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# **MODELLING TOURISM DEMAND FROM MAJOR INTERNATIONAL MARKETS: THE CASE OF ANTIGUA AND BARBUDA**



**BY**

**MR PETER ABRAHAM JR**

## **Abstract**

The aim of the paper is to examine the nature of tourism demand in Antigua and Barbuda from four of its main international markets: the US, UK, Canada and the Caribbean. The paper uses dynamic panel data methods with analysing annual data from 1980 to 2014. The Generalized Method of Moments (GMM) is used to estimate the quantitative relationship between the level of tourists' arrivals to Antigua and Barbuda and some hypothesised determinants. The literature suggests that income and price plays an important role in tourism demand. The results show that tourists to Antigua and Barbuda are income sensitive rather than price sensitive. The results also show that there is a high level of returning tourists to Antigua and Barbuda. Relative price of tourism between source countries and the destination country of Antigua and Barbuda does not affect tourists' decision on choosing to go to Antigua and Barbuda. The results show that Saint Lucia and Barbados are complements to Antigua and Barbuda and not substitutes. Lastly, it showed that natural disasters like hurricanes can affect the demand level of tourism in Antigua and Barbuda.

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## **1.0 Introduction**

The World Tourism Organization (WTO) contends that in 1996 tourism became the single largest industry and employer in the world, with a gross output of US\$3.5 trillion. Roberts (1998) pronounced confidently that over one in ten jobs worldwide were supported by the tourism industry, with its share rising rapidly. Likewise, the tourism sector in the Caribbean and more specifically Antigua and Barbuda is among the main drivers of economic growth, both directly and through related activities. Tourism accounted for 58.3 per cent of total gross domestic product in Antigua and Barbuda in 2014 according to the World Travel and Tourism Council (WTTC).

In light of the importance of this industry, the government of Antigua and Barbuda is continuously making investments in infrastructure and marketing to increase visitor arrivals and spending. It is therefore critical to have a keen understanding of the specific factors that drive visitors to the country, in order to maximize returns from these investments and to improve marketing. Notably, Sinclair and Stabler, (1997) highlighted that given the level of significance and ramifications of tourism, there is a strong case for better understanding the nature of tourists and what factors contribute to their decisions in choosing a destination.

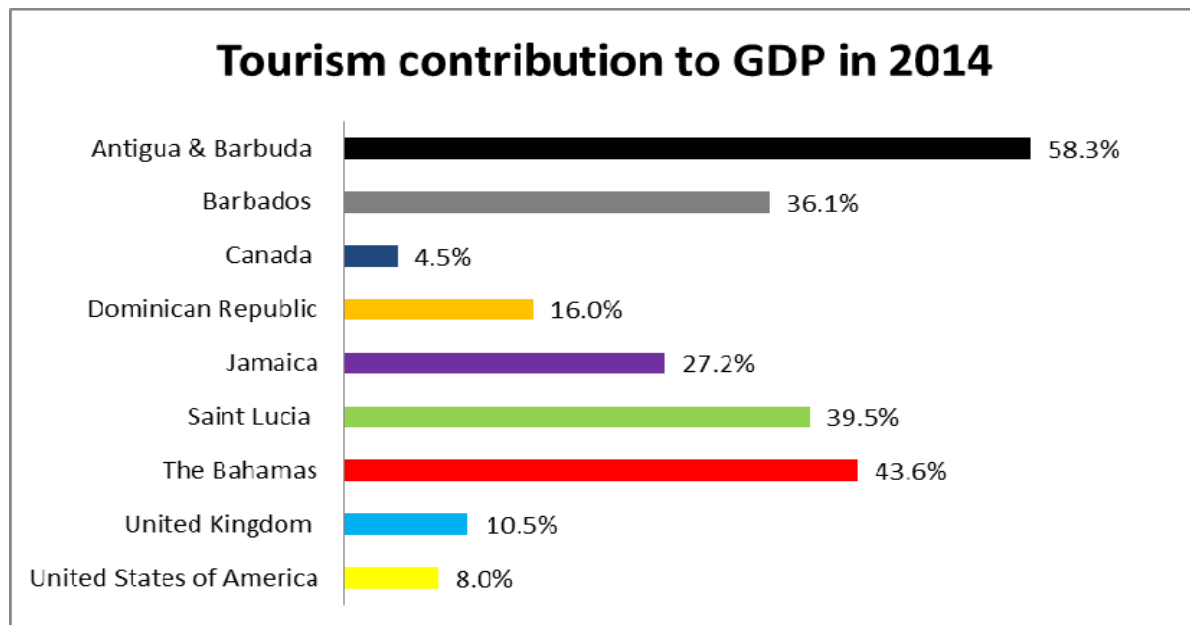
This paper is a relevant one which helps to fill in the gap that currently exists in the literature on modelling tourism demand in developing economies. It uses an empirical approach to determine the main factors affecting stay-over tourism demand in Antigua and Barbuda from the four largest source markets namely the United States of America (USA), United Kingdom (UK), Canada and the Caribbean. The remainder of this paper is organized as follows: section two gives stylised facts on the tourism industry, particularly stay-over tourism, in Antigua and Barbuda, while section three provides a review of the literature on the subject of this research. Data and model specification will be dealt with in section 4, while section five presents the results and an analysis of the findings. Section six concludes the paper and provides some policy recommendations.

## 2.0 Stylised Facts on Tourism in Antigua and Barbuda

### 2.1 Overview of Antigua and Barbuda Tourism Product

Antigua and Barbuda is a twin island state located in the heart of the Caribbean and is known for its 365 beaches. The tag line for its Tourism Authority is ‘the beach is just the beginning’ and the country markets itself as hosting one of the largest sailing regattas in the world as well as the greatest summer festival in the Caribbean, carnival in July. The tourism industry is very important to Antigua and Barbuda relative to other countries (See Figure 1).

