West Indies. Email address: {tdacampbell@hotmail.com}.

Construction materials are classified as intermediate goods since they are used in the production of final goods. They were the second largest component of intermediate imports between 1970 and 1988 and became the single largest component from 1989 until 2000 before being overtaken by fuel imports from 2001 to the present period. Construction materials comprise primarily wood products, fibre-board, cement, iron and steel, structural parts and wood and lumber (see Annual Statistical Digest, Central Bank of Barbados).

The remainder of this paper is organized as follows: section 2 will look at selected studies on imported construction materials while section 3 will examine the trends of the imports of construction materials by Barbados. Section 4 will attempt to identify variables that impact on imported construction materials in the long and short run. Section 5 looks at policy implications as far as the results of the study are concerned and this will be followed by concluding remarks.

2. SELECTED STUDIES ON IMPORTED CONSTRUCTION MATERIALS

As we mentioned earlier in this paper, construction materials are disaggregated into iron and steel, cement, wood products, wood and lumber, fibre-board and structural parts. A study by Hu and Ping (2005) referred to China as the biggest steel producer with an annual steel output exceeding 100 million tons, a position held until 1996. In 2003, China's annual steel consumption reached 215 million tons. As a large proportion of this consumption consisted of high quality steel and the domestic producers had great difficulty to meet the requirement, the shortfall had to be met by imports. The paper also showed that China's steel imports were determined by its economic activities and the real exchange rate.

The argument advanced by Cook (2002) was that since US producers did not provide enough portland cement and clinker to meet US demands, imported portland cement and clinker supply a share of the US' needs. The unusually low price of portland cement imported from Mexico, primarily from CEMEX, the largest company in Mexico, allegedly allowed CEMEX to obtain a disproportionate share of the US market. US producers accused

CEMEX of selling its portland cement and clinker below market value in a predatory business manner. The loss of market share prompted the eight most southern US states (from California to Florida) that produce the above-mentioned products to petition the US Government for anti-dumping relief under the Tariff Act of 1930.

Eastin et al. (2002) felt that since 1955, Japan had seen its self-sufficiency in wood products decline from approximately 95% to below 20% in 2000. They held the view that while there were a variety of factors that contributed to this decline, the net effect was that domestic forest products manufacturers had lost tremendous market share to imported wood products. Similarly, the competitiveness of the forestry sector had declined significantly relative to imported softwood logs.

Luppold (1988) reported that in 1986, 72% of primary hardwood products imported by the US originated from four countries, namely Indonesia, Taiwan, Canada and Brazil. Hardwood plywood was the major imported primary product accounting for 63% on a value basis and a similar percentage on a cubic volume basis. He added that hardwood plywood and log imports decreased markedly through the early 1970s and early 1980s, but rebounded partially with the expanding economy of the mid-1980s.

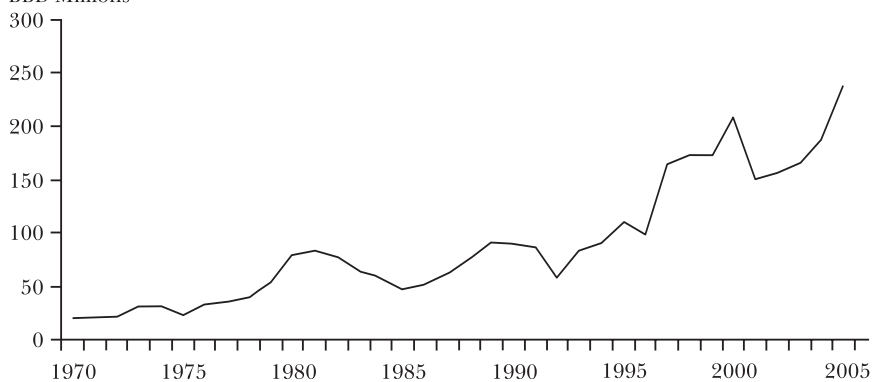
The article by Chudnoff (1980) stated that tropical timbers were now an established part of the US marketplace. Since the early 1960s, US tropical lumber imports had increased fourfold, and plywood imports (primarily from Asian sources) soared fortyfold, to the point where plywood imports equalled domestic production.

3. TRENDS IN IMPORTED CONSTRUCTION MATERIALS BY BARBADOS

Between 1970 and 1981, imports of construction materials moved from around BBD 20 million (or 12% of intermediate imports) to BBD 78.5 million (18% of intermediate imports), registering one decline, in the year 1975 as shown in Figure 1, on account of a sluggish domestic economy. The next contraction occurred in the year 1982 when construction materials were down by BBD 6

million, the reason being that construction activity suffered from the unavailability of mortgage and bridging loans (see Annual Report, Central Bank of Barbados). A further decrease occurred in 1983 as mortgage finance remained scarce and some major projects were completed. Although construction output improved in 1984, however, imports of construction materials fell as a local cement company began to supply local needs.

FIGURE 1. IMPORTED CONSTRUCTION MATERIALS BY BARBADOS, 1970-2005
BBD Millions



SOURCE: Central Bank of Barbados.

Two years later, construction materials expanded with higher construction activity, the result of road improvements, lower mortgage rates and tax concessions. (Annual Report, Central Bank of Barbados). The road building activity in addition to rising private sector housing demand, an increase in single units built by the National Housing Corporation (a Government entity) and major emphasis on the Adams, Barrow and Cummins (ABC) Highway resulted in a further growth in the imports of construction materials, which continued up until 1989. However in the next year, real output in Barbados contracted by 3.1%, at the same time that the country's major trading partners entered into a recession. The decline in economic activity coupled with the imposition of credit controls in the latter part of the previous year was reflected in the performance of imported construction materials which decreased by BBD 1 million. The foreign exchange difficulties facing the Barbados economy deepened during 1991 as output in the export sectors remained depressed relative to activity in the foreign exchange using sectors, the fiscal deficit widened

substantially and debt service payments were growing. These developments impacted negatively on the foreign reserves which reached its lowest level in the country's history.

In order to correct the foreign exchange deficiency, the Government of Barbados entered into an eighteen-month stabilization programme with the support of International Monetary Fund (IMF). The programme sought to reduce imports in the short term through reductions in the fiscal deficit and private sector credit (see Campbell, 1993; and Annual Report, Central Bank of Barbados). The fiscal measures included, among other things, a decrease in the wage bill of all public sector entities and a cut-back on spending on capital projects, while global credit limits were placed on commercial banks and the ceiling on the average lending rate was removed. House-building was hard-hit by the depressed economic conditions and a tight credit stance while Government halted most of its major projects as part of the stabilization programme agreement with the IMF. It was therefore not surprising that imported construction materials contracted sharply by BBD 32 million to BBD 58 million.

In 1993, the Barbados economy began its recovery from the international recession to record growth of one percent. This year witnessed the resumption of Government's capital works programme and tourism related activities. Consequently, imported construction materials expanded by almost BBD 30 million to BBD 84 million. These imports reached the BBD 100 million mark in 1995 and by the year 2000, boosted by private sector building activity, the Grantley Adams' Airport Expansion project, the South Coast Sewerage Project and the Education Sector Enhancement Programme (EDUTECH), surpassed the BBD 200 million mark to total BBD 208 million.

In 2001, imported construction materials fell with the decrease in construction activity, as several projects had either been completed or were winding down. However, this outturn was reversed in the following year as new projects came on stream in addition to the continuation of existing projects. By end-2005, construction materials purchased from abroad totalled BBD 239.1 million (or 22% of intermediate imports).

Iron and steel and wood and lumber accounted for the highest shares of construction materials, approximately 26%, respectively, while wood products accounted for some 20%, cement, 15%,

structural parts, 10% and fibre-board, 3%. The major countries that supplied construction materials to Barbados were US, UK, Canada, Guyana and Trinidad and Tobago.

4. POSSIBLE DETERMINANTS OF IMPORTED CONSTRUCTION MATERIALS

In this paper, we have identified the following variables as possible determinants of imported construction materials. These are real per capita income, the rate of interest, commercial bank credit, the real exchange rate and the rate of unemployment. As real per capita income grows, Barbadians should have more spending power and should be in a better position to purchase additional construction materials from abroad. With a rising rate of interest, the cost of borrowing becomes higher and construction materials should contract. If more commercial bank credit becomes available to Barbadians, this should result in increased purchases in construction materials from overseas.

Following Helmers (1990), we define the real exchange rate as the product of the nominal exchange rate and foreign price index divided by the domestic price index. In Barbados, the nominal exchange rate is fixed, so that if the domestic price index rises at a faster rate than the foreign price index (which is equivalent to a decline in the real exchange rate), this should make imports more attractive and imported construction materials should grow. With a higher unemployment rate, one should expect reduced imports of construction materials since it should be more difficult to buy such products. Positive relationships are therefore expected between construction materials and real per capita income and commercial bank credit, while inverse relationships should occur between the dependent variable and the rate of interest, the real exchange rate and the unemployment rate.

4.1 Model specification

Our model is specified as follows:

$$(1) \quad LCM = f(LY, LR, LCRED, LRER, LUN),$$

+ - + - -

where CM represents the dependent variable, imported construction materials, Y is real per capita income, R is the rate of interest, CRED is commercial bank credit, RER is the real exchange rate and UN is the unemployment rate. The signs under each explanatory variable represent the type of relationship anticipated with the dependent variable. The ordinary least squares (OLS) technique has been used and the model has been estimated in logarithms in order that elasticities may be inferred.

4.2. Data and variables

The model has been estimated using annual data from 1970 to 2005. Real per capita income is calculated by dividing real GDP of Barbados by Barbados' population. The prime lending rate is being used as a measure for the rate of interest while the consumer price index is being used as a proxy for the domestic price index and the consumer price index of the US is being used as a proxy for the foreign price index. Data were obtained from the Annual Statistical Digest of the Central Bank of Barbados and the International Financial Statistics Yearbook of the International Monetary Fund (IMF). The year 1990 is being used as the base year and the econometric software package EVIEWS 5.0 has been used to perform the estimations.

4.3 Results

Having used the Johansen (1988) procedure, we have discovered that there exists only one cointegrating relationship, therefore this allows for the use of the Engle-Granger two-step procedure. In this procedure, coefficients from the cointegrating regression are estimated and the residuals from this estimate are taken and used in their lagged form in a Vector Autoregression (VAR) of the changes of the explanatory and dependent variables. Since this method is more powerful in small samples, it is preferred to the Johansen (1988) maximum likelihood method (see Inder, 1993, pp. 53-68).

The order of integration for each series has been determined by the use of the Augmented Dickey-Fuller (ADF) test, which is a

test of the null hypothesis of non-stationarity or a unit root test (integrated of order d , $I(d)$, and where $d \geq 1$ against the alternative hypothesis of stationarity [or integration of order zero, $I(0)$]. The ADF tests of the differences of each variable indicate that all of the variables are integrated of the first order, that is, $I(1)$. The long run results are shown in equation 2.

$$(2) \quad LCM = -0.157 + 0.149LY - 0.375LR + 0.65LCRED - \\ - 0.11LRER - 0.55LUN$$

$R^2 = 0.96$; adjusted $R^2 = 0.95$; Durbin-Watson (DW) = 1.54; ADF = -4.536 (-3.54); Phillips-Perron (PP) = -4.538 (-3.54).

Equation 2, which is shown above, is the Engle-Granger (EG) cointegrating regression. However, on account of the small sample size, the bias in the EG estimator of the long-run relationship may be significant, and as a result, the standard errors and t -values of the estimated regression coefficients are not reported, as these statistics are not valid (see Banerjee et al., 1986, pp. 253-278).

The results show that in the long run, all of the variables are cointegrated since the ADF and PP tests reject the null hypothesis of stationarity at the 5% level of significance. The Durbin-Watson (DW) test indicates no first order serial correlation.

All of the explanatory variables have the correct sign as was earlier anticipated. A one percent rise in real per capita income will increase imported construction materials by 0.14% while a similar increase in the real exchange rate will decrease the explanatory variable by 0.11%. Both of these relationships, as you can observe, are fairly weak ones. The strongest relationship occurs in the case of commercial bank credit where a one percent increase in this variable will boost imported construction materials by 0.65%. Further, the data show that construction materials will fall by 0.37% if the rate of interest is raised by one percent while a one percent increase in the unemployment rate will cause a 0.55% contraction in construction materials.

Let US now look at the short-run determinants of imported construction materials. The error correction model (ECM) is used to address this issue. An ECM nests the long-run behaviour and short-run dynamics of the model. According to Engle and Granger (1987), an ECM of variables can be formulated as long as

those variables are cointegrated. Further, this study utilizes the Hendry General to Specific Methodology, which begins with an overparameterised model and using a stepwise process, eliminates all insignificant variables until a parsimonious representation of the model is obtained. Both current and lagged variables were taken into consideration but our initial model was restricted to two lags on account of the small sample size. The results are now shown in equation 3, which is the error correction equation.

$$\begin{aligned}
 \Delta LCM = & -0.07 + 1.38 \Delta LY - 2.40 \Delta LY_{-1} - 0.41 \Delta LR + \\
 & (-1.82) \quad (3.85) \quad (-3.90) \quad (1.98) \\
 (3) \quad & + 1.82 \Delta CRED - 1.79 \Delta LRER - 0.99 \Delta LRER_1 - \\
 & (4.51) \quad (-3.32) \quad (-2.65) \\
 & - 0.49 \Delta LUN - 0.65 \Delta LUN_{-1} - 0.84 U_{t-1} \\
 & (-2.24) \quad (-2.88) \quad (-4.79)
 \end{aligned}$$

$R^2 = 0.77$; adjusted $R^2 = 0.68$; DW = 2.03; B-G (prob = 0.67); NORM (prob = 0.11); ADF = -5.70 (-3.56); PP = -20.9 (-3.55); ARCH (prob = 0.76).

The numbers in parenthesis in equation 3 are the t statistics and U_{t-1} is the error correction term lagged one period. All other variables remain unchanged as before. Δ is the first difference operator, B-G is the Breusch-Godfrey Lagrange Multiplier test for serial correlation, NORM is the Jarque-Bera test for normality based on a test of kurtosis and skewedness of the residuals, while ARCH is Engle's k^{th} order autoregressive conditional heteroscedasticity test statistic.

The results show that the model is adequately specified and does not violate the classical assumptions of normality, homoscedasticity and serial dependence. Both the R^2 and Adjusted R^2 values suggest that the model is a good fit.

All of the variables help to explain the movements of imported construction materials in the short term and are significant at the 5% level. Imports of construction materials are not only impacted upon by current real per capita income but by this independent variable lagged in the previous year and this relationship with the endogenous variable is a strong one. It can also be observed that, over a two-year period, a one percent rise in the real exchange rate will reduce imports of construction materials by an even greater margin, in this case, by 2.75%, while over the same period,

a one percent increase in the unemployment rate will bring down imported construction materials by an amount in excess of one percent, namely 1.14%. The relationship between commercial bank credit and imported construction materials is even more robust in the short run than over the long term, since, in the short term, a one percent expansion in this type of credit will boost these products almost two-fold, that is, by 1.82%. As expected, increases in the rate of interest will be accompanied by reduced imports of construction materials in the short term, with a greater impact occurring in the short run than in the long term.

The error correction term is negative and significant as required and its coefficient of 0.84 indicates a swift speed of adjustment to its new long-run equilibrium.

5. POLICY IMPLICATIONS BASED ON THE RESULTS OF THE STUDY

What can we say about policy as far as the results of the study are concerned? We stated earlier in the paper that imported construction materials will primarily place pressure on the country's external current account and its foreign reserves. Therefore, if the foreign reserves were under pressure and it was necessary to reduce imports to bring about some foreign exchange stability, how would one go about decreasing imported construction materials using the above model?

Let us turn our attention to the rate of interest. A reduction in imported construction materials should be achieved if the rate of interest rises. However in Barbados, this rate is no longer determined by the Government of Barbados. If Government sets out to achieve an increase in lending rates, one of the techniques used to do this is by making an upward adjustment to the minimum deposit rate. This represents a charge on commercial banks on their deposit liabilities and it is more than likely that the banks will set out to swiftly recover this additional outlay by raising the cost of borrowing to the public.