Figure 1: Tourism Contribution to GDP in 2014

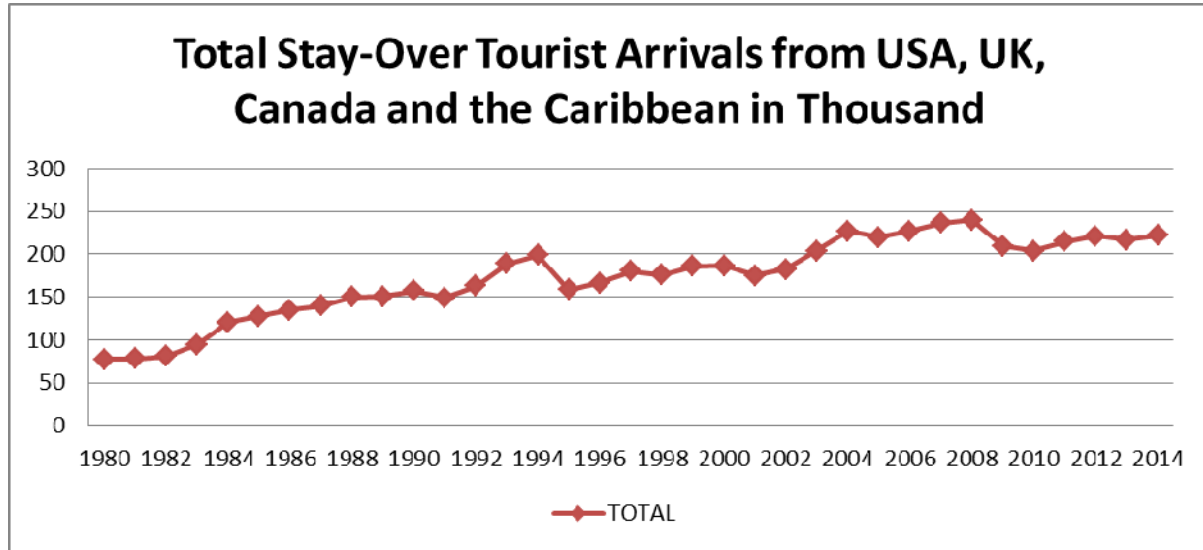


Source: World Travel and Tourism Council

### 2.2 Performance of Stay-Over Tourism in Antigua and Barbuda

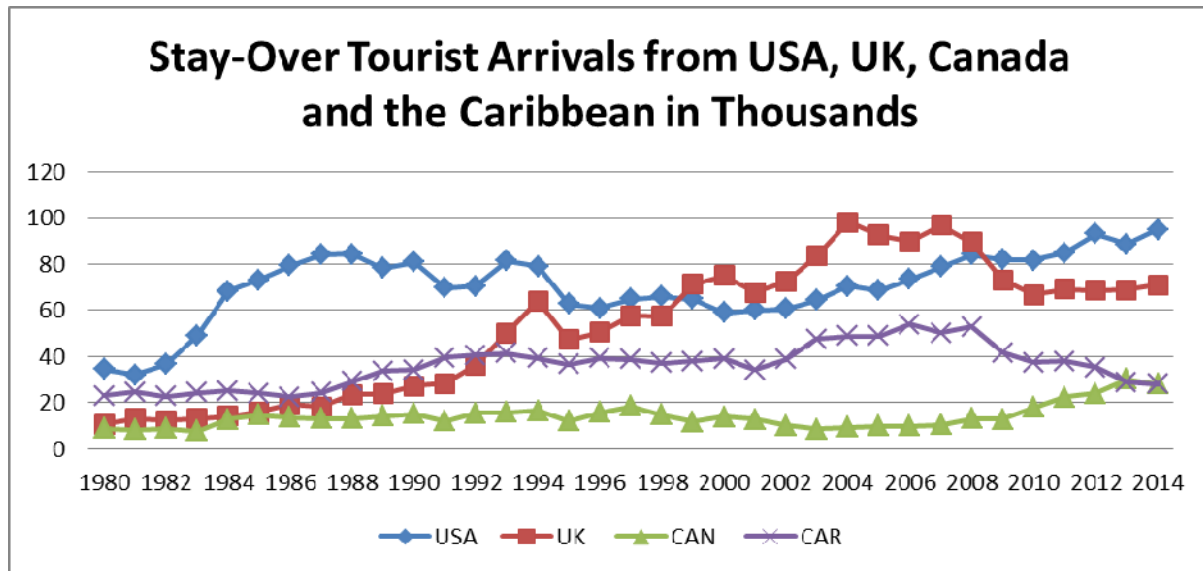
Data for the period 1980 to 2014 indicate that there have been steady increases in the total arrivals from the major source markets to Antigua and Barbuda (See Figure 2). In the last five years, however, although the performance of the stay-over category surpassed the levels observed three decades ago, there has been no growth on an annual basis. In fact, stay-over visitor arrivals remained relatively flat in recent years.

**Figure 2: Total Stay-Over Visitor Arrivals from the Major Source Markets (1980-2014)**



Source: Eastern Caribbean Central Bank

**Figure 3: Stay-Over Visitor Arrivals from the Major Source Markets (1980-2014)**



Source: Eastern Caribbean Central Bank

The decomposition of the total shows different performances for each major source market (See Figure 3). Notably, since the global economic and financial recession, stay-over visitor arrivals from the UK have been decreasing, from 73,000 tourists in 2009 to 71,193 tourists in 2014.



The same trend was observed for the Caribbean tourists<sup>1</sup> as they fell from 41,000 in 2009 to 27,637 in 2014. In the same time period, there were mixed results for the USA tourists as there was a slight decrease in 2010 to 81,598 from 82,068 in 2009, but then an increase in 2012 to 93,214, surpassing the figures before the recession. This was due to an increase in airlift from major hubs in the USA namely Miami and New York. Canadian arrivals remained relatively stable during the period of 2009 to 2014 – rising from 12,947 tourists in 2009 to 27,701 tourists in 2014. This was attributed to Canada’s ability to bounce back very quickly from a decline in late 2008 and early 2009. Former Chief Economic Analyst Philip Cross from Statistics Canada noted the reasons for Canada’s recovery namely strong balance sheets for companies, a sounder financial system and the quick and massive response from policy makers as well as interest rates in Canada not being hit as severely as other countries by the recession.

In line with the lacklustre performance in total stay-over visitor arrivals from the major source markets, receipts from stay-over visitors have remained relatively flat over the last five years (See Figure 4).

**Figure 4: Average Total Receipts from Stay-Over Visitors (1990-2014)**

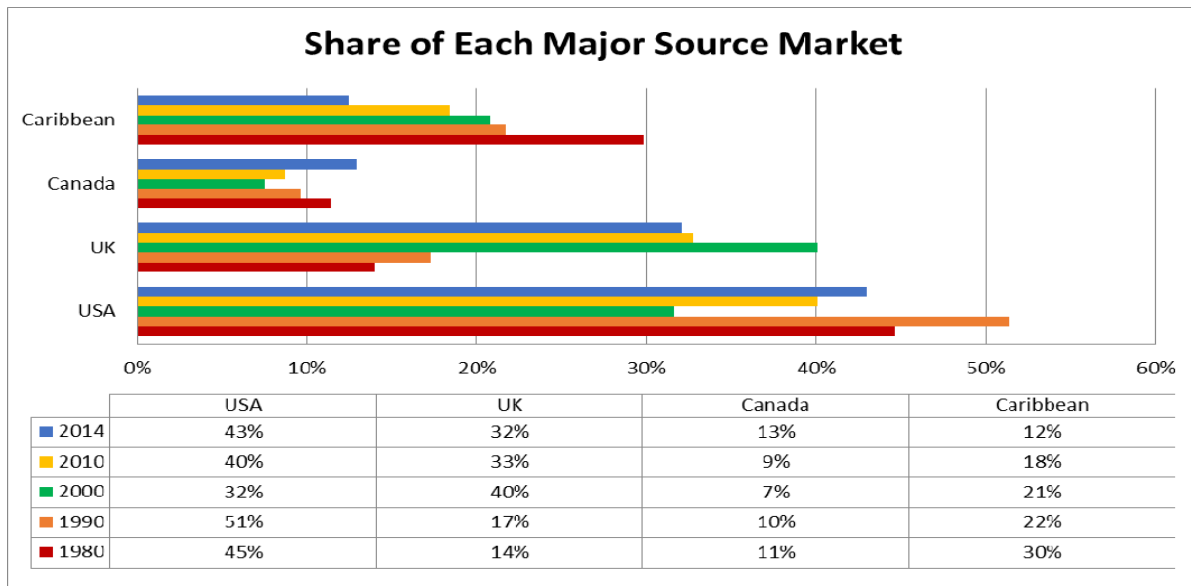


Soucre: Eastern Caribbean Central Bank

<sup>1</sup> Caribbean tourists in this paper are persons from Barbados, The Bahamas, Dominica, Grenada, Guyana, Jamaica, Trinidad and Tobago, St Lucia, St Vincent and the Grenadines and St Kitts and Nevis

In terms of market share the USA accounted for the largest number of stay over visitors (45.0 per cent) followed by the Caribbean (30.0 per cent) in 1980. By 2014, the share of the USA market declined to 43.0 per cent but still accounted for the highest proportion of stay-over tourist arrivals to Antigua and Barbuda. The Caribbean is currently the smallest market while the UK has risen to the second largest.

**Figure 5: The Share of Each Major Source Market <sup>2</sup>(1980-2014)**



Source: Eastern Caribbean Central Bank

### 3.0 Literature Review

Some definitions for tourism demand have been put forward in the literature. Song, et al., (2010) p. 64, posited that “the concept of tourism demand originated from the classical definition of demand in economics, namely the desire to possess a commodity or to make use of a service, combined with the ability to purchase it.” Morley, (1992) p. 255 stated that “tourism demand is a very special form of demand as the tourism product is a bundle of complementary goods and services.” Schulmeister, (1979) also believed that tourism was sophisticated since tourism production and consumption happens at the same time.

<sup>2</sup> The market share of total for the four major source markets

Over the years, there has been increased interest in estimating tourism demand but in doing so researchers have encountered data and methodological challenges. According to Song, et al., (2010), the accuracy of tourism demand estimates has been limited by the nature of the data and methodology. The demand for tourism could be measured by several ways but Crouch and Shaw (1992) as well as Kim (1988) stated that tourist arrivals were the most commonly used measure.

Most researchers have tested income, relative tourism prices, and transportation costs as the main explanatory variables of tourism demand (Greenidge, 2001). Some of them have used other variables such as the exchange rate, consumer price index, distance and population. Furthermore, Cho (2010) added that dummy variables should be used to capture various special events and deterministic trends to also help explain demand. Others like Brakke, (2005) looked at the external shocks that may disrupt the tourism industry.

In investigating tourism demand, different models have been used. Li, et al., (2005) stated that during the period of 1960–2002, 420 studies were published on tourism demand and all the studies used different techniques to model and forecast the demand for tourism in various destinations. Vanegas Sr. (2009) used a general-to-specific methodology in the case of building international tourism in Aruba. Bigovic (2012) used ARIMA models, using Box-Jenkins. Sangchoul, et al., (2011) believed that for efficiency and accuracy in estimating rural tourism demand, the duration model with log-logistic regression is effective. Hanafiah, et al., (2009) used a modified Gravity model in the case of estimating Malaysia tourist arrival. Greenidge (2001) employed a structural time series modelling whereas Moore (2010) and Sahely (2005) used a standard Ordinary Least Squares model (OLS). Lorde, et al., (2015) used a Generalised Method of Moments (GMM) approach to model demand for the Caribbean. Amid all of these methods, Witt & Song, (2000) and Li, et al., (2005) stated that there was no clear cut evidence suggesting which model produces the most accurate results.

Despite the use of different models, some researchers have arrived at similar results on the main factors affecting tourism demand. In examining the long run effect of tourism demand in Mexico with respect to the USA visitors, Brida et al., (2008) found that tourism demand in Mexico has

been positively affected by USA income per capita and public investment. Song, et al., (2003) found that, for Hong Kong, the most important factors determining tourism demand were the cost of tourism in Hong Kong and income of the tourist's country of origin. Narayan, (2003), in his paper on Fiji, found that in the long-run real GDP of the tourist's country of origin, the price of tourism and the transportation cost affect tourist's expenditure. Similar results were highlighted for studies done on tourism demand for the Caribbean. In their paper on competitiveness of Caribbean tourism, Craigwell and Worrell, (2008) found that income effects dominated the price effects. This was supported by both Sahely, (2005) and Tsounta, (2008) where they both found income to be the biggest determinant of tourism demand in the Caribbean. These latter authors also found that price was still very important for Caribbean tourism demand. Notably, Lorde, et al., (2015) found in their paper that habit persistence was the main determinant of tourism demand for the Caribbean.

## **4.0 Method and Data**

### **4.1 Model Specification**

Tourism demand could be affected by many factors, including economic and non-economic ones such as social problems, political issues and natural disasters. Recent econometric studies have focused on examining the economic factors, likewise the approach in this study. This research is based on the assumptions from the neoclassical economic theory which emphasises that income and price are very important in determining the demand for tourism. Crouch, (1994) p. 47 said "income is the most important explanatory variable and the income elasticity generally exceeds unity but is below two." From economic theory, when income elasticity is below two we can say that international travel is still treated as luxury consumption.

Given the theory and what has been done in previous studies, this study tests whether the following variables affect stay-over tourism demand in Antigua and Barbuda: income, relative price, and substitute prices of alternative destinations, transportation cost and a hurricane. The following is the reduced form of the function which was used in this study:

$$LNTA_{ijt} = \alpha_1 + \beta_1 LNGDP_{jt} + \beta_2 LNSUB_{p^*ijt} + \beta_3 LNTA_{ij(t-1)} + \beta_4 LNOIL_{jt} + \beta_5 LNOWN_{ijt} + \beta_6 D95 + u_{ijt} \quad \text{Eq. (1)}$$

where  $TA_{ijt}$  is stay-over visitor arrivals from the country of origin (j) to the destination (i) during the time period (t);  $GDP_{jt}$  is real GDP per capita in the country of origin in period t;  $SUB_{p^*ijt}$  is the price of tourism in substitute countries namely Saint Lucia and Barbados;  $TA_{ij(t-1)}$  is the proxy used for habit persistence;  $OIL_{jt}$  is the cost of transportation using the average cost of a barrel of crude oil multiplied by the distance of the source market to the destination;  $OWN_{ijt}$  is the relative price of tourism between origin and destination;  $D95$  is a dummy variable for Hurricane Luis which hit Antigua and Barbuda in September of 1995 causing damage estimated at US\$350m. The US dollar was used as the base currency for the GDP, relative price, substitute price and oil cost variables in this paper. The error term,  $u_{ijt}$ , captured all the other country-specific effects in Antigua and Barbuda that may have impacted stay-over tourism demand from the major source markets such as political environment, ideologies, culture and geographic size.

The tourism price and nominal exchange rates were taken into consideration when calculating the two price variables in this study: (i) the relative price of tourism between Antigua and Barbuda and the origin country, and (ii) the tourism price of the substitute countries relative to that of Antigua and Barbuda.

The relative price of tourism shows the cost of tourism in the source market relative to that of Antigua and Barbuda. This is very useful for tourists in deciding whether to travel overseas or do a staycation. In order to find relative tourism price the following formula was used, which was adapted from Song, et al., (2010):

$$P_{it} = \frac{CPI_{kt} / EX_{kt}}{CPI_{it} / EX_{it}}$$

Eq. (2)

where  $CPI_{kt}$  and  $CPI_{it}$  are the consumer price indices for Antigua and Barbuda and country of origin.  $EX_{kt}$  and  $EX_{it}$  are the exchange rates of Antigua and Barbuda and of the country of origin denoted in US dollars.

The price of the substitutes was found by applying the same method used by Song, et al., (2010):

$$P_{st} = \sum_{j=1}^2 \frac{CP_{jt}}{EX_{jt}} w_{ijt}$$

**Eq. (3)**

where  $j$  = the number of substitutes, which was two (2); and  $w_{ijt}$ , is the share of stay-over visitor arrivals to the country from the source market and is calculated using the following according to Song, et al., (2010):

$$W_{ijt} = TA_{ijt} / \sum_{j=1}^2 TA_{ijt}$$

**Eq. (4)**

where  $TA_{ijt}$  is stay-over visitor arrivals to substitutes (Barbados and Saint Lucia) from the source markets. Barbados and Saint Lucia were selected as substitute countries for stay over visitors because their tourism products are similar to that being offered by Antigua and Barbuda. This formula is necessary as it shows the dynamics of the substitution effect. If there is an increase in price of Antigua and Barbuda's tourism product and the demand for tourism in the other two counties rose, *ceteris paribus*, they are substitutes for Antigua and Barbuda. If there is an increase in price of Antigua and Barbuda's tourism product and the demand for tourism in the two counties declined, *ceteris paribus*, they are complementary to Antigua and Barbuda.