In the case of commercial bank credit, imported construction materials should contract if credit falls. Many years ago, the Central Bank of Barbados assumed responsibility for imposing selective credit controls on the banking sector an effort to restrict

credit growth. However, as part of the liberalisation process, this policy was discontinued from the early 1990s. One of the frequently used tools to signal to commercial banks to cut back on extending credit is by also increasing the minimum deposit rate. Once more, as the minimum deposit rate is raised, any previously attractive credit terms offered by commercial banks may be less feasible. Consequently, this may serve as a disincentive for Barbadians wishing to obtain credit and might lead to a decrease in construction materials.

Next, we examine real per capita income. The model would suggest that a contraction in imported construction materials would require a reduction in this variable. This can be achieved through increases either in direct taxes, indirect taxes or both. Over the past five years, the Government of Barbados has made continuous downward adjustments to its direct tax system in order that these rates may be on par and competitive with its CARICOM neighbours. A reversal of this direct tax policy is therefore unlikely. This means that any policy geared towards reducing real per capita income would have to be done with adjustments to the indirect tax regime, aimed at decreasing consumption of these imports.

The real exchange rate, as defined in this paper, is driven by the domestic and foreign price indices. Since Barbados has no control over the foreign price index, then its focus must be on the domestic price index. This model indicates that a reduction in the domestic price index (equivalent to an increase in the real exchange rate) would be necessary to achieve a contraction in imported construction materials. While Government may be able to lower the price of those items which are under price controls, in general, prices in Barbados are rigid downwards and any incentives provided by Government to business organizations to encourage them to reduce prices may not necessarily achieve that objective but may translate into higher firm profitability. It is not necessary to address the unemployment rate in this situation since no Government wishes to see higher levels of unemployment.

Suppose on the other hand, Government wanted to stimulate economic activity and together with the private sector, focused on boosting construction output, then imported construction materials could play a very important role in achieving this objective.

Using our model, the minimum deposit rate might be lowered in the hope that commercial banks would reduce the rate of interest. If this occurs, then with a reduction in the cost of borrowing, imported construction materials should expand. Also, a decrease in the minimum deposit rate would represent a saving to commercial banks and they might use some of this savings to make credit more appealing. In this way, commercial bank credit should increase and one would expect to see rising imported construction materials.

In the case of real per capita income, Government can make downward revisions to the direct and indirect tax regimes, in order to ensure that more spending power is in the hands of consumers. The real exchange rate variable, as defined in this paper, would present something of a problem. An increase in imported construction materials would require a rise in the domestic price index, making purchases from abroad cheaper. The difficulty here is that a higher domestic price policy would hardly find favour with Barbadian consumers who are already complaining of high prices. Finally, with a pick-up in real economic activity, the unemployment rate should fall as more persons should find work and should be able to purchase higher amounts of imported construction materials.

6. CONCLUSION

The purpose of this paper was to have a look at imported construction materials by Barbados. For the most part, construction materials represented the second largest component of intermediate goods with the exception of the period 1989 to 2000, when they became the single largest component. Further they moved from being some 12% of intermediate imports in 1970 to 22% of intermediate imports in 2005. In almost all cases, the movement of construction materials coincided with that of construction activity, with the exception of 1984, when a local company began to supply cement needs. The major countries that supply construction materials to Barbados are US, UK, Canada and Guyana.

The study also showed that, using the Engle-Granger two step methodology and annual data, real per capita income, the rate of interest, commercial bank credit, the real exchange rate and the

rate of unemployment impacted on imported construction materials both in the long and short run. An attempt was also made to see to what extent to which economic policies might be used in this model in restricting or boosting imported construction materials. This paper showed that if the intention was to restrict purchases of construction materials from abroad, then one would need to increase the minimum deposit rate in the hope that the rate of interest would rise, thereby making commercial bank credit more difficult to obtain, make an upward adjustment to the indirect tax regime to reduce consumption, and attempt to attain a lower domestic price index to increase the real exchange rate. If however, the aim was to encourage increased construction activity and this required an expansion in the imports of construction materials, then one should consider lowering the minimum deposit rate in the hope of bringing about a fall in the rate of interest and making commercial bank credit cheaper, and effecting downward adjustments to both the direct and indirect tax regimes. Hence both monetary and fiscal policy would have a role to play in achieving these outturns.

REFERENCES

- Banerjee, A., J. Dolado, D. Hendry and G. Smith (1986), "Exploring Equilibrium Relations in Econometrics Through State Models: Some Monte Carlo Evidence", *Bulletin*, vol. 48, pp. 253-78.
- Breusch, T. S., and L. G. Godfrey (1981), "A Review of Recent Work on Testing for Autocorrelation in Dynamic Simulation Models", in D. Currie, R. Nobay and D. Peel (eds.), *Macroeconomic Analysis: Essays in Macroeconomics and Econometrics*, Croom Helm, London.
- Campbell, T. (1993), *A Review of Monetary Control Instruments Used by the Central Bank of Barbados*, Central Bank of Barbados (Working Papers, pp. 355-69).
- Central Bank of Barbados, *Annual Report*, various issues.
- Central Bank of Barbados, *Annual Statistical Digest*, various issues.
- Chudnoff, M. (1980), "Tropical Timbers of the World", *Agriculture Handbook 607*, United States Department of Agriculture, Forest Service, Forest Products Laboratory.

- Cook, R. (2002), "Mexico's Cement Exports to the US and The Dispute on It", *Trade Environmental Database (TED) Case Studies*, no. 133, an on-line Journal.
- Dickey, D. A., and W. Fuller (1979), "Distribution of Estimators for Autoregressive Time Series with a Unit Root", *Journal of American Statistical Association*, vol. 74, pp. 427-31.
- Eastin, I., P. Boardman and J. Perez-Garcia (2002), *A Competitive Assessment of the Japanese Forestry and Forest Products Sectors*, Centre for International Trade in Forest Products (CINTRAFOR) (Working Paper, n° 87, pp. 1-3).
- Engle, R., and C. W. G. Granger (1987), "Co-Integration and Error Correction, Representation, Estimation, and Testing", *Econometrica*, vol. 55, n° 2, pp. 251-76.
- EViews 5, *Quantitative Micro Software*, Irvine, Ca.
- Helmets, F. Leslie C. H. (1986), "The Real Exchange Rate", in R. Dornbush and F. Leslie C. H. Helms (eds.), *The Open Economy: Tools for Policymakers in Developing Countries*, Oxford University Press, NY, pp. 11-33.
- Hendry, D. F. (1995), *Dynamic Econometrics: Applied Text in Econometrics*, Oxford University Press, Oxford, UK.
- Hu, X., and H. Ping (2005), *Iron and Steel Industry- Modelling China's Demand for Steel Importation*, presented at Xi' An Conference, China, pp. 1-16.
- Inder, B. (1993) "Estimating Long-Run Relationships in Economics: A Comparison of Different Approaches", *Journal of Econometrics*, vol.57, n° 2, pp. 53-68.
- International Monetary Fund, *International Financial Statistics Yearbook*, various issues.
- Jarque, C. M., and K. Bera (1980), "Efficient Tests for Normality, Homoscedasticity and Serial Dependence of Regression Residuals", *Economic Letters*, vol. 6, pp. 255-59.
- Johansen, S. (1988), "Statistical Analysis of Cointegrating Vectors", *Journal of Economic Dynamics and Control*, vol. 12, n° 213, pp. 231-54.
- Luppold, W. (1988), *Hardwood Import Trends*, United States Department of Agriculture, Forest Service, Northeastern Forest Experiment Station (Research Paper, n° NE-619, pp. 1-8).
- Phillips, P. C. B., and P. Perron (1988), "Testing for A Unit Root in a Time Series Regression", *Biometrika*, vol. 75, pp. 335-46.

Ignacio Lozano

Budget deficit, money growth and inflation: evidence from the Colombian case

1. INTRODUCTION

The relationship between budget deficit, money growth and inflation has acquired a prominent place in literature on monetary economics. From a theoretical perspective, both the monetarist hypothesis (MH), based originally on the quantitative theory of money, and the fiscal theory of the price level (FTPL), known as the quantitative theory of government debt, represent the two traditional approaches to understanding what links these macroeconomic variables. Recently, the new Keynesian (NK) theory, build on dynamic general macroeconomic models with imperfect competition, offers an alternative explanation of the dynamics of these variables.

The role of money in monetary-policy management has been relegated, in practice. While some analysts emphasize that money

Paper prepared by I. Lozano, is a researcher of the Economics Research Department at the Central Bank of Colombia (Banco de la República). The views expressed in this paper are those of the author and do not necessarily reflect the opinions of the Central Bank of Colombia. The author wishes to thank to Karen Rodriguez for her valuable technical assistance.

helps to explain the dynamics of inflation,¹ others suggest it should be considered a mere unit of account.² As recent textbooks point out, a discrepancy over the significance of money supply to modern monetary policy has emerged between the European Central Bank (ECB) and other central banks, such as the United States Federal Reserve or the Bank of England.³ At present, the ECB appears to be alone among the central banks in the importance it gives to the rate of money supply, while still trying to use this variable as the *second pillar* of its monetary policy. Conversely, the United States Federal Reserve is discontinuing the collection of statistical data on certain monetary aggregates and places relatively little emphasis on money. The discussion on the role of money has influenced policy-making at the central banks of emerging countries as well.

On an empirical basis, the connection between budget deficit, money growth and inflation has been explored extensively in both industrial and developing economies, with mixed results. In developing countries, it often has been argued that high inflation materializes when governments face large and persistent deficits that are financed through money creation. Hence, inflation emerges as a fiscal-driven monetary phenomenon. Nevertheless, if inflation is a consequence of non-fiscal disturbances, real tax revenues might decline and the budget deficit could end up being endogenous to the inflationary process. Thus, fiscal and monetary policies could exhibit a simple or a bi-directional causal-relationship: changes in inflation could influence the fiscal authority's decisions and (or), conversely, the budget deficit could have implications for money growth and inflation.

An endogeneity (exogeneity) analysis of budget deficit and money supply with respect to inflation appears as crucial to understanding the dynamics between these variables as well as to assessing the theoretical approaches. This tri-variate system has been proposed to test at least four alternative hypotheses. The first is the MH, which requires the definition of a long-run inflation equation as a function of money growth and budget deficit. The evidence supports this approach, if the last two variables are

¹ Nelson (2003); Gerlach (2004); and Nelson (2008).

² Woodford (2003); Woodford (2007); and Galí and Gertler (2007).

³ Wickens (2008).

weakly exogenous in the system. The second is the Sargent and Wallace hypotheses (SW-H), which emphasizes that causality goes from deficit to money growth and, thereafter, from money growth to inflation. It also says the fiscal deficit needs to be weakly exogenous especially in the long-term money growth equation. The third, which is the FTPL, requires the presence of a deficit-caused long-term inflation equation, with money playing no role. Finally, there is the NK hypothesis, which is supported empirically by a money growth equation conditioned to weakly exogenous inflation.

In Colombia, the system described previously has yet to be evaluated empirically, in its entirety, even though fiscal deficits have been interpreted as a possible cause of inflation. There are a number of papers that assess the empirical relationship between money growth and the price level, but none explicitly cites the fiscal deficit as a possible source of money creation and/or inflation. This paper attempts to provide evidence on the subject, using a vector error correction model (VECM), which is recommended in earlier empirical papers. Our analysis is relevant for Colombia, particularly as of the early nineties, when the autonomous central bank was restricted to making direct loans to the government and the banking system (included the central bank) became a major holder of Colombian government securities.

Apart from the introduction, this paper is organized as follows. The next section contains a summary of the foremost theoretical ideas on price level determination and the role of the budget deficit. It also offers a review of earlier empirical studies. The data and the tests of the main statistical properties required for the VECM (unit root and cointegration tests) are described in the third section. In the fourth, both the nature of the model and the results are presented and discussed. The paper ends with some concluding remarks.

2. SOME NOTES ON PRICE LEVEL DETERMINATION AND THE BUDGET DEFICIT ROLE

2.1 Review of Theory

2.1.1 *The Monetarist Hypotheses (MH)*

With the quantitative theory of money, the pattern of real economic activity requires a certain desired level of real money balances, and the price level is controlled by the nominal money supply. The reasoning is straightforward. Given the nominal money supply –exogenously determined by the monetary authority– the price level is determined as the unique level of prices that will make the purchasing power of the money supply equal to the desired level of real balances. From an operational point of view, it means the central bank seeks to ensure the quantity of money agents want for their transactions. Given a price level, if the nominal money supply differs from the desired real balances, it will translate into changes in that price level. Hence, the price level has to be fully flexible and determined exclusively by the exogenous nominal money supply.

With regard to fiscal policy, the nominal money supply could change due to the use of seigniorage as a main source of financing for public expenditure, or as the result of an open market operation in which the central bank purchases interest-bearing government debt. Since these two money-expansion mechanisms may have different repercussions for taxes and the stock of government debt, they may lead to different effects on prices/or interest rates. While the monetarist hypothesis comments on the first mechanism, the second is analyzed extensively by the FTPL.

The budget deficit and its subsequent financing through money creation (seigniorage) are regarded as exogenous to the monetary authority. Hence, money growth would be dominated by the government's financing requirements, and the price level increases as a result of that monetary expansion. From an empirical point of view, in terms of the deficit-money growth-inflation system, it means the first two variables in the system have to satisfy the weak exogeneity property, while the later has to be determined endogenously. Consequently, with a monetarist approach,

there is expected to be a positive correlation between monetary growth and inflation. A regime of that nature is known as fiscal dominance, pursuant to the spirit of Sargent and Wallace's seminal paper (1981). Strictly speaking, they emphasized the causality runs from fiscal deficit to money growth and, subsequently, from money growth to inflation. Moreover, in the long-run money growth equation, the fiscal deficit needs to be weakly exogenous.⁴

In practice, the monetarist view founded on the quantitative theory of money faces serious difficulties when it comes to controlling inflation. One of those difficulties is the appropriate definition of nominal money supply, mainly due to the substitution between financial monetary and non-monetary assets. Asset substitution to conduct transactions has increased, given the rapid pace of financial innovations and global deregulation of the financial system. The effectiveness of influencing prices via the standard nominal money supply was questioned, because of the amount of financial non-monetary assets within the scope of the monetary authority's control. Instead, the nominal interest rate becomes the instrument used to control the price level, and the nominal quantitative supply of money ends up being determined endogenously in the money market.

2.1.2 *The Fiscal Theory of the Price Level (FTPL)*

The FTPL links fiscal and monetary policies through the government's inter-temporal budget constraint (GBC), which also is understood as a long-term solvency condition for public sector finances. The GBC is satisfied when the discounted value of the government's future primary surplus is larger than (or equal to) the current nominal value of the public debt. It is important to note that seigniorage is included in the government's primary surplus –as a revenue source–, while the nominal public debt takes into account the monetary base. This is why the relevant public sector is comprised of both the government and the central bank. Because the GBC is expressed, most often, as a percentage of

⁴ With this regime, the central bank loses the ability to control inflation: i.e. monetary policy becomes *passive*, even if fiscal policy is *active* to decide revenues and expenses autonomously.

nominal GDP, the discount rate is determined by the ratio of the real interest rate to the economic growth rate.

According to the FTPL, the GBC is assumed to be an equilibrium condition, and the future path of revenues and primary expenditures is decided exogenously by the fiscal authority. Therefore, given a discount rate, if the discounted value of the primary surplus is lower than a predetermined level of nominal debt (both as a percentage of nominal GDP), the price level has to *jump* to equalize the GBC condition: i.e. the price level becomes the exclusive adjustment variable to maintain that condition.

So as to be more explicit about how the price level is affected by fiscal actions, Woodford (1995) suggests first considering a positive and exogenous price shock that reduces the real value of the government's liabilities and leads to a parallel reduction in the real value of private portfolios invested in government securities. The lower real value of these private assets generates a negative wealth-effect, which will be reflected ultimately in less demand for goods. According to the FTPL, the agent's expectations concerning the sustainability of fiscal policy would produce a similar wealth-effect.