## **4.2 Econometric Method**

The econometric method applied in this paper was the Generalized Method of Moments (GMM) estimator using panel data. Several econometric problems may arise from estimating equation (1) if the GMM was not utilised. In the model, there is potential endogeneity of the regressors in the model, specifically, the presence of bidirectional causality between stay-over tourist arrivals and GDP per capita. Also, the different source countries would have invariant country-specific effects (fixed effects) such as political environment, ideologies, culture and geographic size. These fixed effects are contained in the error term of the equation and we must account for these

unobserved effects. Additionally, the presence of the lagged dependent variable gives rise to serial correlation. These challenges were addressed by adapting the GMM method by Arellano and Bond (1991) which optimally exploits the linear moment restrictions that follow from the assumptions of no autocorrelation in the errors in an equation with individual effects, no strictly exogenous variables, and lagged dependent variables. Also, another advantage of using the GMM by Arellano and Bond was that it solved the issue of weak instrument whereby the difference estimator eliminated the country-specific effects by taking first-differences of the equation.

Two tests were done to check the specification of the model. The first test performed was the Hausman test for endogeneity, while the second test performed was the Sargan test of over-identifying restrictions the model passed both tests.

### **4.3 Data**

The annual data used in this research covers the period 1980 to 2014. The panel model equation was used as it enables one to exploit the time-series dynamics of the variables in question.

Data for this paper was sourced mainly from the Eastern Caribbean Central Bank and the Caribbean Tourism Organisation. Other sources of data included the World Bank's World Development Indicators (WDI), the Federal Reserve, the International Monetary Fund (IMF) World Economic Outlook, WTO and the United Nation Conference on Trade and Development.

## **5.0 Results and Analysis**

### ***5.1 Results of Preliminary Tests***

An analysis of the correlation results indicated a positive and significant relationship between stay-over arrivals and both GDP of source income countries and substitute prices (See Table 1 below). This implies that GDP and substitute price move in the same direction as stay-over arrivals. This movement indicates that when GDP and substitute price increase that stay-over arrivals will also increase as there is a positive relationship between the variables. There is a

negative but significant relationship between transportation cost and relative price and this suggests that the variables move in the opposite direction to stay-over arrivals. Both transportation cost and relative price decreased as stay-over arrivals increased. Also, seen in the correlation matrix is the strong relationship between GDP and relative price, showing that they move in the opposite direction of one another. Correlation, however, does not mean causality hence a regression analysis has to be done.

**Table 1: Correlation Matrix of Variables**

Correlation Matrix					
	LARRIVALS	LGDP	LOIL	LOWN	LSUB
LARRIVALS	1				
LGDP	0.2602	1			
LOIL	-0.1853	0.6843	1		
LOWN	-0.1447	-0.7421	-0.7421	1	
LSUB	0.1755	0.5357	0.1994	0.0856	1

Source: Calculated by Author

## 5.2 Results of Panel Estimation

**Table 2: Arellano-Bond Dynamic Panel-Data Estimation**

Dynamic Panel-Data Estimation			
	<i>COEFFECIENT</i>	<i>STANDARD ERROR</i>	<i>P&gt;  Z </i>
LARRIVALS L1.	.8849905	.0348978	0.000
LGDP	.2780077	.0805727	0.001
LOIL	.0069924	.0234145	0.765
LOWN	-.004959	.0320821	0.877
LSUB	-.4156511	.1176343	0.000
D95	-.2240115	.0573897	0.000
Wald chi2 (6) = 1759.25			
Prob > chi2 = 0.000			

Source: Calculated by author



### ***Habit Persistence***

The result of the estimation shows that stay-over tourist arrivals exhibit a high degree of habit persistence or in other words there is a high level of repeat tourists. The estimated coefficient on  $LNTA_{ij(t-1)}$  suggests that tourist arrivals adjust to a new equilibrium at the rate of 88.0 per cent in the year after changes in any of its determinants. The significance of the coefficient implies that there is a high level of repeat visitation to Antigua and Barbuda. This high degree of habit persistence should be of extreme significance for Antigua and Barbuda as they could increase their share of arrivals from the USA, UK, Canada and Caribbean by identifying and improving the factors which are responsible for creating a habituated tourist clientele. This high level of habit persistence is in line with the results found by Lorde, et al., (2015) in their paper modelling Caribbean tourism demand.

### ***Income***

The income elasticity for the source countries was significantly positive. The coefficient is showing that a 10 per cent rise in income in the source countries would see an increase of 2.8 per cent arrivals to Antigua and Barbuda. This indicates that economic conditions in the USA, UK, Canada and the Caribbean (source markets) have a substantial effect on the levels of tourism demand for Antigua and Barbuda. Lorde, et al., (2015) also found arrivals to increase between 2.2 per cent and 2.9 per cent giving income increased by 10 per cent in the Caribbean. This is a critical finding for the Government of Antigua and Barbuda as they should consider the economic outlook of the source countries to able to improve their forecasting of tourist arrivals and revenue. Income being significantly important was also found by Jack (2010) in the neighbouring island of Dominica.

### ***Prices***

The relative price of tourism product is not significant in affecting tourism demand from the major source markets at the 5.0 per cent level of confidence. This shows that tourist from the USA, UK, Canada and the Caribbean travelling to Antigua and Barbuda are not affected by the price of the tourism product in Antigua and Barbuda relative to the price of the tourism product in their country. The fact that owns price is not significant means that for Antigua and Barbuda

tourists arriving to the country are not price sensitive. The substitute price is significant but negative. Arrivals to Antigua and Barbuda decline by 4.2 per cent for every 10 per cent increase in the price of Antigua and Barbuda's tourism product to its competitors, Saint Lucia and Barbados. Therefore the countries act as complements to each other rather than substitutes. These results contradict what Lorde, et al., (2015) found that both substitute price and own price to be significant.

### ***Transportation Cost***

The result for transportation cost was not significant with a p value well over the 5.0 per cent level of confidence. This is a good sign for Antigua and Barbuda as this estimated result says that cost of travelling to Antigua and Barbuda does not affect tourist coming to the country. This is a very important aspect as the cost of travelling has increased in recent years with the introductions of new taxes such as the air passenger duty tax that was implemented by the British Government. Also, this result could be explain by airlines hedging against the movement of oil prices which could result in stable prices in the short run but however in the long run airlines would adjust their prices to suit the current levels of oil prices at the time. This result went against Lorde, et al., (2015) findings where the researchers found that transportation cost was significant and important in tourism demand for the Caribbean. The insignificant value of transportation cost could be due to the use of oil prices and distance as a proxy for transportation cost, as a more suitable proxy would have been average airfares but the complete data was not available for the period of this study. Also, a model that looked at the specific source market could give results in line with Lorde, et al., (2015).

### ***Natural Disaster***

The dummy variable, denoted D95, representing Hurricane Luis in 1995 confirms priori expectations. The number of tourists to Antigua and Barbuda would have dropped significantly in that year. Hurricane Luis would have had a large impact on the tourism product of Antigua and Barbuda by destroying many hotel rooms, therefore reducing Antigua and Barbuda's capacity to accommodate as many tourists as they could have before the hurricane. This finding

is also supported by Sahely, (2005) where she found that hurricanes do affect tourism demand for Antigua and Barbuda but the impact was minimal.

## **6.0 Conclusion and Policy Recommendations**

Tourism is clearly an essential industry for Antigua and Barbuda, being the main earner of foreign exchange and a key contributor to economic activity and employment. Based on the results of this study, the main variables affecting stay-over tourism demand were income, habit persistence, substitute price and hurricane. However, oil prices (transportation cost) and relative price were not very significant. The most significant variable was habit persistence as it suggests that there is a high level of repeat visitors in Antigua and Barbuda. This could imply that the first impression that tourists have of Antigua and Barbuda is a good one and it motivates them to return to the island. These results were consistent with previous literature on tourism demand for the Caribbean and more specifically the ECCU region.

Based on the findings of this study, the following are recommended:

- 1. Introduction of a tourism satellite account to capture key elements such as level of repeat visitors and factors contributing to that behaviour.** This survey will be an essential tool for the government to use in order to assess which areas are doing well and which areas need improvement. The benefit of such information is that the government could look at the areas that need improvement and create a strategic plan in order to improve them. Also, such information, the reasons why tourists return to Antigua and Barbuda can influence government's decision with respect to changing a policy or product that would have a negative impact on tourists returning to the island. This information allows the government the ability to create a strategy that enhances a tourist experience in the country.
- 2. The government should continue to train airport staff workers, as well as hotel and other persons in the tourism industry.** The continuous training of airport staff would help the government to maintain a good first impression on visitors. The continuous

training will allow staff to keep improving their skills, which in turn could translate to them performing their duties better. Also, with the continuous training for airport staff government should have a sensitization of the public on tourism more frequently. This sensitization could be in the form of training for vendors and person in the tourism industry about customer service for tourist when they are in the country. This continuous sensitization would allow for persons in the tourism industry to keep improving them self which in turn could improve the overall tourism product offered by Antigua and Barbuda. Example of a route the government could take is by partnering with private hotel owners to train staff in the hotels and to offer hotel management an incentive such as tax holiday as the government sees fit for the hotel with the best customer service and experience for tourist. The training of persons at the airport and hotel staff would allow for Antigua and Barbuda to maintain their high level of repeat visitors.

- 3. Employ an economist in the Ministry of Tourism.** The economist would use econometric techniques for forecasting stay-over arrivals and visitor expenditure from data on the future income of source markets. The benefit of such analysis for the government is that they would be able to better target their marketing – strengthen it in countries that are expecting growth and review or reduce their marketing in countries that are not expecting growth. Also, the economist using different techniques could do a study on different markets to see if the government can branch out and diversify its source markets even more.
- 4. Strategic pricing of Antigua and Barbuda’s tourism product.** The fact that the habit persistence level is high means that it would take some time before changes in price would affect demand. Also with the high level of ‘loyalty’ to the country by tourists, government revenue could increase if the tourism product is priced at the correct level. The government could introduce marginal pricing where in the off season you introduce bundling of hotel and tours together creating more ‘all-inclusive’ packages. This bundling could go along with the current technique of staycation used in off season
- 5. Developing tourism plans that set a clear strategy for the tourism industry in the aftermath of a natural disaster.** The reason for this recommendation is premised on the

fact that the results of the study show that hurricane is a significant variable. Also, in 1995, following the aftermath of hurricane Luis, the damage to Antigua and Barbuda amounted to US\$350m and put the economy back at least 10 years. Therefore, the following are recommended:

**a.** The establishment of a natural disaster fund for the tourism industry. The fund will provide the necessary finance for the strategy's implementation. Financing of the fund could be sourced from the Citizenship by Investment Programme (CIP). The government can take a decision to allocate 2.0 per cent of the revenue from the CIP to the fund.

**b.** The strategy should also focus on the infrastructure at the sea ports and airport and have a clear plan for maintenance and rehabilitation of the infrastructure in the event of a natural disaster. In the event of any infrastructural damage, the strategy should ensure that the air and sea ports are back to operational standard in the shortest amount of time.

**c.** Natural disasters evacuation programmes and centres for tourists should be an integral part of the strategy. Government should ensure that hotel owners/operators have a clear contingency plan for tourists in the event of a natural disaster and that they have a safe centre on compound that can act as a shelter for the tourist during the natural disasters.

**d.** The strategy should take into consideration other sectors in the economy. The tourism sector is the largest sector in the economy and it has many linkages to other sectors. Therefore, when drafting the strategy the impact on other sectors should be taken into consideration.

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# **CROWDFUNDING: ITS POTENTIAL FOR STIMULATING FINANCIAL DEVELOPMENT IN THE ECCU**



by

Mr Calvin Duggins

## **ABSTRACT**

The lack and access to suitable financing continues to be a major constraint for entrepreneurial, micro and small enterprises. Following the global financial and economic crisis 2007-2009 bank lending declined while excess reserves accelerated resulting in a widening of the entrepreneurial funding gap. Thus, in an effort to reduce the size of the gap the author proposes the implementation of a crowdfunding framework primarily owing to the World Bank's recommendation for developing countries. Consequently, the author examines the feasibility of such a framework in the ECCU, as well as the potential impact on the sub-region. With an estimate of at least \$9.5m XCD becoming available through the platform, along with added positive externalities, the writer was able to conclude that crowdfunding as an alternative source of financing, should be considered by regional governments.

JEL classification: G11, G12, G18, E22

**Keywords:** Crowdfunding, Capital, Alternative Finance, Diversification, Regulation

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### List of Acronyms and Abbreviations