If the market has a negative perception of the sustainability of public finances; that is, if the discounted value of the government's primary surplus does not cover the nominal value of its liabilities, that perception will prompt an increase in the price level to the extent required to restore GBC equilibrium. The higher price level reduces the real value of private portfolios, thereby generating the aforementioned wealth effect. The higher the nominal government liabilities (nominal debt), the greater the adjustment required in the price level. Hence, the FTPL is also known as the quantitative theory of the public debt. As a result, the presence of a budget deficit-caused long-run inflation equation with money growth playing no role, may constitute strong support for the FTPL.

2.1.3 The New Keynesian Approach (NK)

With the NK standard approach, the relationship between money growth, inflation and budget deficit can be derived from a system of two equations: aggregate-supply (or an inflation equation) and aggregate-demand. The system, which is well-

substantiated for a closed economy, is obtained with a dynamic stochastic general equilibrium framework based on maximization of the agent's behavior, with imperfect competition. The nature of the NK theory is, therefore, quite different from the approaches discussed earlier, as it does not constitute a quantitative theory on price determination, since money amount is conceived in a monetarist way or as the stock of debt in the FTPL.

The demand equation is a *special* IS-function. It is achieved on a microfundamental basis and is affected by both the output gap and real interest rate expectations (i.e. it is an expectational, forward-looking IS curve). The supply equation corresponds to a NK version of the Phillips curve, based on maximization of the firm's profits, which adjust its prices temporarily, in a staggered way. This two-equation system represents the equilibrium conditions for a well specified general equilibrium model, which is usually completed with an interest rate rule used by the central bank to control inflation (when monetary policy is rule-based instead of discretion-based).

The output gap (current and expected), inflation (current and expected) and the nominal interest rate are the variables to be solved in the system. Even though money is not taken into account as an explicit variable of the standard model, its inclusion throughout the utility function poses no problem.⁵ More importantly, when solving the NK model with money, the quantity of money ends up being endogenous to the nominal interest rate (or inflation), and becomes an irrelevant variable for policy purposes. According to Woodford (2007), because the system is self-contained, the money demand function is not required to solve the model for inflation (this function is redundant).

In an additional simplification of the NK standard model, output is consumed entirely by households (i.e. consumption is the unique demand component), while the role of private investment and that of government expenditure are ignored.⁶ Nevertheless, public expenditure shocks can be incorporated feasibly into the

⁵ For instance, if money is added as a non-separable argument of the utility function, the balance of real money affects both the marginal rate of substitution (between consumption and leisure) and the demand equation.

⁶ Because the economy is closed, the model also assumes that households have zero net assets.

standard model in the same way the productivity shock is introduced. Specifically, the effects of fiscal policy on the real economy will depend on agents' expectations about the current (in t) and future (in $t+1$) level of government expenditure.

Given an output gap and inflation expectations for $t+1$, if individuals expect government expenditure to increase in $t+1$, with respect to its current level, it is reasonable to expect that private consumption will fall in $t+1$. Because families have to save, at present, to finance added public spending in $t+1$, consumption in t will have to be reduced. With a Keynesian multiplier, the lower current-consumption level implies a contemporary decline in output, the output gap and inflation. The contrary case could be interesting, because current output (as well as the output gap) would increase, thus forcing up the price level, if individuals believe current government expenditure (in t) is greater than its trend in long-term sustainability (in $t+1$). In short, individual expectations with respect to current and future fiscal action could affect inflation directly and induce money expansion through a higher price level.

2.2 Review of Previous Empirical Work

The inflationary effects of a budget deficit have been the object of extensive empirical evaluation at international level, with mixed results. There are some remarkable papers that found no significant relationship between budget deficit, money growth, and inflation. In principle, this could be consistent with the New Keynesian standard model with *ricardian* fiscal regimes. Several other papers found results to the contrary: namely, significant positive inflationary effects of budget deficit, which could be coherent with the MH, SW-H or FTPL approaches.

Using postwar data for the US and twelve other developed and developing countries, King and Plosser (1985) examined the connection between government deficit and factors that influence inflation in neoclassical macroeconomic models; i.e. factors affecting the supply of, or demand for money. With an unstructured approach (basic regularities in the data), they found little evidence that deficit played an important role in postwar inflation by exerting pressure on the central bank to print money. Karras (1994) investigated the impact of budget deficit on money

growth, inflation, investment and real output for a wider sample (32 countries), including developed and developing economies. He used annual data (1950-1989) to estimate reduced form equations and found, among other things, that *i*) deficits are generally not monetized and, therefore, do not produce inflation via monetary expansion; and *ii*) deficits are not inflationary, even by virtue of their aggregate-demand effects.

Using a variety of indicators of central bank independence, Sikken and Haan (1998) found analogous outcomes for a group of 30 developing countries. Basically, they tested whether a relationship exists between central bank independence and the government budget deficit, and whether such independence affects monetization of the deficit. They concluded there is no relationship between central bank independence and the budget deficit level. Other findings that show fiscal deficit does not contribute significantly to money growth and inflation are reported by Protopapadakis and Siegel (1987) and by Barnhart and Darrat (1988) for samples that include developed economies, and by De Haan and Zelhorst (1990) for developing countries.

In a case study for the US, Joines (1985) empirically analyzed the relationship between government budget deficits and the growth of high-powered money during an extended period (1866-1983). Through reduced-form equations, he provides no evidence that growth in high-powered money is related to the non-war government deficit, after controlling for the level of overall economic activity. His results are consistent with the view that the government has set its real targets for the deficit and for high-powered money growth independently of one another.

Among the papers with opposite results, Edwards and Tabetlini (1991) found that budget deficits are an important determinant of inflation. They used cross section techniques for a wide sample of developed countries. The remaining papers with similar findings are case studies of specific countries. For instance, Favero and Spinelli (1999) assessed the relationship among these variables for an extended period (1875-1975) in Italy. In doing so, they confirmed the positive long-term causal direction from budget deficit to money growth and from money growth to inflation, emphasizing the effects vary according to the degree of central banking independence and the type of monetary policy regime.

Metin (1998) evaluated annual fiscal and monetary data for Turkey (from 1950 to 1987) and found the budget deficit and government debt monetization affected the price level significantly. For the same country, Özata (2000) found the price level has been adjusted to the monetary imbalances caused by the Turkish government's fiscal imbalances. Tekin-Koru and Özmen (2003), on the other hand, confirmed the aforementioned results for Turkey, but used a vector error correction model. For the Democratic Republic of the Congo, Nachega (2005) assessed the fiscal dominance (FD) hypothesis during the period 1981-2003, using a cointegration analysis. His empirical findings reveal a strong and statistically significant long-term relationship between fiscal deficit and money growth, and between money creation and inflation. This supports the assumption that the FD hypothesis applies throughout the period studied.

For Ghana, Sowa (1994) estimated an inflation equation for the period 1965-1991, carefully examining fiscal consistency under different regimes. On the whole, he found that inflation was influenced more by output volatility than by monetary factors induced by the government's deficit. However, inflation was on target during periods characterized by a fiscal discipline regime and exceeded the target during periods marked by fiscal incoherence. Later on, Gharthey (2001) found the fiscal deficit to be an inflationary factor in Ghana for the period 1972- 1992, because an important amount of financing came from printing money. He concludes that budget-deficit monetization generated inflationary pressures, which created, in turn, an adverse environment for economic growth. Accordingly, it is crucial to steer public finances along a balanced path.

For Colombia, there are no previous studies that empirically evaluate the relationship between budget deficit, money growth and inflation, as proposed in this paper. There are, of course, some remarkable papers assessing the bivariate relationship between money growth and inflation, but none of them explicitly points to the fiscal deficit as a possible source of money expansion and/or inflation. For instance, Misas, López and Querubín (2002) evaluated the relationship between money and inflation through neuronal network models. They found that, although monetary aggregates have been used traditionally as explanatory variables of inflation, the presence of asymmetries between monetary policy

and inflation explains the non-linear relationship between these variables. Jalil and Melo (1999) also found a non-linear relationship between inflation and money growth, which could be used to forecast inflation. Finally, Misas, Posada and Vásquez (2001) explore – for the period 1954-2000 – the statistical relevance of the permanent components of the nominal quantity of money and real output, as relative components for the price level (CPI).

3. THE DATA

3.1 Choice of Variables and the Sample Period

This paper proposes an evaluation of three systems, using the VEC model: $z_{1,t}=(\Delta P_t, \Delta M1_t, DEFY_t)$; $z_{2,t}=(\Delta P_t, \Delta M0_t, DEFY_t)$; and $z_{3,t}=(\Delta P_t, \Delta M3_t, DEFY_t)$. The first, represented by $z_{1,t}$, is the benchmark system and encompasses inflation (ΔP_t), the money supply growth rate ($\Delta M1_t$) and the budget deficit of the central government ($DEFY_t$). The second and third systems ($z_{2,t}$ and $z_{3,t}$), substitute only the standard money supply ($\Delta M1$) by its narrowest ($\Delta M0$) and broadest ($\Delta M3$) definition, respectively. The narrowest definition of money supply (using the monetary base) includes the total amount of reserves held by the banking system, plus the currency in the hands of the public, while the broadest definition consists of $M1$, plus saving accounts and other denomination time deposits easily used in, or converted to use for transactions.

The system $z_{2,t}$ is pertinent, since the government's domestic financing could be an important source of monetary base expansion ($M0$), while $z_{3,t}$ is relevant for the presumed high substitutability between monetary and non-monetary assets to conduct transactions. Inflation and the growth rate of money supply are derived, in practice, as the log-first-differences from the consumer price index (CPI) and from the nominal monetary aggregates. The prices and money series are from the database at the Central Bank of Colombia (Banco de la República, BR).

An important question to emerge concerning the budget deficit-money growth- inflation relationship is whether fiscal data needs to be used; namely, central government or general government fiscal data. The choice is not a trivial one. Even if the central government deficit (and its financing) is related more to

money expansion, the general government deficit could be related more to the inflation process. After analyzing the empirical results for both cases, we opted for the central government budget deficit ($DEFY_t$), which is defined as the difference between total expenditure and total revenue in cash bases, expressed as a percentage of GDP. The budget deficit is, therefore, a positive number.

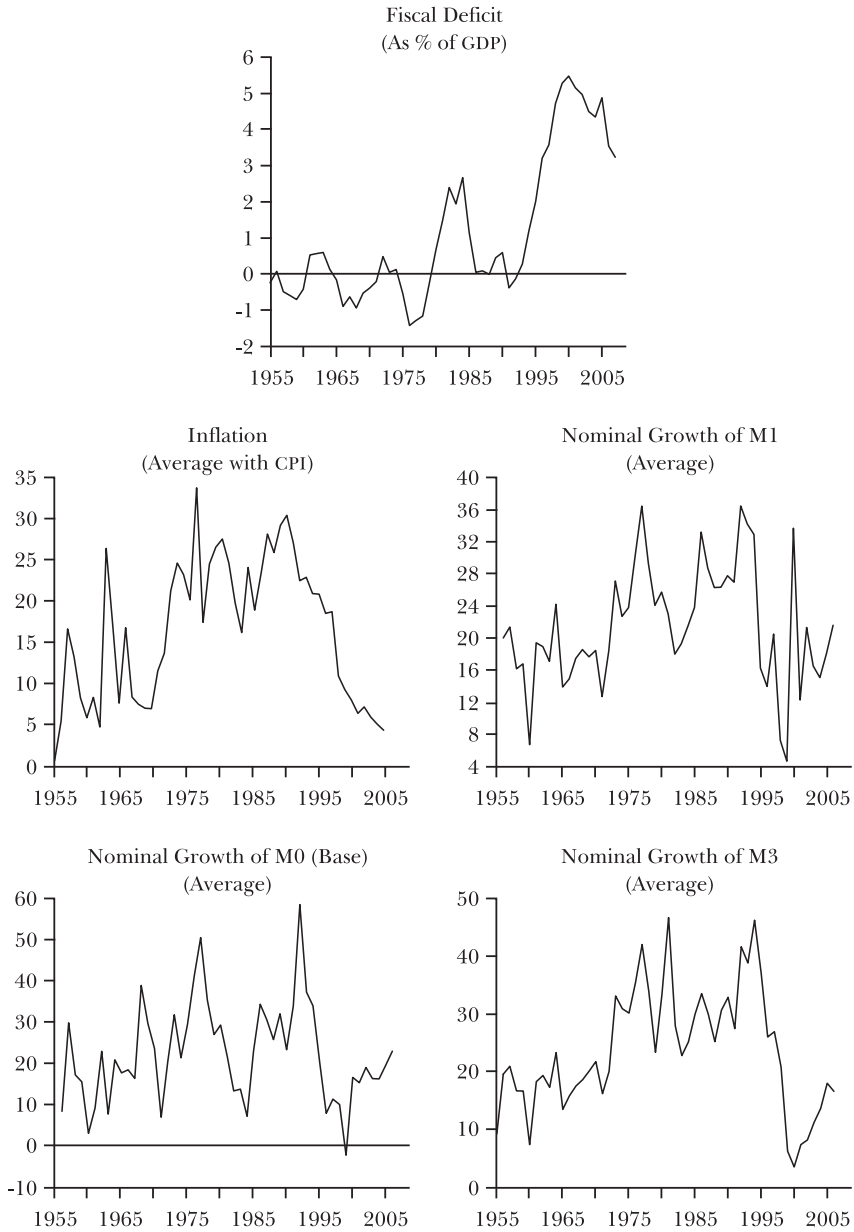
In as much as the VEC model makes it possible to establish the causal long-term relationship between a set of variables, this paper considers two samples in accordance with the availability of data. The first covers a 53-year period (from 1955 to 2007) and its management, employing annual data series. The fiscal budget is assembled by standardizing data from Junguito and Rincón (2004), Garcia and Guterman (1988) and the BR database. Nevertheless, because the VEC technique relies heavily on the existence of consistent quarterly data over a long period of time, we consider a second sample that covers the last 25 years (1982Q1 to 2007Q4). In this case, the fiscal budget is attained by homogenizing the databases of the National Planning Department (DNP) and the BR (Website and the monthly review). The quarterly series are seasonally adjusted. Figures 1 and 2 show the data for these samples.

Two periods with important fiscal unbalances are clearly shown in the top panel of Figure 1: the first, at the beginning of the eighties, and the second, at the end of the nineties. However, the fiscal deficit grew extraordinary in the latter period, rising to 6% of GDP in 2000 (deficit in cash bases), partially as result of the severe economic slump at the end of the nineties, but also as a reflection of structural problems with central government finances.⁷ Even though the fiscal balance improved considerably during the final years (2004 to 2007), the government's fiscal position remains highly imbalanced (deficit equivalent to 4% of GDP).

Analyzing quarterly data (Figure 2), the minimum values for the fiscal deficit are recorded in the first quarters of 1985Q1 and 1990Q1, with -2.9% and -4.1% of GDP, respectively (by definition, negative numbers mean fiscal surplus). The maximum values are recorded in the fourth quarters of 2000Q4 and 2001Q4 (8.2% and

⁷ Lozano (2004) offers a complete analysis of the structural problems of public finances in Colombia.

FIGURE 1. BUDGET DEFICIT, MONEY GROWTH AND INFLATION IN COLOMBIA
(Annual Data: 1955 to 2007)



SOURCES: Banco de la República, Junguito and Rincón (2004); and García and Guterman (1988).

7.1% of GDP). The pattern of low-value deficits during the first quarters and high-value deficits during the fourths is repeated each year, reflecting a particular dynamic induced by the tax and budgetary institutions. Given the way the tax calendar is designed (especially for income tax), the major taxes are collected in first six months of each year; however, according to budgetary practices, a substantial share of payments is made in the second half of the year.