ECCU – Eastern Caribbean Currency Union

ECSE – Eastern Caribbean Securities Exchange

XCD – Eastern Caribbean Dollar

USD – United States Dollar

ECN – European Crowdfunding Network

RGSM – Regional Governments Securities Market

ECHMB – Eastern Caribbean Home Mortgage Bank

ECSM – Eastern Caribbean Securities Market

ECEF – Eastern Caribbean Enterprise Fund

ECUT – Eastern Caribbean Unit Trust

HEMAV – High Endurance Multipurpose Aerial Vehicles

ICT – Information and Communications Technology

UNDP – United Nations Development Programme

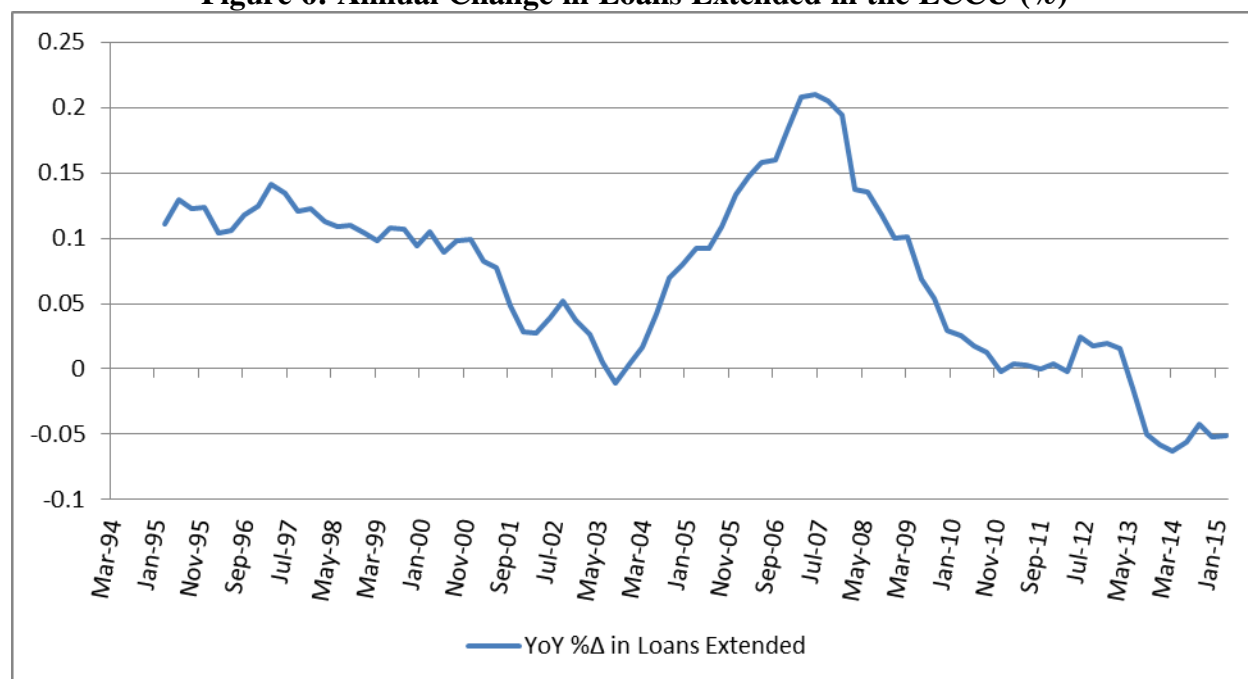
IPO – Initial Public Offering

## 1.0 Introduction

In the Eastern Caribbean Currency Union, the banking segment of the financial sector continues to be the most dominant, amassing a total asset value of approximately \$27.7b (XCD) as at the end of the first quarter of 2015. The banking industry is also the largest provider of capital with loans amounting to approximately \$13.5b, while the Eastern Caribbean Securities Exchange, which makes up the capital markets segment – another source of traditional finance - has a market capitalisation of a \$1.4b (XCD) as at 14 July 2015, exclusive of cross-listings.

Although banks remain the largest provider of capital, they have reduced lending following the global economic and financial crisis 2007-2009 (see Figure 1). In fact, lending has not recovered to pre-crisis levels.

**Figure 6: Annual Change in Loans Extended in the ECCU (%)**

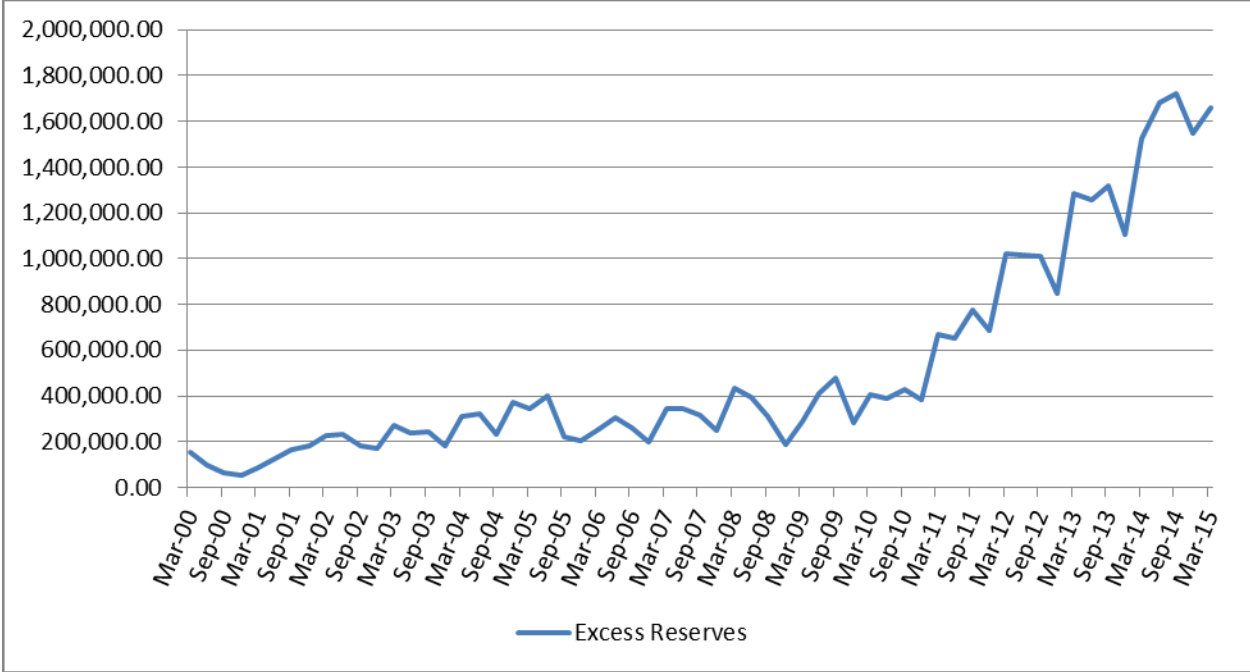


Source: ECCB

The post-crisis period has also seen an acceleration in the growth of excess reserves (see Figure 2) while the entrepreneurial funding gap, which refers to the lack of access to seed

capital, has widened. As these traditional sources of debt and equity financing have become less appropriate for entrepreneurial, micro and small enterprises, the search for alternative financing sources is critical for the effective mobilisation of savings for investment purposes. It is within this context, and given the successes achieved in other markets, that crowdfunding is proposed as a major alternative source of finance.

**Figure 2: Excess Reserves in the ECCU (\$M)**



Source: ECCB

In 2014, global crowdfunding expanded by 167.0 per cent, representing a total of US\$16.2 billion compared with \$6.1 billion in 2013<sup>3</sup>. Further, the sector is expected to raise \$34.4 billion in 2015 (Finextra Research, 2015). Such rapid growth continually pushes crowdfunding into the spotlight, as several organisations publicly noted its potential. For instance, the Commonwealth has pointed to the potential for crowdfunding to support sustained and inclusive growth, while improving access to capital, improving the management of the supply and demand for capital, fuelling innovation and efficiency, and funding new markets<sup>4</sup>.

<sup>3</sup> <http://thecommonwealth.org/media/press-release/can-crowdfunding-help-close-financing-gap>

<sup>4</sup> *Ibid*

In light of the aforementioned, the aim of this paper is to assess whether crowdfunding is a viable option for mobilising individuals' savings for investment purposes within the ECCU. The remainder of the paper is organised as follows. Section two provides an overview of the relevant literature. Section three discusses the stylised facts of the financial system in the ECCU. Section four analyses the role of crowdfunding in the ECCU and is aided by an equity-based model case study in section five. Finally, section six recommends policies based on the analysis in the prior sections and then the paper concludes in section seven.

## **2.0 Literature Review**

As developing economies grow, the provision of start-up and business finance will become extremely important for the sustainability of this growth (Baeck, P. and Collins, L. 2015). With few opportunities to access finance, entrepreneurs and business ventures continue to look for additional sources. Similarly, institutional and retail investors continually seek ways to invest, save and/or lend. A study by the World Bank (2013) suggests that crowdfunding contains numerous potential for developing countries such as those in the ECCU. Several of which include the provision of a financial outlet for diaspora members to strengthen their country, as a mechanism of remittance capital and as a gauge of the international community's interest to invest within the country.

Although there is no universal definition of the term, for the purpose of this paper, crowdfunding is defined as the acquisition of small amounts of money from a large number of contributors/investors for a specific purpose, whether it is to fund a project, business or loan, through the use of an online web-based platform (Kirby & Worner 2014). This is consistent with the definition postulated by the European Crowdfunding Network (2012) as "a collective effort of many individuals who network and pool their resources to support efforts initiated by other people or organisations." Crowdfunding may be categorised into two broad groups, namely, community crowdfunding and financial return crowdfunding, with the main difference being the provision of a yield or return on an investment in the latter category.

On the one hand, community crowdfunding comprises social lending/donation-based crowdfunding, which involves the donation of small amounts of money to meet the larger funding goals of a specific charitable project while receiving no financial or material return. Rewards-based crowdfunding, another form of community crowdfunding, involves individuals donating to a particular venture with the expectations of receiving in return a non-financial reward, such as goods or services, at a later stage in exchange for their contribution (European Commission 2015; Kirby & Worner 2014).