Inflation has exhibited a great deal of fluctuation in the last fifty years. During the first half of the seventies, the inflation rate showed a remarkable degree of acceleration. Subsequently, and for a period of twenty years (between 1975 and 1995), the annual inflation rate fluctuated around 25%, with the highest rates occurring in 1977 and 1991 (33.7% and 30.4%, respectively). Inflation has been on a downward trend since the beginning of the nineties. At the present time, the annual rate of inflation oscillates around 6% (Figure 1).

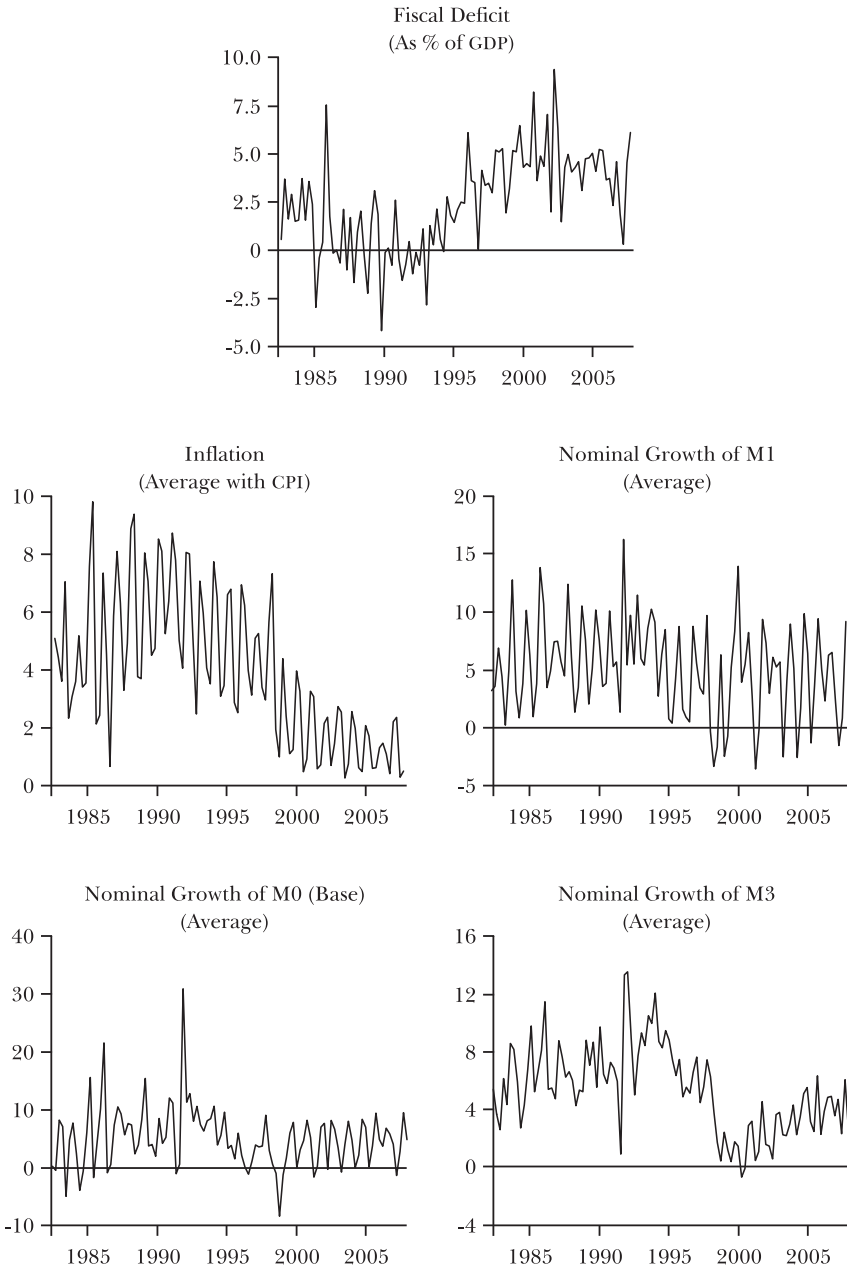
Using quarterly data, the inflation rate (average) starts with a maximum value of 8.9% in the first quarter of 1988 and recorded a minimum value of 0.28% in the third quarter of 2007. Contrary to what happens with the dynamics of the budget deficit, the highest inflation rate is recorded in the first quarter of each year, while the lowest rate is attained in the third quarter.

Finally, the bottom panels in Figures 1 and 2 show the growth rate for the monetary aggregates: the standard money supply ($M1$), the monetary base ($M0$) and $M3$. A look at the quarterly series shows $M1$ and $M0$ exhibit similar time-behaviour (stationary pattern), even though $M1$ is highly dispersed. Notice when the Colombian economy faced the lowest growth phase (between 1997 and 2002), the variation in $M1$ was higher. As we mentioned previously, the inclusion of $M0$ and $M3$ could be interesting from an empirical standpoint. However, from a theoretical point of view, $M1$ is the candidate to explore the long-term relationship with inflation and budget deficit.

3.2 Properties of the Systems

Two statistical properties are required of the variables used in the VEC model: non-stationary and cointegrated. A time series is non-stationary, if its mean and variance are time-dependent, which

FIGURE 2. BUDGET DEFICIT, MONEY GROWTH AND INFLATION IN COLOMBIA
(Quarterly Data: 1982Q1 to 2007Q4)



SOURCES: Banco de la República and National Planning Department (DNP).

is very common in the economic variables we chose for this paper. Furthermore, if the variables have a common stochastic trend, which means they move together in the long-term, they are cointegrated. The VEC model is one of the most recommended specifications for analyzing variables of that nature, since it offers more and better information compared to other data generation processes.

The analysis begins by testing the set of variables contained in $z_{1,t}$, $z_{2,t}$ and $z_{3,t}$ for the presence of unit roots and the possibility of a common stochastic trend among them. Three test statistics are used: the Augmented Dickey-Fuller test (ADF, 1979), the Phillips-Perron test (PP, 1988) and the GLS transformed Dickey-Fuller test (DFGLS, 1996). The most common is the ADF-test, which allows for series with a deterministic component. It also makes it possible to include a high number of lags, which is useful for high frequency series. The null hypothesis (H_0) denotes the presence of a unit root in each variable. When H_0 is rejected, the variables are stationary.

The optimal lag lengths are fixed on four variables with quarterly frequency (and two with annual frequency).⁸ The tests contain constant and exogenous linear trends. Table 1 reports the ADF unit root tests in which all the series are integrated of order one, $I(1)$, and robust across the other alternative tests (at 0.05 levels of significance). Although the tests for the annual frequency variables are not shown, their results are similar.

A system that involves non-stationary variables presents an equilibrium or long-term relationship, provided those variables do not move independently of one of another (i.e. are cointegrated). Initially, we explored this long-term relationship using the cointegration methodology developed by Johansen-Juselius (1990). The test provides two types of proof: the maximum eigenvalue (λ_{\max}) and trace statistical (λ_{trace}). The maximum eigenvalue and trace tests proceed sequentially from the first hypothesis –no cointegration– to an increasing number of cointegrating vectors. The λ_{\max} is based on the null hypothesis that the number of cointegrating vectors is r in contrast to the alternative $r+1$ cointegrating vectors, while the λ_{trace} is based on the null hypothesis

⁸ According to Akaike's criterion (AIC), Schwarz's criterion (SC) and Hannan-Quinn's criterion (HQC).

that the number of cointegrating vectors is less than or equal to r in contrast to a general alternative. The results of these tests for $z_{1,t}$, $z_{2,t}$ and $z_{3,t}$, are reported in Table 1. Clearly, the null hypothesis of no-cointegration (i.e. $r=0$) is rejected with both λ_{\max} and λ_{trace} , but not the alternative hypothesis of at least one cointegration vector ($r=1$), at 0.01 level of significance.

TABLE 1. UNIT ROOT AND COINTEGRATION TESTS (USING QUARTERLY DATA)

Unit Root Test					
<i>ADF-t</i>					
	<i>P</i>	<i>MI</i>	<i>M0</i>	<i>M3</i>	<i>DEFY</i>
Levels	-2.3841	-2.6698	-3.0741	-0.7692	-0.2685
First differences	-4.2418 ^a	-3.8906 ^a	-6.8053 ^a	-12.034 ^a	-7.422 ^a
Johansen Cointegration Test					
<i>Hypotheses</i>		<i>r = 0</i>	<i>r ≤ 1</i>	<i>r ≤ 2</i>	
Z_1	Eigenvalue	0.2555	0.0373	0.0145	
	λ_{trace}	34.7792 ^a	5.2677	1.4625	
	λ_{\max}	29.5114 ^a	3.8052	1.4625	
Z_2	Eigenvalue	0.2250	0.0337	0.0163	
	λ_{trace}	30.5842 ^a	5.0832	1.6467	
	λ_{\max}	25.5009 ^a	3.4365	1.6467	
Z_3	Eigenvalue	0.1806	0.0392	0.0111	
	λ_{trace}	25.0458 ^a	5.1247	1.1186	
	λ_{\max}	19.9211 ^a	4.0060	1.1186	

^a Denotes rejection of the hypothesis at the 0.01 level.

4. THE VECTOR ERROR CORRECTION MODEL: NATURE AND RESULTS

4.1 The Model

The VEC model is used to establish the causal long-term or equilibrium relationship among a set of variables. In addition, when an unexpected shock results in any variable of the system deviating temporarily from the equilibrium path, the model also allows us to evaluate the short-term dynamic adjustment. To

facilitate the VECM description, we redefine the variables of $z_{1,t}$ as $z_{1,t} = (x_{1t}, x_{2t}, x_{3t})'$, where $x_{1t} = \Delta P_t$; $x_{2t} = \Delta M1_t$ and $x_{3t} = DEFY_t$.

The equilibrium relationship between the variables of $z_{1,t}$ could be given by the equation $\beta'z_t = \beta_1x_{1,t} + \beta_2x_{2,t} + \beta_3x_{3,t} = 0$, where $\beta = (\beta_1, \beta_2, \beta_3)'$ are the parameters to fix that relationship. For a particular period, the long-term relationship is not usually satisfied; that is, it could be that $\beta'z_t = y_t$, where y_t is a stochastic variable representing deviations from the equilibrium level. If the equilibrium relationship actually exists, it is plausible to assume the $z_{1,t}$ variables move together and y_t is stable.

To make things easier, it is usually assumed the long-term relationship is given by $x_{1,t} = \beta_2x_{2,t} + \beta_3x_{3,t}$, where we normalized in β_1 ($\beta_1=1$). The VECM starts by emphasizing that changes in variables in period t depend on deviations from this equilibrium relationship in period t-1, which means:

$$\begin{aligned} \Delta x_{1,t} &= \alpha_1(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) + \mu_{1,t} \\ (1) \quad \Delta x_{2,t} &= \alpha_2(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) + \mu_{2,t} \\ \Delta x_{3,t} &= \alpha_3(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) + \mu_{3,t} \end{aligned}$$

where the α 's are parameters that measure the deviations and the μ 's represent the error terms. Moreover, the model assumes that changes in the variables in t depend not only on deviations from this equilibrium relationship, but also on changes in each of the variables in period t-1. Thus,

$$\begin{aligned} \Delta x_{1,t} &= \alpha_1(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) + \gamma_{11}\Delta x_{1,t-1} + \gamma_{12}\Delta x_{2,t-1} + \gamma_{13}\Delta x_{3,t-1} + \mu_{1,t} \\ (2) \quad \Delta x_{2,t} &= \alpha_2(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) + \gamma_{21}\Delta x_{1,t-1} + \gamma_{22}\Delta x_{2,t-1} + \gamma_{23}\Delta x_{3,t-1} + \mu_{2,t} \\ \Delta x_{3,t} &= \alpha_3(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) + \gamma_{31}\Delta x_{1,t-1} + \gamma_{32}\Delta x_{2,t-1} + \gamma_{33}\Delta x_{3,t-1} + \mu_{3,t} \end{aligned}$$

where the parameter γ 's denote the last effects. The close relationship between the VEC model –represented by (2)– and the cointegration relations can be checked by reordering any Δx_i equation,

$$(3) \quad \alpha_i(x_{1,t-1} - \beta_2x_{2,t-1} - \beta_3x_{3,t-1}) = \Delta x_{i,t} - \gamma_{i1}\Delta x_{1,t-1} - \gamma_{i2}\Delta x_{2,t-1} - \gamma_{i3}\Delta x_{3,t-1} - \mu_{i,t}$$

If we assume, for instance, that the cointegration order is I(1),

as was found for the z 's in section 3, the right side of (3) is stable, $I(0)$, as long as the μ_i errors are white noise. If, moreover, $\alpha_i \neq 0$, then $x_{1,t-1} - \beta_2 x_{2,t-1} - \beta_3 x_{3,t-1}$ is also stable. Therefore, the β 's unambiguously represent a cointegration relation.

The system (2) can be represented, in a matrix shape, as:

$$\Delta z_t = \alpha \beta' z_{t-1} + \Gamma_1 \Delta z_{t-1} + \mu_t \quad \text{or}$$

$$(4) \quad \Delta z_t = \Pi z_{t-1} + \Gamma_1 \Delta z_{t-1} + \mu_t$$

where, $z_t = (x_{1,t}, x_{2,t}, x_{3,t})'$; $\mu_t = (\mu_{1,t}, \mu_{2,t}, \mu_{3,t})'$; $\alpha = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix}$;

$$\beta' = (1, -\beta_2, -\beta_3); \text{ and } \Gamma_1 = \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} \end{bmatrix}.$$

In (4) $\Pi = \alpha \beta'$, where α and β are matrices of order $K \times r$, the range of Π corresponds to a cointegration rank of the system (in our case $0 < r < 3$), while β represents the cointegration matrix.

Finally, the model is generalized to include two extensions. On the one side, the lag number of Δz is expanded up to period $t - \rho + 1$ and, on the other, a deterministic term ε_t is included, which may be present in both the cointegration process and the VECM. The deterministic term (as an option extension) offers advantages to the model's estimation and could be a constant, $\varepsilon_t = \varepsilon_0$, a lineal trend, $\varepsilon_t = \varepsilon_0 + \varepsilon_1 t$, or simply a seasonal dummy variable (Lütkepohl, 2005). Notice that ε_0 and ε_1 are vectors of fixed parameters of dimension K . If we assume that $\varepsilon_t = \varepsilon_0$, then:

$$(5) \quad \Delta z_t = \Pi z_{t-1} + \Gamma_1 \Delta z_{t-1} + \dots + \Gamma_{\rho-1} \Delta z_{t-\rho+1} + \varepsilon_0 + \mu_t$$

which is the final VEC model specification, where the Γ_j ($j=1, \dots, \rho-1$) represent the short-term parameters and Π denotes the long-term parameters of the model. More specifically, in $\Pi = \alpha \beta'$, α and β are $3 \times r$ matrices that represent, respectively, the short-term to long-term adjustment coefficients and the cointegration vector (or the long-term relationships among the set of variables).

4.2 Results

4.2.1 Results With Quarterly Data: Period 1982Q1 to 2007Q4

Table 2 contains the VECM estimates for the benchmark system $z_{1,t}$, and also for $z_{2,t}$ and $z_{3,t}$, using quarterly data for the last 25 years. The series are seasonally adjusted as a deterministic term option. Based on AIC, SC and HQC criteria (footnote 8), four were chosen as the optimum lag lengths for the VAR in the VECM. The systems contain at least one cointegration relationship (Table 1).

The cointegration vectors are normalized in prices and money supply to obtain the long term equations of these variables. In the first case (when the system is normalized in prices, $\beta_1=1$), we find the long-term inflation equation is dependent upon money supply and fiscal deficits. In the second (when $\beta_2=1$), we obtain the long-term money growth equation dependent on inflation and fiscal deficits. Since we are particularly interested in the effects of the fiscal deficit, we do not normalize in this variable. The two-equation system provides economically and statistically significant information, as long as both systems are supported by tests for exclusion, stationarity and weak exogeneity, which are usual in VEC modeling. Equations and tests are used together for an empirical assessment of the theoretical approaches described in section 2.

The exclusion test evaluates the relevance (or significance) of each variable within the long-term equations, while the stationarity test verifies this statistical property for time series data. If the null hypothesis is rejected in the first case, the tested variable has not been excluded from the system. The weak exogeneity test is used to verify whether or not the variables employed as explanatory variables (usually located on the right-hand side of the equation) are exogenous to the system and, in turn, if the variable chosen to be explained (located on the left-hand side) is endogenous to the system. In this case, if the null hypothesis is not rejected, the tested variable satisfies weak exogeneity. Consequently, proof of weak exogeneity becomes in one of the most relevant tests for empirically validating the causal relationship between fiscal deficit, monetary growth and inflation.

TABLE 2. COINTEGRATION ANALYSIS FOR Z_1 , Z_2 AND Z_3 (With Quarterly Data: 1982Q2-2007Q4)

Benchmark System z_1 (ΔP, $\Delta M1$, $DEFY$)			
<i>Standardized Eigenvectors (β's)</i>			
	ΔP	$\Delta M1$	$DEFY$
First vector	1.000000	-0.957048 ^b	0.437089
Second vector	-1.044880 ^b	1.0000000	-0.456705 ^a
<i>Standardized Adjustment Coefficients (α's)</i>			
	$\alpha 1$	$\alpha 2$	$\alpha 3$
$\Delta^2 P$	-0.166146 ^b	0.159010 ^b	-0.072621 ^b
$\Delta^2 M1$	0.408708 ^a	-0.39115 ^a	0.178642 ^a
$\Delta^2 DEFY$	0.029584	-0.028313	0.012931
<i>Test for Exclusion: $LR \sim X^2$ (r)</i>			
	ΔP	$\Delta M1$	$DEFY$
	47.89 ^a	53.45 ^a	6.00 ^a
<i>Multivariate Statistics for Testing Stationary: $LR \sim X^2$ ($p-r$)</i>			
	ΔP	$\Delta M1$	$DEFY$
	57.29 ^a	53.88 ^a	57.01 ^a
<i>Test for Weak Exogeneity: $LR \sim X^2$ (r)</i>			
	ΔP	$\Delta M1$	$DEFY$
	39.53 ^a	25.95 ^a	0.00
System z_2 (ΔP, $\Delta M0$, $DEFY$)			
<i>Standardized Eigenvectors (β's)</i>			
	ΔP	$\Delta M0$	$DEFY$
First vector	1.000000	-0.885107 ^b	0.172814
Second vector	-1.129807 ^b	1.000000	-0.195246
System z_3 (ΔP, $\Delta M3$, $DEFY$)			
<i>Standardized Eigenvectors (β's)</i>			
	ΔP	$\Delta M3$	$DEFY$
First vector	1.000000	-0.764105 ^b	0.083620
Second vector	-1.308721 ^b	1.000000	-0.109435

^a Indicates significance at the 0.05 level. ^b Indicates significance at the 0.01 level.

Price and Money Supply Equations in the Benchmark System (z_1)

By normalizing cointegration vectors in both price ($\beta_1=1$) and money supply ($\beta_2=1$), on the one side, and taking into account the significance level of the long-term parameters, on the other, we obtain the following long-term equations (z_1 from Table 2)

$$(6) \quad \Delta P = 0.957 \Delta M1$$

$$(7) \quad \Delta M1 = 1.044 \Delta P + 0.456 DEFY$$

The money supply coefficient of the inflation equation (6) has the expected sign. The value of 0.96 suggests that a one percentage point increase in the *M1* growth rate induces, on average, an increase of about 0.96 percentage points in the inflation rate. The magnitude of this effect (close to one) is similar to the evidence found in other countries, using analogous or different techniques. McCandless and Weber (1995), for instance, found a long-term correlation coefficient of 0.958 among these variables for a period of 30 years in 110 countries. Because the parameter of the budget deficit has significance problems, that variable is not included.

Equation (7) shows that *M1* grows with inflation and fiscal deficit. Intuitively, this seems realistic. In particular, a one percentage point increase in the fiscal deficit (as a share of GDP) leads to an increase of about 0.46 percentage points in the *M1* growth rate. The size of this parameter looks acceptable, above all when compared to what is found in other countries. For instance, Tekin-Koru et al. (2003) found a β of 0.434 for Turkey. The standardizing adjustment coefficients (α 's) indicate a relatively rapid adjustment in inflation and money growth to disequilibrium (between two and six quarters).

The expected sign and the significance level of the coefficients are not enough to conclude the existence of a causal long-term relationship among the variables of z_1 . As previously mentioned, it requires further analysis of the exclusion, stationarity and weak exogeneity tests, the results of which are presented in Table 2. According to the exclusion test ($X^2(r)$), the null hypothesis is rejected for the three variables, at 95% confidence; in other words, all the variables are pertinent (significant) to the system. Hence, equations (6) and (7) reveal valuable information, in principle.

Equally satisfactory results are obtained with the stationarity tests ($X^2(p-r)$), which corroborate the previous unit root test (section 3.2), at 95% confidence.

The weak exogeneity test provides surprising results. The null hypothesis is not rejected at 5% significance, only in the case of the budget deficit. Consequently, the evidence supports the idea that fiscal deficit is actually the only exogenous variable in systems (6) and (7), while money growth and inflation are jointly (endogenously) determined. These empirical findings are crucial to establishing the scope of the theoretical approaches, in the following sense.

First, because money supply does not satisfy the weak exogeneity test, it is difficult to validate the orthodox monetarist hypothesis (MH) whereby one-time proportional changes in the nominal quantity of money lead to equal proportional changes in the prices level. Our results merely confirm the long-run inflation rate is linked closely to growth in money supply. Secondly, as we found no evidence that fiscal deficit is a direct cause of long-run inflation, with money supply playing no role, equation (6) offers no support to the fiscal theory of the price level (FTPL). In a recent paper, Lozano and Herrera (2008) found no evidence to support a fiscal dominance relationship between fiscal and monetary policies in Colombia for the period 1990 to 2007. These two empirical results are coherent, since the FTPL and fiscal dominance are proximate concepts. Thirdly, because the results presented in Table 2 clearly offer no evidence of a money growth equation conditioned by weakly exogenous inflation, the new Keynesian (NK) endogenous money hypothesis is difficult to corroborate.

Consequently, we conclude that the most appropriated approach to understanding the relationship between budget deficit, monetary growth and inflation in Colombia is given by the Sargent and Wallace hypothesis (SW-H). Previously, we mentioned this hypothesis consists of two parts. One concerns causality and calls for the budget deficit to cause money growth and, subsequently, money growth to cause inflation. The other is exogenously, in which fiscal deficit is required to be weakly exogenous, particularly in the long-term money growth equation. Even if, up to now, the first requirement is not entirely proved in this paper, the second is.

The close long-term relationship between inflation and money supply shown in (6) has been explored empirically, particularly through correlation analysis. As McCandless et al., point out, even though correlations are not direct evidence of causality, they do lend support to causal hypotheses that yield predictions consistent with the correlations. We end this section with the results of a pair-wise granger-causality test for z_t variables (Table 3).

TABLE 3. RESULTS OF PAIR-WISE GRANGER CAUSALITY TEST (F-Statistic)

Pair-Variables	Quarterly: 1982Q1-2007Q4		Annual: 1955 -2007	
	Causal direction		Causal direction	
	→	←	→	←
$\Delta M1, \Delta P$	31.834 ^b	19.126 ^b	3.551	6.179 ^a
DEF, ΔP	13.125 ^b	4.083 ^a	3.042	0.579
DEF, $\Delta M1$	5.670 ^b	2.487	2.083	0.206

^a Denotes significance at a 0.05 level. ^b Denotes significance at a 0.01 level.

Using the highest significance level (denoted by ^b), we find evidence, first, of fiscal deficit granger-cause money supply growth (which is consistent with SW-H) and, secondly, money supply growth granger-cause inflation (albeit the opposite is also true; that is, inflation granger-cause money supply growth). Notice that these conclusions do not hold when annual data for a longer period are used.

Price and the Narrowest and the Broadest Money Supply Equations (z_2 and z_3)

The long-term coefficients (β 's) for systems z_2 and z_3 are presented in the lower part of Table 2. These systems use the narrowest and the broadest definitions of money supply growth, respectively. In section 3.1 we noted the empirical valuation of z_2 could be relevant, since government borrowing (deficit) might be an important source of monetary base expansion ($\Delta M0$), while z_3 could corroborate the high substitutability conjecture between monetary and non-monetary assets to conduct transactions.

When normalizing cointegration vectors in prices ($\beta_1=1$), we find the expected sign for both the narrowest and the broadest definitions of money supply in price equations (at the highest

level of significance). In the first case, the parameter β_2 suggests that a one percentage point increase in the monetary base ($M0$) growth rate has induced, on average, an increase of about 0.88 percentage points in the inflation rate. Once again, the lower size of this parameter (with respect to $M1$) is comparable to what is found in other studies (i.e. McCandless and Webber, 1995, who found a long-term correlation coefficient of 0.925 among these variables). In the second case (price equation with the broadest definition of money supply), the coefficient is 0.76.

As to the role of the fiscal deficit, our estimates do not proffer conclusive results in these systems, as the parameters do not present a suitable significance. Moreover, contrary what is showed for the benchmark system (z_1), the null hypothesis of the exclusion test is not rejected for fiscal deficit in z_2 and z_3 ($X^2(r)=0.07$ and $X^2(r)=0.05$, respectively),⁹ which means this variable is not relevant to the systems. Nonetheless, the results of the stationarity and weak exogeneity tests for z_2 and z_3 are analogous with what is found for z_1 . Although the results of these tests are not presented in Table 2, they are available from the author upon request.

4.2.2 Results With Annual Data: Period 1955 to 2007

The empirical procedure described in section 4.2.1, is conducted with annual data for the period 1955 to 2007. Essentially, the idea is to corroborate the results obtained with the benchmark system, using quarterly data, but for a longer period and with annual series. To begin with, we ensure the statistical properties of the variables are met (unit root and cointegration test). Afterward, we do the VECM estimates for similar systems: z_1 , z_2 and z_3 . Finally, the tests for exclusion, weak exogeneity, and stationarity are provided on each one. The new results are shown in Table 4.

Both the size and the sign of the long-term parameters (β 's) in all the systems are close to those obtained with quarterly data. The long-term ample relationship between money growth and inflation is corroborated with the three money definitions: 0.84 with $M1$; 0.73 with $M0$ (base); and 0.71 with $M3$. The results of the stationarity, weak exogeneity and exclusion tests are analogous

⁹ The critical value for the exclusion test is 3.84, at a 0.05 confidence level.

TABLE 4. COINTEGRATION ANALYSIS FOR Z_1 , Z_2 AND Z_3 (With Annual Data: 1955-2007)

Benchmark System z_1 (ΔP, $\Delta M1$, $DEFY$)			
<i>Standardized Eigenvectors (β's)</i>			
	ΔP	$\Delta M1$	$DEFY$
First vector	1.000000	-0.837684 ^b	0.722976
Second vector	-1.193768 ^b	1.000000	-0.863066
<i>Standardized Adjustment Coefficients (α's)</i>			
	$\alpha 1$	$\alpha 2$	$\alpha 3$
$\Delta^2 P$	-0.388369 ^b	0.325330 ^b	-0.280781 ^b
$\Delta^2 M1$	0.418193 ^b	-0.350314 ^b	0.302344 ^b
$\Delta^2 DEFY$	0.011906	-0.009974	0.008608
<i>Test for Exclusion: $LR \sim X^2$ (r)</i>			
	ΔP	$\Delta M1$	$DEFY$
	14.98 ^a	16.56 ^a	3.83
<i>Multivariate Statistics for Testing Stationary: $LR \sim X^2$ (p-r)</i>			
	ΔP	$\Delta M1$	$DEFY$
	18.45 ^a	18.85 ^a	17.75 ^a
<i>Test for Weak Exogeneity: $LR \sim X^2$ (r)</i>			
	ΔP	$\Delta M1$	$DEFY$
	10.64 ^a	5.16 ^a	0.09
System z_2 (ΔP, $\Delta M0$, $DEFY0.09$)			
<i>Standardized Eigenvectors (β's)</i>			
	ΔP	$\Delta M0$	$DEFY$
First vector	1.000000	-0.730609 ^b	-0.153536
Second vector	-1.368721 ^b	1.000000	0.210148
System z_3 (ΔP, $\Delta M3$, $DEFY$)			
<i>Standardized Eigenvectors (β's)</i>			
	ΔP	$\Delta M3$	$DEFY$
First vector	1.000000	-0.714958 ^b	0.036401
Second vector	-1.398684 ^b	1.000000	-0.050914

^a Indicates significance at the 0.05 level. ^b Indicates significance at the 0.01 level.

to the previous case.¹⁰ Once again, the budget deficit continues to be the only exogenous variable in the benchmark system, while money growth and inflation are determined jointly (endogenously).

Regarding the fiscal deficit, the VEC-new-sample model provides no results to support the role assigned in the previous case. The size of the budget deficit parameter in the money supply equation is larger than what is included in equation 7. Nonetheless, its significance level is below 0.1. In addition, when examining the pair-wise granger causality test (Table 3), we found no evidence that the fiscal deficit caused growth in money supply during this longer period. Hence, we cannot conclude that the fiscal deficit had inflationary effects for the period 1955 to 2007 as, in fact, we did conclude for a shorter period (from 1982 to 2007).

5. CONCLUDING REMARKS

This paper attempts to offer evidence on the causal long-term relationship between budget deficit, money growth and inflation in Colombia, considering the standard (*M1*), the narrowest (*M0-Base*) and the broadest (*M3*) definitions of money supply. The Johansen cointegration test suggests there is at least one cointegration vector among these variables. Under such circumstances, we employed a vector error correction (VEC) model, since it offers more and better information compared to other data generation processes. The VEC model was estimated for two samples according to data availability. The first covers a period of 53 years (from 1955 to 2007) and is done with annual series. Nevertheless, as the VEC technique relies heavily on the existence of consistent quarterly data over an amply long period of time, we considered a second sample from 1982Q1 to 2007Q4.

The results point to a close long-term relationship between inflation and money supply, comparable to what is found in other

¹⁰ Surprisingly, for the exclusion test, the null hypothesis is not rejected lightly for the fiscal deficit at the 0.05 level of significance: $X^2(r)=3.83$ versus a critical value of $X^2(r)_{C,0.05}=3.84$. Nevertheless, this hypotheses is rejected at the 0.1 level of significance $X^2(r)_{C,0.1}=2.705$.

countries with analogous or different techniques (the long-term coefficient is 0.96 for the shorter period). As expected, this coefficient is lower with the narrowest and the broadest definition of the monetary aggregate (0.88 and 0.76, respectively). With regard to the role of the fiscal deficit, the VEC estimates provide evidence that a one percentage point increase in the fiscal deficit (as a share of GDP) leads an increase of almost 0.46 percentage points in the *M1* growth rate. The size of this parameter looks also acceptable, above all when compared to what is found in other emerging countries.

The causal long-term relationship between budget deficit, money growth and inflation could vary depending on the degree of independence of the central bank and the type of monetary-policy regime, as it has been explored in other studies. However, these subjects are beyond the scope of this paper and should be the subject of further research.

Based on *i*) the sign of the long-term parameters and their significance level; *ii*) the tests for exclusion, stationarity and weak exogeneity; and *iii*) the pair-wise granger-causality test for the benchmark system variables, we conclude that the Sargent and Wallace hypothesis (SW-H) could be the most appropriate approach to understanding the dynamics among this set of variables in Colombia as of 1980. The SW-H has two parts. One concerns causality and calls for the budget deficit to cause money growth and, subsequently, money growth to cause inflation. The other is exogenous, in which fiscal deficit is required to be weakly exogenous, particularly in the long-term money growth equation. Our findings do not uphold the orthodox monetarist hypothesis (MH), the fiscal theory of the price level (FTPL) or the new Keynesian (NK) endogenous money hypothesis.