On the other hand, financial return crowdfunding comprises peer-to-peer lending, which involves individuals lending money to an individual or company with the understanding that the loan will be repaid with interest, and equity-based crowdfunding wherein individuals invest money in exchange for equity in the venture (European Commission 2015; Kirby & Worner 2014).

The importance of crowdfunding as an alternative source of finance grew in the USA when ArtistShare, originally a website where musicians sought donations from fans to produce digital recordings, launched in 2003 (Freedman and Nutting, 2015). The authors also note that consequent to ArtistShare's success more rewards-based platforms were launched including popular platforms such as Indiegogo and Kickstarter in 2008 and 2009, respectively. The importance of crowdfunding can also be seen via the launching of several platforms in other countries such as the UK and Sweden such as Crowdfunder, Crowdcube and Fundedbyme, among others.

The introduction of crowdfunding has brought with it several benefits as well as drawbacks. As expressed by the European Commission (2015), "the practice of crowdfunding provides proof of concept and validation; it assists with other forms of financing; it gives one access to a *crowd*; and it acts as a powerful marketing tool." Entrepreneurs are given the opportunity to test marketability (Valanciene & Jegeleviciute, 2013) and are able to gauge the potential market for their product based on the *crowd's* response (Ramsey, 2012). Conversely,

entrepreneurs looking to crowdfund run the risk of having their ideas stolen by better-funded investors or large corporations (Sullivan and Ma, 2012).

### **3.0 Stylised Facts on the ECCU Financial System**

The ECCU comprises eight island economies namely Anguilla, Antigua and Barbuda, the Commonwealth of Dominica, Grenada, Montserrat, St Kitts and Nevis, Saint Lucia, and St Vincent and the Grenadines, with an approximate population of six hundred thousand. These countries share a common central bank and a common currency.

The financial system in the ECCU comprises domestic banks, international financial services sector banks, credit unions, insurance companies, national development foundations, development finance institutions, building and loan associations, and other finance companies. Presently, there are forty commercial banks and fifteen non-bank financial institutions licensed under the revised Banking Act (2006)<sup>5</sup>. Twenty-two of the commercial banks are locally incorporated while 18 are foreign incorporated. Of the remaining financial institutions, there are six development banks in all of the islands except St. Vincent and the Grenadines, and Montserrat and there are sixty-seven credit unions, with most of them being concentrated in Dominica, Grenada and Saint Lucia. Each country has a national development foundation and a building and loans association exists in four<sup>6</sup> of the eight countries. International financial services sector banks (offshore banks) exist in each country except Grenada with Antigua and Barbuda hosting the largest number.

The financial system continues to be dominated by the commercial banking sector given its size of approximately \$27.7b (XCD) in assets as at the end of the first quarter of 2015. Additionally, bank lending continues to be the primary source of capital given outstanding loans to businesses of approximately \$5.0b as at 31 March 2015 compared to \$1.4b (XCD) securities market capitalisation as at 14 July 2015, exclusive of cross-listings. This represents

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<sup>5</sup> Over the period 1988 to 1992 new banking legislation was enacted in each of the member states with further amendments being made over the period 2004 to 2006.

<sup>6</sup> The Commonwealth of Dominica, Grenada, Montserrat and St Vincent and the Grenadines.



less than 1.0 per cent of the banking segment. Additionally, several initiatives have been established at a regional level to assist with money and capital market development. These include the Eastern Caribbean Home Mortgage Bank; the Eastern Caribbean Securities Market, which is made up of the Eastern Caribbean Securities Exchange and the Regional Government Securities Market; and the Eastern Caribbean Enterprise Fund. The Eastern Caribbean Unit Trust is yet to be established.

#### **4.0 Analysis of the Role for Crowdfunding in the ECCU**

The rise of the internet and the effects of the global financial and economic crisis have created the enabling conditions for the proposed alternative source of finance, crowdfunding. Although it is not a totally new concept, the idea has been further publicised and pushed into the limelight following several noteworthy successes. Some of these successes include the Pebble E-Paper Watch, the Ouya open-source game console and the Oculus Rift virtual-reality headset, which was later bought by Facebook for approximately \$2.0 billion (USD).

With hopes of replicating similar successes in the region this section aims to provide the reader with an assessment of the feasibility of the implementation of crowdfunding via some regional authority. The writer will make mention of the minimum necessary requirements that are deemed fundamental to the successful implementation of crowdfunding, then a direct assessment of its feasibility will be attempted, assisted by some simplifying assumptions. To close this section, the writer will also attempt to convey the potential impact of crowdfunding on financial development.

The process of crowdfunding continues to be lauded for its potential to spur economic growth and financial development. The process has continually gained traction, with support from organisations such as the UNDP and the World Bank. In attempting to present the reader with a clearer understanding of how the process works, this section will be immediately followed by a case study explaining the equity-based model of crowdfunding.

#### **4.1 Minimum Necessary Requirements for Crowdfunding**

The author sought an ideal scenario for developing crowdfunding in the ECCU. The European Union was examined for states which engaged in crowdfunding. The EU like the ECCU has several member states and engages in similar legislative and fiscal development. To this extent, the Netherlands an EU member state was selected.

Based on the Netherlands experience (AFM 2014), several preconditions must be met in order for crowdfunding to take off in the ECCU. Firstly, the platform must be professional, ethical and focused on continuity. The platform is the marketplace where all agents meet and thus must be operationally stable, with business being conducted ethically and professionally. The ICT infrastructure as well as the systems must be technologically up-to-date and must also be adequately secured and monitored.

Secondly, screening should be a continual process so as to allow for early detection and mitigation of risk. The process should include the assessment of the feasibility of the project, the creditworthiness of the individuals and other key indicators so as to reduce the risk of fraud and failure. In effect, preference should then be given to high quality projects opposed to lower quality ones, although the initial income generated by the platform from such projects may be higher.

Thirdly, there must be a minimum level of transparency. Transparency allows for more informed decisions to be made. In effect, this mitigates risk and assists in effective capital allocation. Transparency would also hinder participants who wish to behave in a fraudulent manner. Here, the information needs to be concise but sufficient, and easily understood by potential investors. The information should be manageable and the production of such information should be relatively inexpensive. Transparency also involves the communication of the risks associated with participating in crowdfunding (crowdfunding platform) and any other obligations of the borrower. A crowdfunding platform needs to be clear about its services: the cost, the conditions to be met, and details on the screening procedure.

Fourthly, there should be a minimum level of protection for lenders and investors. Even with a raised level of transparency and education, investors are still at risk of being defrauded. In this instance, the platform should compensate the investor/lender. The platform should bear the primary responsibility of fraud detection since investors/lenders would not have the resources to do so.

Fifthly, there must be a minimum level of protection for borrowers and entrepreneurs. This minimum level speaks to the risk of unsuitable funding for projects. For example, where a start-up receives a debt obligation but it has no cash flows or where cash flows are limited owing to the start-up's short lifespan. The possibility of selecting inappropriate funding is considerable given the fact that the investors/lenders, which have an incentive to assess the suitability of funding, are not in a position to do so. It is the platform that is in the position to conduct the necessary assessments; however, given its structure, there are no natural incentives to conduct the reviews. Thus, a minimum of a suitability test for borrowers should be offered. This is to inform the entrepreneur/borrower of what is suitable in his/her case.

Finally, as the proposal is for one platform to operate within the ECCU, there must be a harmonisation of legislation across the member territories. Participants must be governed by the same rules and regulations so as to provide for equal opportunity.