REFERENCES

- Barnhart, S., and A. Darrat (1988), "Budget deficits, money growth and causality: Further OECD evidence", *Journal of International Money and Finance*, vol. 7, June, pp. 231-42.
- De Haan, J., and D. Zelhorst (1990), "The impact of government deficit on money growth in developing countries", *Journal of International Money and Finance*, vol. 9, December, pp. 455-69.

- Dickey, D., and W. A. Fuller (1979), "Distribution of the estimators for autoregressive time series with a unit root", *Journal of the American Statistical Association*, vol. 74, pp. 427-31.
- Edwards, S., and G. Tabellini (1991), "Explaining fiscal policies and inflation in developing countries", *Journal of International Money and Finances*, vol. 10, pp. 16-48.
- Favero, C., and F. Spinelli (1999), "Deficit, money growth and inflation in Italy: 1875-1994", *Economic Notes*, vol. 28, n° 1, pp. 43-71.
- Galí, J. (2008), *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*, Princeton University Press, Princeton, N. J.
- Galí, J., and M. Gertler (2007), *Macroeconomic modeling for monetary policy evaluation*, Universitat Pompeu Fabra Department of Economics and Business (Working Papers, n° 1039).
- García, J., and L. Guterman (1988), "Medición del déficit del sector público colombiano y su financiación: 1950-1986", *Ensayos sobre Política Económica* (Banco de la República), n° 14, December, pp. 115-33.
- Gerlach, Stefan (2004), "The two pillars of the European Central Bank", *Economic Policy*, vol. 40, October, pp. 389-439.
- Ghartey, E. (2001), "Macroeconomic instability and inflationary financing in Ghana", in *Economic Modelling*, vol. 18, 415-33.
- Harris, R. (1995), *Cointegration Analysis in Econometric Modelling*, ch. 5, Prentice Hall/Harvester Wheatsheaf, pp. 76-90.
- Jalil, M., and L. Melo (1999), *Una relación no lineal entre inflación y los medios de pago*, Mimeo, Banco de la República, December.
- Johansen, S., and K. Juselius (1990), "Maximum likelihood estimation and inference on cointegration with applications to the demand for money", *Oxford Bulletin of Economics and Statistics*, vol. 52, pp. 169-210.
- Joines, D. (1985), "Deficit and money growth in the United States: 1872-1983", *Journal of Monetary Economics*, vol. 16, pp. 329-51.
- Junguito, R., and H. Rincón (2004), *La política fiscal en el siglo XX en Colombia*, Banco de la República, August (Borradores de Economía, n° 318).
- Karras, G. (1994), "Macroeconomic effects of budget deficit: Further international evidence", *Journal of International Money and Finance*, vol. 13, n° 2, pp. 199-210.

- King, R., and C. Plosser (1985), "Money, deficit and inflation", in K. Brunner and A. H. Meltzer (eds.), *Understanding Monetary Regimes* (Carnegie-Rochester Series on Public Policy, pp. 147-195).
- Lozano, I. (2004), *Colombia's public finance in the 1990s: a decade of reforms, fiscal imbalance, and debt*, In *Fiscal Deficits in the Pacific Region*, Chap 5, Edited by Akira Kohsaka, Ed Routledge T & F G.
- Lozano, I., and M. Herrera (2008), *Dominancia fiscal versus dominancia monetaria: evidencia para Colombia, 1990-2007*, Banco de la República (Borradores de Economía, n° 485).
- Lütkepohl, H. (2004), *Applied Time Series Econometrics*, Edited by Helmut Lütkepohl.
- McCandless, G., and W. Weber (1995), "Some monetary facts", *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 19, n° 3, pp. 2-11.
- Metin, K. (1998), "The relationship between Inflation and the budget deficit in Turkey", *Journal of Business & Economic Statistics*, vol. 16, n° 4, October, pp. 412-22.
- Misas, M., E. López and P. Querubín (2002), *La inflación en Colombia: una aproximación desde las redes neuronales*, Mimeo, Banco de la República, February.
- Misas, M., C. Posada and D. Vásquez, (2001), *¿Está determinado el nivel de precios por las expectativas de dinero y producto en Colombia?*, Mimeo, Banco de la República, October.
- Nachega, J. (2005), *Fiscal dominance and inflation in the Democratic Republic of the Congo*, IMF (Working Paper, n° 05/221).
- Nelson, E. (2003), "The future of monetary aggregates in monetary policy analysis", *Journal of Monetary Economics*, vol. 50, pp. 1029-59.
- Nelson, E. (2008), *Why money growth determines inflation in the long run: Answering the Woodford critique*, Federal Reserve Bank of St. Louis (Working Paper, n° 2008-013A).
- Özatay, F. (2000), *The currency crisis in Turkey*, Ankara University (Working Paper).
- Phillips, P., and P. Perron (1988), "Testing for a unit root in time series regression", *Biometrika*, vol. 75, pp. 335-46.
- Protopapadakis, A., and J. Siegel (1987), "Are money growth and inflation related to government deficit? Evidence from ten

- industrialized economies”, *Journal of International Money and Finance*, pp. 31-48.
- Sargent, T, and N. Wallace (1981), “Some unpleasant monetarist arithmetic”, *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 5, pp. 1-17.
- Sikken, B., and J. de Haan (1998), “Budget deficit, monetization, and central bank independence in developing countries”, *Oxford Economic Papers*, vol. 50, pp. 493-511.
- Sowa, N. (1994), “Fiscal deficit, output growth and inflation: Targets in Ghana”, in *World Development*, vol. 22, n° 8, pp. 1105-1117.
- Tekin-Koru, A., and E. Özmen (2003), “Budget deficits, money growth and inflation: The Turkish evidence”, *Applied Economics*, *Taylor and Francis Journals*, vol. 35, n° 5, pp. 591-96.
- Wickens, M. (2008), *Macroeconomic Theory: A Dynamic General Equilibrium Approach*, Princeton University Press, Princeton, N. J.
- Woodford, M. (1995), *Price level determination without control of a monetary aggregate*, National Bureau of Economic Research, August (Working Paper, n° 5204).
- Woodford, M. (2003), *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press, Princeton, N. J.
- Woodford, M. (2007), *How important is money in the conduct of monetary policy*, NBER (Working Paper, n° 13325).

Brian Francis
Troy Lorde
Kimberly Waithe

Balance of payments adjustment in Barbados

1. INTRODUCTION

In September 1991, Barbados implemented a structural adjustment programme aided by the international monetary fund (IMF). The government of Barbados invited the IMF to provide balance of payments support to the country's depleted foreign reserves which had reached a low BBD 38.9 million. That diminution of the foreign reserves resulted from several factors; namely, fiscal over expansion that caused the central government's fiscal deficit to rise to 7.5% of GDP in 1990; a bunching of external debt repayments; and poor performances of all the main foreign exchange sectors, particularly tourism, sugar, and manufacturing. The problems generated by the reduction in the country's foreign reserves were exacerbated by the negative impact of the gulf war in Iraq which not only led to a decline in travel and tourism but also to an increase in the oil price and hence inflation, which

Paper prepared by B. Francis, T. Lorde, and K. Waithe in that order. B. Francis and T. Lorde are Lecturers in the Department of Economics, University of the West Indies, Cave Hill Campus, Bridgetown, Barbados; and K. Waithe is an Economist in the Ministry of Finance and Economic Affairs, Warrens, St. Michael, Barbados.

surged to an average of 6% in 1990 and 1991 both of which stood above the annual average rate of 3% for the Barbadian economy.

The severity of the problems faced in 1991 was such that the government came under tremendous pressure from the IMF to devalue the local currency. That pressure was resisted through the implementation of tight fiscal and monetary reforms which resulted in among other things an 8% cut in public sector wages and the retrenchment of more than 3,000 government employees.

It therefore came as no surprise when Arthur (2005)¹ proposed several measures aimed at curtailing imports of consumer goods, as well as improving revenue generation that can, in turn, be injected into boosting the country's productive capacity and, by extension, export potential. These measures clearly reflect the government's response to what it perceived as potentially serious Balance of Payments (BOP) adjustment problems facing the economy. If not remedied, severe BOP problems could have serious consequences for macroeconomic stability within the Barbadian economy as evident in 1991.

Clearly, given the decision of the government to intervene to resolve potential BOP challenges for the economy, several key questions arise. First, was there cause for concern? Second, what factors accounted for the BOP problems? Third, what were the proposed remedies? Fourth, what economic and historical experiences provided the foundations for those BOP problems? Fifth, is there any theoretical justification for Arthur's (2005) intervention? Sixth, can the proposed remedies help relieve some of the pressures on the BOP? The search for answers to these key questions forms the basic motivation for our paper. We believe that answers to these questions could contribute to the policy debate pertaining to the role of the government or market in resolving balance of payments problems in small, open economies like Barbados. In this light, the objective of our paper is to provide an economic analysis of the problem and its potential solutions based upon available data.

¹ By Arthur (2005) is meant Owen S. Arthur who was the Prime Minister and Minister of Finance in Barbados from 1994-2008. As Prime Minister, he was Head of the Government. Therefore, all references to Arthur (2005) throughout the paper are synonymous to the Government of Barbados.

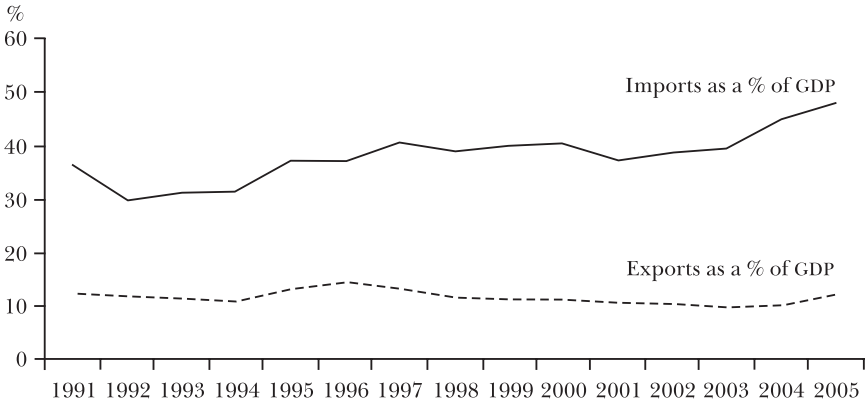
To achieve our objective and provide answers to the six questions of interest, the rest of the paper is structured as follows. The answer to the first question is discussed in section 2. This section presents a summary of the contextual framework within which Arthur (2005) proposed measures to tackle the potential BOP problems facing the country. The answer to the second and third questions are addressed in section 3, which documents and analyses the main factors identified as the cause of the BOP problems and policies proposed by the Arthur (2005) to alleviate them. Section 4, which addresses the fourth question, summarises the economic and historical experiences of Barbados that have led to the evolution of the pattern of trade observed and BOP challenges. The fifth question is taken up in section 5, which highlights some of the main theoretical arguments for and against government's intervention to resolve BOP problems, and the policies necessary to affect BOP equilibrium. This section also assesses these theoretical policy views within the context of the Barbados case. The final section contains some concluding remarks and provides an answer to the sixth question.

2. THE CONTEXTUAL FRAMEWORK

At present, the major challenges facing Barbados with respect to its balance of payments position relate directly to the country's external trade balance and international reserves position.

According to the Central Bank of Barbados *Balance of Payments of Barbados 2006*, during 2005, the visible trade balance deteriorated by BBD 229.2 million (11.8%) to BBD 2,171.1 million. In that same period, visible trade payments amounted to BBD 2,928.2 million, compared to BBD 2,528.1 million one year earlier, representing the largest outflow within the last decade. This expansion has been reflected in the burgeoning of merchandise imports, specifically in consumer and intermediate goods imports. As illustrated in Figure 1, merchandise imports continuing on an increasingly upward trend since 1992, amounted to nearly 50% of gross domestic product (GDP) by the end of 2005. Consequently, the current account deficit expanded to an estimated 12.3% of GDP, up from 12.0% in 2004 (see Figure 2).

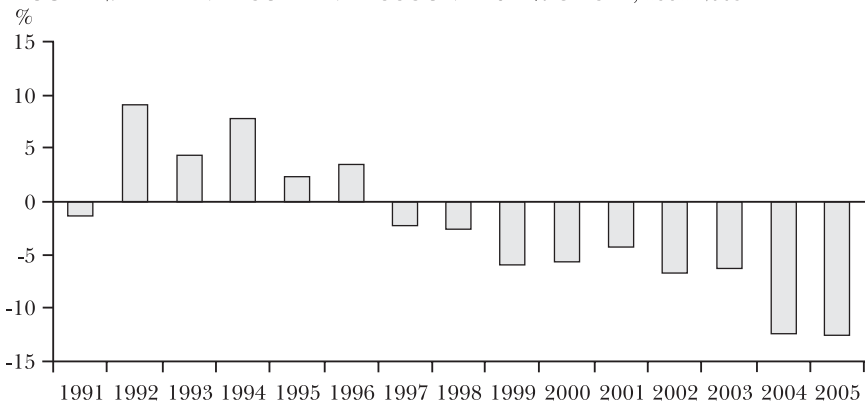
According to Summers (1996), a current account deficit in excess

FIGURE 1. EXPORTS AND IMPORTS AS A % OF GDP, 1991-2005

SOURCE: Central Bank of Barbados, *Balance of Payments of Barbados*, 2006.

of 5% of GDP should warrant some degree of concern. As Figure 2 shows, with the marginal exception of 2001, Barbados' current account deficit has persistently exceeded this threshold from 1999-2005, a period of seven years. Summers maintained that such a scenario is even more critical if the deficit is particularly financed in a way that leads to rapid reversals. This position gained greater prominence after empirical studies on the Asian crisis concluded that countries that were hit hard were those with large deficit/GDP ratios throughout the 1990s (Corseti, Pesenti and Roubini, 1999; Radelet and Sachs, 2000).

As a result of this strong import growth, primarily driven by demand in the non-traded sectors, high international energy prices,

FIGURE 2. EXTERNAL CURRENT ACCOUNT AS A % OF GDP, 1991-2005

SOURCE: Central Bank of Barbados, *Balance of Payments of Barbados*, 2006.

and the moderate decline in tourism (the country's main foreign exchange earning industry), severe pressure has been placed on the Net International Reserves (NIR) of the monetary authorities. As such, the modest rise of BBD 48.7 million in the NIR in 2005 is primarily the proceeds of an international bond issue (BBD 245.2 million) during the fourth quarter. This performance is a reversal from the BBD 312.9 million contraction in the previous year (see Table 1). Moreover, as illustrated in Table 1, the NIR without this foreign borrowing would actually register a decline of BBD 156.8 million. Other significant increases in the NIR, such as in 1995, 1999, 2000 and 2001, have also been supported by high amounts of foreign borrowing.

TABLE 1. NET INTERNATIONAL RESERVES

Years	<i>Changes in Net International Reserves (- increase/+decrease)</i>		<i>Changes in Net International Reserves without Foreign borrowing (- increase/+decrease)</i>
	<i>Reserves (- increase/+decrease)</i>	<i>Bonds and Notes</i>	
1995	-82.8	80.8	-2.0
1996	-173.2	-8.0	-181.2
1997	-36.1	-48.0	-84.1
1998	11.0	-48.2	-37.2
1999	-73.9	90.0	16.1
2000	-356.0	200.0	-156.0
2001	-445.4	300.0	-145.4
2002	47.7	-20.0	27.7
2003	-136.9	-20.0	-156.9
2004	312.9	-24.9	288.0
2005	-48.7	205.5	156.8

SOURCE: Central Bank of Barbados *Balance of Payments of Barbados 2006*.

The Central Bank of Barbados *Annual Report 2006* also notes that although Barbados registered a surplus on the capital and financial account (BBD 671.7 million) in 2006, approximately BBD 88.5 million above the balance recorded in 2005, this was insufficient to offset the external current account deficit. Thus, as in 2005, the balance of payments was buttressed by significant foreign borrowing (BBD 135.9 million), and there was a BBD 37.6 million reduction in the NIR. Taken together, this evidence clearly points to the unstable nature of Barbados' NIR position.

Hence, the main thrust of the Government of Barbados' economic policy was to address certain structural trends in the country's external trade and its international reserves position, both of which were sufficiently worrisome to warrant the attention of the Government. It is within this context that Arthur (2005) proposed several solutions to the current balance of payments challenges facing the economy. The next section outlines the sources of Barbados' external account woes and the proposed remedies.

3. THE FACTORS AND THE PROPOSED REMEDIES

3.1 Factors Responsible for the Balance of Payments Problems

According to Arthur (2005), Barbados' current BOP problems can be linked to several factors. However, the three that will be highlighted and analysed in this paper are: the huge and rapidly growing import bill; the inheritance of a weak export structure that relied too heavily on preferential access of agricultural commodities to the European Market; and macroeconomic factors, particularly easy access to credit.²

In relation to the first factor, there has been a continued surge in import demand. At the end of 2005, retained imports amounted to BBD 2,911.0 million, a growth of 11.3% (BBD 294.8 million). This increase was mainly due to a 16.4% increase in consumer goods imports, particularly in food and beverages and motor car imports; growth in these areas was 14.1% and 17.8% in 2003 and 2004 respectively.

Additionally, the price of oil had more than doubled, moving from USD 30 per barrel to the unprecedented level of USD 70 per

² Other factors include the significant reduction in revenue generation from offshore financial services transactions and international business; the consolidation of all of Barbados' indirect taxes into one Value Added Tax; trade liberalisation efforts under the auspices of the World Trade Organisation; the implementation of the CARICOM Common External Tariff (CET); the Organisation for Economic Cooperation and Development harmful tax competition initiative that not only put the international business and financial sector's development on pause, but threatened the very survival of the sector; and China joining the World Trade Organisation and its subsequent production of most of the world's textiles.

barrel by the end of 2005. These high oil prices are unlikely to dissipate in the short or medium term and it is reasonable to assume that prices will continue to rise for some time into the future. In December 2007, crude oil prices rose to an all time high of USD 100 per barrel, putting pressure on the already high and rising import bill. The potential for severe natural disaster like hurricanes, earthquake or tsunami, compounds the risk and uncertainty for the Barbadian economy. Recognising this, the Barbados government sought to devise and implement strategies which would minimise the effect of these high oil prices.

These strategies include intensification of efforts to maximise the production of crude oil and natural gas, diversification of the energy mix to make natural gas and other non-liquid fuels more dominant in the economy, introduction and maintenance of a comprehensive set of energy conservation and efficiency measures aimed at maximising the efficient use of energy, and ensuring that renewable energy plays a progressively more significant role in the economy.

With reference to the second factor, it has been argued in the literature that the price concessions and guaranteed access for many African, Caribbean and Pacific (ACP) States' exports to the European Union (EU) have encouraged many ACP states to remain heavily dependent on a few traditional primary products that are hardly competitive in the global market place. As such, it is believed that trade preferences, such as the LOME Convention, have contributed to inefficiency in production in some developing countries, including CARICOM.³ These countries have long depended on these trade preferences within the international trading arena for the promotion of their export trade and economic growth. The view is that such preferences merely serve to provide a safety net for inefficient and non-innovative exporters, who could not otherwise survive in the open international export market. Consequently, this prolonged dependence has caused these economies to remain fragile and vulnerable to external economic shocks. In sum, the benefits enjoyed under the LOME

³ CARICOM countries are Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

Convention and other trading arrangements with the United States and Canada, have inhibited the development of local producers and thus the ability of a number of these countries to attain self-sustained economic growth and development.

As a result, one major cause for concern among ACP countries is the fact that traditional benefits, enjoyed under the regime of preferential treatment, are gradually being eroded. The original preferential margins in Europe have already been reduced by the gradual reductions in the *most favoured nation* (MFN) tariffs, over the years. Furthermore, the future of the protocols that for many years have guaranteed export of Caribbean sugar, bananas and rum to Europe are in jeopardy. This certainly affects the Barbados sugar industry, which has experienced severe competition on the international arena in recent times.⁴

It is no surprise, therefore, that Barbados' real economic activity in recent years has been led by robust growth in the non-traded sectors. Consequently, 2005 marked the second consecutive year in which traded sector growth was outpaced by that of the non-traded sectors. The weak performance of the traded sectors, which declined by 1%, was almost entirely due to a fall-off in cruise ship activity and in some of the major long-stay tourism markets. On the other hand, in the non-traded sectors, there was a broad based expansion of 5.8%, driven mainly by the growth in construction activity, as was the case in 2004. This relative expansion in the non-traded sectors is likely to result in increased pressure on the external account deficit and lead to a contraction of net international reserves. As a result, the rise in retained imports, which underpins the growth in non-traded activity, has outpaced any net earnings from services, particularly tourism, and domestic merchandise exports.

However, with the hosting of the International Cricket Council (ICC) Cricket World Cup (CWC) 2007, the strength of the pound sterling and an expected recovery in cruise tourism, faster growth

⁴ The age of economic preferences effectively came to an end, in 2005, with the decision of the European Union to cut the guaranteed price for sugar provided to the ACP countries by 36% over a four-year period. As such, the current guaranteed price of EUR 523.7 per tonne is scheduled to decrease to EUR 335 by the 2008/2009 crop. Based on its quota to the EU of 31,097 tonnes (white sugar equivalent), Barbados stands to lose more than BBD 30 million over the four year period.

in tourism is expected in the future. According to the Central Bank of Barbados *Annual Report 2006*, tourism output is conservatively projected to grow by 6% in 2007 and should result in a higher overall growth rate for the traded sectors, thus easing the pressure on the balance of payments. In addition, a significant portion of the capital and financial inflows, which were used to finance productive projects including the redevelopment of Kensington Oval into a multipurpose world-class facility, the refurbishment of hotels (for example, Hilton Barbados and Accra Beach Hotel), and the improvement of road infrastructure, is expected to expand the country's earning capacity over time.

Regarding the third factor, Arthur (2005) has inferred that the external problems facing the Barbadian economy can also be traced to certain macroeconomic forces affecting the country. He lamented the fact that Barbadians are spending too much in relation to the country's earning capacity simply because they have easy access credit. Therefore, each time there is a surge in credit creation in excess of the growth in liquid assets in the financial system, that major addition to spending power puts additional pressure on the country's international reserves.

As noted in the Central Bank of Barbados *Annual Report 2005*, the robust growth in imports was reflected by the surge of non-financial private sector credit relative to the rate of growth in deposits. During this period, commercial bank credit to the non-financial private sector grew by BBD 687.2 million (23.3%) compared to a growth of only 11.2% growth in domestic deposits during the year, marking the largest annual growth in credit since the Central Bank was established in 1972. The situation was exacerbated by a reduction in import duties from 45% on average during the 1980s to 20% at present. This reduction in duties not only lowered the cost of extra-regional imports into Barbados, but also increased the competitive position of imports.

Overall, the country continues to witness an unsustainable demand for imports. In 2005 alone, Barbados' imports increased by almost BBD 300 million, a growth of 11%. Arthur (2005) concluded that a series of measures would have to be instituted to control the growth of credit in the economy, because it is credit, above all else, that is causing the growth in Barbados' imports.

To summarise, therefore, what Barbados faces is the twin problem of surging imports and weak export performance. Thus, the

performance of the tourism sector in generating a tremendous amount of foreign exchange is insufficient to compensate for the growing demand of imported consumer goods and the inadequate performance of other traded sectors of the Barbadian economy. As a result, to counteract these difficulties, Arthur (2005) proposed several measures aimed at curtailing imports of consumer goods as well as improving revenue generation that can, in turn, be injected into boosting the country's productive capacity and, by extension, export potential. These measures are outlined in the subsequent sub-section.

3.2 Proposed Remedies

Based on Arthur's (2005) perception of the major factors responsible for the country's balance of payments difficulties, documented and analysed in section 3.1, he proposed several measures aimed at resolving the external imbalance, especially on the current account, so that the economy can return to a sustainable external position. First, the Central Bank of Barbados was given the mandate to tighten credit by increasing interest rates, as well as by varying the reserve requirements of commercial banks. This was to ensure that credit became more expensive and harder to attain, and to restrain the extent to which credit creation undermined Barbados' capacity to pay its way in the world. Indeed, the objective of this proposal was to put a line on credit creation for both public and private purposes if the economy was to restore external balance. However, Arthur (2005) urged the need for more credit to be directed towards expansion in agriculture and tourism, as well as other productive purposes rather than to the distributive sector and for personal use to purchase imports.

Second, emphasis was placed on measures geared at creating new capacity and bringing new incentives to stimulate desirable change with respect to exports. Towards this end, Arthur (2005) proposed the creation of a dedicated Export Promotion and Marketing Fund to assist in boosting exports. The fund will be capitalised largely from taxes on imports. This initiative was justified on the grounds that Barbadians are consuming BBD 2.8 billion worth of imported goods, and the fact that the rate of consumption is increasing at BBD 0.5 billion a year. The proposed

revenue-generating measure was a 3% excise tax on extra-regional imports⁵ of consumption goods for 18 months. This tax was subsequently raised to 6%. Goods needed for investment inputs, companies operating under incentives, and the hotel industry were all exempted from this tax. The anticipated effect of this measure was that the high rate of importation of foreign goods would be curbed and there would be greater sales of domestically produced goods. Hopefully, the net result of this measure would be the enhancement of domestic production capacity to expand Barbados' exports, and the building of distribution relationships with Barbadians and the domestic economy.

Third, Arthur (2005) noted that an aspect of Barbados' over consumption, and an area in which the country's import bill had been growing too fast, was the importation of motor vehicles. In this regard, he proposed a change in the excise tax on motor vehicles. For cars with engines' capacity of 1,800cc or a chargeable of BBD 45,000 or less, there was no change in the excise tax. However, cars carrying engines with a capacity greater than 1800cc, and which cost more than BBD 45,000, would witness an increase in the excise tax from 93% to 120%. Lorries that were 5 tonnes in weight or over would now pay an excise tax of 10% of their value. Finally, the environmental levy on used cars would move from BBD 150 per car to BBD 2,000 per car.

Indeed, Arthur (2005) pointed out that the revenues from the excise tax on extra-regional imports on consumer goods, the excise tax on motor vehicles over 1800cc and a chargeable value of BBD 45,000, the new excise tax on lorries five-tonnes and over, and the environmental levy on used cars, were not going into the general revenue but were to be used for specific purposes. Specifically, these funds would be credited to the Export Promotion and Marketing Fund to be administered by the Enterprise Growth Fund. A portion of the funds were also to be used to assist the private sector in improving their export production capacity.

Thus far, we have analysed three of the major factors identified as critical in understanding the balance of payments challenges confronting Barbados. We have also documented the policy

⁵ By extra-regional is meant imports originating from all countries except those in CARICOM.

measures proposed by Arthur (2005) to combat those challenges. In the next section, we address the economic and historical experiences of Barbados' development thrust, which underpin the balance of payments challenges the country faces.

4. THE ECONOMIC AND HISTORICAL EXPERIENCES OF BARBADOS

The huge surge in imports and the weak export performance witnessed in Barbados over the past decade are reflective of the types of historical relationships⁶ the country has forged over a long period of time with Europe and North America, as well as the shift in development strategies that occurred since the 1950s.

The economic performance of the Barbadian economy has and continues to be strongly influenced by the historical (and indeed colonial) relationship that exists with Europe, particularly the United Kingdom. Based on this colonial relationship, Barbados invested a huge amount of resources in its sugar industry, which benefits from preferential access to the European market and a subsidised price in excess of world market price. In addition, the performance of the country's tourism industry is greatly enhanced from large number of visitors from Europe on an annual basis.

Furthermore, the benefits derived from this relationship include stability in the prices of exports to Europe, favourable terms of trade, and continued access to preferential arrangements. Since most of these benefits accrue mainly to traditional agricultural staples such as bananas, sugar, and rice, little efforts were made to diversify the country's agricultural exports in particular and exports in general. Thus, the economy evolved with a rather narrow export base, which is now proving insufficient to offset the huge increases in imports, despite the strong performance of tourism.

To expand the range of economic activities in the country, Barbados implemented development strategies that involved some degree of industrialisation. Elements of those strategies were

⁶ See Blackman (1991) for a more detailed discussion of issues relevant to these relationships in Barbados and the wider Caribbean context.

consistent with the views expressed by Lewis (1950, 1954) – views that reflected some degree of dissatisfaction with the vast deterioration in the economic and social conditions of Caribbean countries and the manner in which the colonial authorities handled their developments. Lewis' strategy advocated the insertion of foreign enterprise and capital into the domestic economy to take advantage of cheap labour in the traditional agricultural sector and to manufacture for metropolitan markets. Specifically, Lewis prescribed export-based industrialisation for economic development, invitation to foreign capitalists to invest in the domestic economy, and granting tax and other incentives to encourage overseas investment in the country. Presently, these policies are being pursued in Barbados with some degree of success.

During the 1960s and 1970s, Lewis' ideas fell under severe scrutiny, mostly from the Plantation School.⁷ Contrary to Lewis' model of industrialisation through attracting foreign direct investment and promoting exports, the plantation model is one of internally propelled growth and development. In terms of policy prescriptions, the plantation economy model proposes that production be reorganised around the domestic economy, with the local sectors becoming the target for investment and long-term capital accumulation. A policy of import substitution industrialisation (ISI) was favoured. This paradigm dominated development policy in Barbados during the 1960s and 1970s as well as the early 1980s. This ISI strategy resulted in the establishment of inefficient local industries protected by high import duties and tariffs.

Faced with macroeconomic problems in the 1980s⁸ and spurred on by the International Monetary Fund (IMF) and the World Bank, Barbados, like other Caribbean countries, abandoned its inward-looking strategy of industrialisation in favour of

⁷ For some of the criticisms levied against Lewis and an in-depth exposition on the Plantation School, see Beckford (1972), Best (1968), and Thomas (1968).

⁸ Some of the economic problems of the 1980s included reductions in gross per capita investment, deterioration in physical and human capital, rising levels of malnutrition, rising levels of debt, sharp contraction in private capital inflows, an increase in net outflows of capital, weak economic structures, and inappropriate economic policies (Wilson, 1992). The 1970s oil crises significantly aggravated these economic problems. For a detailed discussion of the oil crises see Lee et al. (1990), Fleay (2000) and Odell (2001).

an outward-oriented development strategy. This strategy promoted exportation of processed products, semi-manufacturers, light manufacturing, and non-traditional agricultural commodities (rather than continue to focus on the export of a few major unprocessed primary products). The basic argument supporting this view was that openness to foreign competition and capital and elimination of export biases would engender structural change in accordance with the dictates of comparative advantage. In essence, import substitution industrialisation was replaced by an outward-oriented development strategy (Thorpe, 1997; Weeks, 1995).

As the outward-oriented paradigm gained favour with the United States Agency for International Development (USAID) and the World Bank, access to development funds became increasingly dependent on adopting policies consistent with this approach. During the period 1978-1988, the Organisation for Economic Cooperation and Development (OECD, 1992) documented the huge amount of resources in the form of official/overseas development assistance (ODA) to Barbados and other Caribbean countries from various bilateral and multilateral donors including the US,⁹ Canada, the United Nations Development Programme (UNDP), and the Inter-American Development Bank (IADB). Net ODA disbursements to the Caribbean from all sources, at 1987 prices and exchange rates, totalled BBD 572 million in 1978 and BBD 509 million in 1988 (OECD, 1992, p. 98-99). Agriculture benefited tremendously.

Thus, Barbados, like many other Caribbean countries, had little choice but to move in the direction of outward-oriented policies, despite continued scepticism regarding the efficacy of such policies. The acceptance of these liberal policies by institutions such as the IMF and World Bank resulted in the outward-oriented development strategy being identified as the Washington Consensus,¹⁰ which opposes import protection.

⁹ The US efforts towards boosting agricultural export expansion from the Caribbean was strongly supported by the passage of the Caribbean Basin Economic Recovery Act (CBERA) in 1983 and its successor, the Caribbean Basin Trade Partnership Act (CBTPA). The CBTPA expanded duty-free access to the US market granted under the original CBERA and provided near NAFTA parity to eligible beneficiaries.

¹⁰ Williamson (1993) is credited with the creation of the concept known as the

Based on the adoption of these liberal policies in Barbados, import duties and tariffs have been lowered, contributing significantly to the increases in imports documented and analysed earlier. However, the country's export base remains narrow with most foreign exchange earnings generated by tourism and sugar. With a narrow export base, the economy is unable to fully exploit available opportunities in the global market. Hence, it is becoming increasingly difficult to maintain BOP stability.

5. THEORETICAL PERSPECTIVES

In this section of the paper, we address the question of whether there is in fact any theoretical justification for the government's intervention to resolve any potential difficulties for the country's balance of payments. Our discussion draws heavily on an excellent presentation by Ruccio (1991). According to Ruccio (1991), there are essentially three strategies open to a government to alleviate balance of payments problems. These strategies can be classified as the neoclassical or market-oriented approach, the structuralist theory, and a third paradigm that draws wisdom from both the neoclassical and structuralist schools of thoughts.

The neoclassical approach is based on the belief that balance of payments problems arise principally from existing deficiencies that deny the external market its ability to achieve equilibrium. These deficiencies include, *inter alia*, the presence of an overvalued exchange rate and restrictions on the movement of foreign exchange, particularly out of the local economy. When the government deems it necessary to intervene in the functioning of the economy, that action creates distortions which not only results in the failure of the market to achieve desired equilibrium, but also transmits unseemly warning signs to individual economic participants. The absence of these distortions will guarantee that the economy will not move toward a state of macroeconomic disequilibrium. In any eventually, should macroeconomic disequilibrium occur, adjustments in individual reactions will restore market stability. If the market mechanism is designed to function in such an efficient manner, why would it be possible for the balance of

Washington Consensus.

payments to record a deficit? This situation can arise if the economy is impacted by an internal or external shock such as a hurricane or unexpected rise in world oil prices. In any event, individuals will respond, the market will eventually adjust, the disparity will wane, and the economy will return to macroeconomic equilibrium.

Notwithstanding the importance of individual actions and the power of the market mechanism, the neoclassical approach promotes several mainstream policy initiatives that are capable of resolving relentless disequilibria on the balance of payments. These policies include stabilising the government's fiscal account, real wage amendments, exchange rate adjustment (either through the implementation of a flexible exchange rate regime, or the devaluation of the local currency if it is deemed to be overvalued), liberalisation of exchange controls, and liberalisation of imports and exports. These measures are necessary to create the right conditions to support individual decision making and to create consistency between government's intervention and the environment required for the market mechanism to function efficiently. Clearly, therefore, within the neoclassical approach, the market mechanism will succeed in restoring balance of payments stability based on the reactions and adjustments made by individuals, not through government's intervention.

Unlike the neoclassical approach, the structuralist theory sees a major role for the government in resolving balance of payments problems. At the heart of the structuralist theory is the idea that the market mechanism is intrinsically flawed and therefore incapable of achieving balance of payments equilibrium independently. Hence, government's intervention is required. Accordingly, the structuralist theory prescribe policies such as greater management of the market mechanism, industrial policies to influence investment decisions at the microeconomic level when faced with uncertainties, and controls over the movements of capital to override potential as well as actual difficulties pertaining to the balance of payments.

The third strategy draws wisdom from both the neoclassical approach and the structuralist theory. This strategy advocates a role for both the market mechanism and the government in restoring balance of payments equilibrium, depending on circumstances. As Ruccio (1991) puts it "This middle position is thus

based on an ever-changing compromise between humanism and structuralism. At times, the tendency to reduce all economic phenomena to human nature is apparent; at other times, given economic and social structures play a significant role.”

During the structural adjustment programme in 1991, Barbados refused to let its currency float; hence, its policy prescriptions cannot strictly follow the neoclassical vein. There exists at all levels of Barbados’ society a consensus that maintaining the existing currency anchor with the US is essential to maintaining macroeconomic stability.¹¹ Indeed, it would be fair to characterise the defence of the exchange rate parity as the central pillar of Barbados’ macroeconomic strategy over the past two decades. While some of the larger economies in the Caribbean region (such as Guyana, Jamaica and Trinidad and Tobago) have opted for various strategies of staged devaluation and managed or *dirty* floating, Barbados has successfully maintained its fixed exchange rate since 1975, following a short period of devaluation as the currency moved from its peg with the pound sterling to its current US dollar peg. Moreover, given Barbados’ strong import demand, namely its high propensity to import consumer goods, exchange rate depreciation may not be particularly effective.

Based on the discussions in section 3, Barbados’ government policy is more in line with the structuralist’s views. This economy has registered strong economic growth over the past few years with a positive outlook for continued economic expansion. Moreover, it has maintained its parity and has recorded no major economic crisis in the last decade. As a result of the robust growth in imports, which was reflected by the surge in non-financial private sector credit, the Central Bank implemented tight monetary measures such as raising the minimum deposit rate on four occasions (a cumulative expansion of 2.5 percentage points), as well as raising the Bank rate. Liquidity in the banking system was tightened in 2005, as reflected in the reduction of the liquid asset ratio to 9.8% from 14.0% in 2004.

¹¹ As Worrell et al. (1998) argue, during the midst of the 1991 crisis, “the exchange rate anchor was supported by all influential interest groups.” For further insight into macroeconomic policymaking in Barbados and an exposition of what one could term the ‘Bridgetown Consensus’ view concerning the exchange rate anchor, see Blackman (1998).

The implementation of these measures led to some success. As noted in the Central Bank of Barbados *Annual Report 2006*, the tight monetary stance and fiscal initiatives implemented in April 2005 resulted in a small decline in retained imports, in contrast to the sharp increase experienced over the previous three years when import growth averaged 13.5%. There was also a significant expansion in the export of goods and services, particularly in travel credits. The expansion in credit to the non-financial private sector slowed from the historical high of 23.8% (BBD 730 million) in 2005 to 13.2% (BBD 501.1 million) in 2006, when the rate increases took effect. Nonetheless, this increase is still above the rate of 6.3% (BBD 151.6 million) averaged between 1999 and 2004 and represents the second highest level of growth since the establishment of the Central Bank in 1972. Thus, the current tight fiscal and monetary policy environment is recommended in the context of Barbados.

The current account deficit for 2006 remained high but improved for the first time since 2001, primarily as a result of the robust growth in domestic merchandise exports, an expansion in travel credits and a contraction in retained imports. Exports of domestic goods rose by 16.8%, representing the third consecutive year of expansion and the second successive year of double digit growth, while the level of retained imports contracted by 1.5% marking the first reduction since 2001. Consumer goods imports also declined, weakening by 12.6%, in contrast to the 16.4% rise in 2005. Consequently, the external account deficit fell from 12.3% of GDP in 2005 to an estimated 8.4% of GDP in 2006. This fall-off, when compared to the annual average expansion of 13.5% during 2003 to 2005, is indicative of the success of the monetary policy measures as well as the cess implemented in 2005. From this evidence, we can therefore argue that the measures announced by Arthur (2005) are economically sound from a structuralist perspective, as a means of solving Barbados balance of payments difficulties.

6. CONCLUSION

Faced with the twin problems of surging imports and weak performances of the export sectors, the government of Barbados felt

obliged to institute measures to alleviate any potentially severe difficulties that can arise in respect of the country's balance of payments. On the basis of that intervention, the government proposed several measures aimed at curtailing imports of consumer goods, as well as improving revenue generation that can, in turn, be injected into boosting the country's productive capacity and, by extension, export potential.

Within this context, we addressed six key questions: Was there cause for concern? What factors accounted for the BOP problems? What were the proposed remedies? What economic and historical experiences provided the foundations for those BOP problems? Is there any theoretical justification for Arthur's (2005) intervention? Can the proposed remedies help relieve some of the pressures on the BOP? In search of answers to these key questions, we provided an economic analysis of the problem and its potential solutions based upon available data.

The first question was addressed in the section on contextual framework. Based on the evidence presented there was indeed sufficient cause for concern to warrant an intervention by the government. The second and third questions were discussed in the section on the factors and the proposed remedies. The fourth question was deliberated in the section on economic and historical experiences. Barbados' reliance on preferential access to the European market, the shift in development strategy from import substitution industrialisation to outward orientation, and the reliance on tourism as the major foreign exchange earner have all contributed significantly to the balance of payments challenges confronting the economy. The fifth question was addressed in the section on theoretical perspectives. Indeed, the government's intervention can be justified within the context of the structuralist paradigm. Of course, neoclassical economists would argue for more market-oriented solutions.

Finally, let us answer the sixth question posed. It is our contention that the proposed remedies may only relieve some of the pressures on the balance of payments in the short term. Barbados' strong import growth is primarily driven by demand in its non-traded sectors, which, as a result of rapid expansion in recent years, is on average about one-third larger than the traded sectors. This leads to continual pressure on the existing external current account deficit and the international reserve position.

Thus, although further tightening of monetary policies to reduce the risks of overheating and to help support the exchange rate peg are recommended, this may only provide a brief reprieve in the short run.

Furthermore, we believe that the success of the measures depends heavily on moral suasion, and the willingness and ability of Barbadians to comply with the policies prescribed. Thus, given the strong demand for imports, especially consumer goods imports, the long-term solution to Barbados' Balance of Payments problems requires a fundamental change in Barbadians' preference relations vis-à-vis demand for domestic versus foreign produced goods and services and channelling of credit more to productive activities as opposed to the purchase of imported consumer items.

In addition, exports of merchandise have remained uncompetitive and dependent on government support and preferential access to foreign markets. Thus, it also requires the development and implementation of a comprehensive export strategy driven by international competitiveness. Finally, with the significant portion of capital and financial inflows used to finance productive projects, such as tourism-related building activities to host CWC 2007 and comprehensive Road Rehabilitation programmes, the country's earning capacity is expected to expand over time. These activities in combination with the strength of the pound sterling and an expected recovery in cruise tourism point to faster growth in tourism in the future, thus easing the pressure on the balance of payments.

REFERENCES

- Ahmad, Jaleel (1978), *Import Substitution, Trade and Development*, JAI Press USA, Greenwich, Connecticut.
- Arthur, Owen S. (2005), *The Export Promotion and Marketing Fund Bill, 2005*, Order No. 6: Statement to the House of Representatives, Barbados, Tuesday, August 23.
- Beckford, G. L. (1972), *Persistent Poverty - Underdevelopment in Plantation Economies of the Third world*, Oxford University Press, New York.

- Best, Lloyd (1968), "Outlines of a Model of Pure Plantation Economy", *Social and Economic Studies*, vol. 17, n° 3, pp. 283-326.
- Blackman, Courtney N. (1991), "The Economic Management of Small Island Developing Countries", *Caribbean Affairs*, vol. 4, n° 4, pp. 1-12.
- Blackman, Courtney N. (1998), *Central Banking in Theory and Practice: A Small States Perspective*, Caribbean Centre for Monetary Studies, St Augustine, Trinidad and Tobago.
- Central Bank of Barbados (2005), *Annual Report*, Central Bank of Barbados, St. Michael, Barbados.
- Central Bank of Barbados (2006), *Annual Report*, Central Bank of Barbados, St. Michael, Barbados.
- Central Bank of Barbados (2006), *Balance of Payments of Barbados*, Central Bank of Barbados, St. Michael, Barbados.
- Corsetti, G., P. Pesenti and N. Roubini (1999), "What caused the Asian currency and financial crisis?", *Japan and the World Economy*, vol. 11, n° 3, pp. 305-373.
- Lewis, W. A. (1950), "The Industrialisation of the British West Indies", Reprinted in Patrick A. M. Emmanuel (ed.), *Sir William Arthur Lewis: Collected Papers 1941-1988*, University of the West Indies Press, Kingston, Jamaica, pp. 824-64.
- Lewis, W. A. (1954), "Economic development with unlimited supplies of labor", Reprinted in Patrick A. M. Emmanuel (ed.), *Sir William Arthur Lewis: Collected Papers 1941-1988*, University of the West Indies Press, Kingston, Jamaica, pp. 900-28.
- Organisation for Economic Cooperation and Development (1992), *Development and Democracy: Aid Policies in Latin America*, Organisation for Economic Cooperation and Development, Paris.
- Radelet, S., and J. Sachs (2000), "The Onset of the East Asian Currency Crisis", in Paul Krugman (ed.), *Currency Crises*, University of Chicago Press, Chicago, pp. 153-61.
- Ruccio, David F. (1991), "When Failure Becomes Success: Class and the Debate Over Stabilisation and Adjustment", *World Development*, vol. 19, n° 10, pp. 1315-34.
- Summers, Lawrence H. (1996), "The Macroeconomics of Capital Flows to Latin America: Experience and Policy Issues: Commentary", in Ricardo Hausmann and Liliana Rojas-Suarez (eds.), *Volatile Capital Flows: Taming Their Impact on Latin America*, Inter-American Development Bank, Johns Hopkins University Press, Washington, D. C., pp. 53-57.

- Thomas, C. Y. (1968), "Pure Plantation Economy: Comment", *Social and Economic Studies*, vol. 17, n° 3, pp. 339-48.
- Thorpe, A. (1997), "Structural Adjustment and the Agrarian Sector in Latin America", in M. Spoor (ed.), *The 'Market Panacea': Agrarian Transformation in Developing Countries and Former Socialist Countries*, IT Publications, London, pp. 15-28.
- Weeks, John (ed.) (1995), *Structural Adjustment and the Agricultural Sector in Latin America and the Caribbean*, MacMillan Press, London.
- Williamson, John (1993), "Democracy and the Washington Consensus", *World Development*, vol. 21, n° 8, pp. 1329-36.
- Worrell, D., D. Marshall and N. Smith (1998), *The Political Economy of Exchange Rate Policy in the Caribbean*, Central Bank of Barbados Central Bank of Barbados, St. Michael, Barbados (Working Papers, pp. 121-48).

MEMBERS OF CEMLA

ASSOCIATES

Banco Central de la República Argentina	Banco de Guatemala
Centrale Bank van Aruba	Bank of Guyana
Central Bank of the Bahamas	Banque de la République d'Haïti
Central Bank of Barbados	Banco Central de Honduras
Central Bank of Belize	Bank of Jamaica
Banco Central de Bolivia	Banco de México
Banco Central do Brasil	Bank van de Nederlandse Antillen
Eastern Caribbean Central Bank	Banco Central de Nicaragua
Cayman Islands Monetary Authority	Banco Central del Paraguay
Banco Central de Chile	Banco Central de Reserva del Perú
Banco de la República (Colombia)	Banco Central de la República Dominicana
Banco Central de Costa Rica	Centrale Bank van Suriname
Banco Central de Cuba	Central Bank of Trinidad and Tobago
Banco Central del Ecuador	Banco Central del Uruguay
Banco Central de Reserva de El Salvador	Banco Central de Venezuela

COLLABORATORS

Central Banks

Deutsche Bundesbank (Alemania)	Banca d'Italia
Bank of Canada	De Nederlandsche Bank (Países Bajos)
Banco de España	Bangko Sentral ng Pilipinas
Federal Reserve System (Estados Unidos)	Banco de Portugal
Banque de France	European Central Bank

Other Institutions

Superintendencia de Bancos y Seguros (Ecuador)	Superintendencia de Bancos (República Dominicana)
Superintendencia del Sistema Financiero (El Salvador)	Banco Centroamericano de Integración Económica
Superintendencia de Bancos (Guatemala)	Banco Latinoamericano de Exportaciones, S. A.
Comisión Nacional de Bancos y Seguros (Honduras)	Deutscher Genossenschafts- und Raiffeisenverband e. V. (Confederación Alemana de Cooperativas)
Superintendencia de Bancos (Panamá)	Fondo Latinoamericano de Reservas

CENTRO DE ESTUDIOS MONETARIOS LATINOAMERICANOS

Asociación Regional de Bancos Centrales

www.cemla.org