#### **4.2 The Feasibility of Crowdfunding**

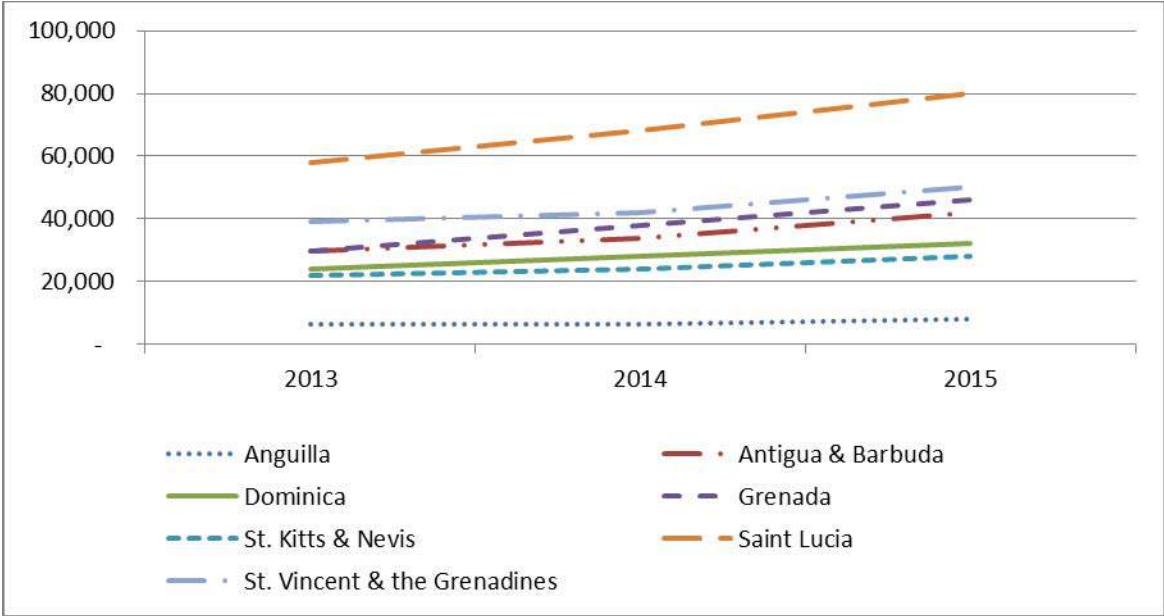
Crowdfunding is inherently social and is done with the use of online web platforms. Thus, its success is primarily dependent on the size of the *crowd*, while the size of the *crowd* is dependent on individuals' access to the internet. As such, the most appropriate measure for social media engagement would be Facebook users since Facebook is the largest social network in all but ten countries according to the World Bank.

Moreover, an assessment of the number of Facebook users in the individual member territories of the ECCU illustrates that said territories appear to be fairly 'social' as the number of users seems to be on a steady increase (Figure 3). Growth in the number of Facebook users seems

most favourable in the case of Saint Lucia, as can be seen from the steep incline of the trend line. Anguilla has a much flatter trend line indicating slower growth.

The total number of Facebook users from the countries under study amounted to 208,540 in 2013. The total jumped to 240,600 in 2014 and has risen to 286,200 up to the first quarter of 2015. The continual growth in this proxy gives a positive outlook on the future growth of the crowd.

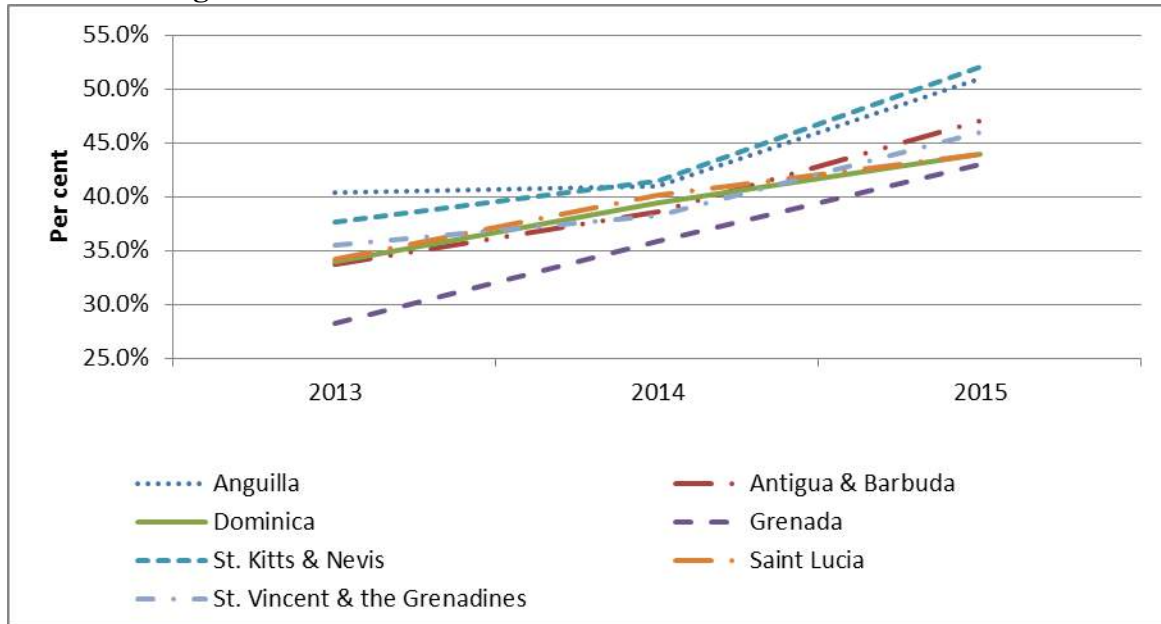
**Figure 3: Number of Facebook Users in the ECCU 2013-2015**



Source: ICT Pulse

Moreover, Facebook user penetration rates have been on a steady rise (see Figure 4). This lends to the argument that the citizens of the ECCU member territories listed below are fairly ‘social’. Penetration rates are generally upward-sloping, except for Saint Lucia with a kink in 2014. These trend lines appear to be steep, indicating moderate to rapid growth.

**Figure 4: Facebook User Penetration Rates in the ECCU 2013-2015**



Source: ICT Pulse

Using simplifying assumptions, we first assume that one third of Facebook users are employed. Secondly, we assume that these employed users constitute the *crowd*. Finally, we assume that the average contribution is \$100 XCD. By applying these assumptions, there would be \$9.5m XCD available for funding. Additionally, as in the case of the UK government (Armitage 2012; Platt 2014), if the governments of the ECCU agreed to contribute 20.0 per cent of every loan that reached 80.0 per cent of its target from the *crowd* or 10.0 per cent in the case of 90.0 per cent from the *crowd*, then there would be an additional \$1.0 to \$2.0 million in alternative finance. It is also worth noting that the *crowd* may extend beyond domestic borders.

### 4.3 The Potential Impact of Crowdfunding on Financial Development

Crowdfunding is an alternative source of finance that provides improvements in the mobilisation and pooling of savings; improvements in trading, diversification, and management of risk; and improvements in producing information about possible investments. It acts as an enabling mechanism for new venture formation, job creation, and consequently economic growth.

Through the leveraging of ICTs, crowdfunding connects the social web with entrepreneurial finance. This allows for the centralisation of data on possible investment opportunities, and also the rapid flow of information from entrepreneur to investor. Investors will now be able to assess a vast number of investment opportunities online at the same time. They will also be able to quickly ascertain whether the characteristics of the specific investments align with theirs.

Moreover, from the perspective of entrepreneurs/businesses, crowdfunding is seemingly more efficient than the traditional routes. Setting up a successful crowdfunding campaign takes only a few hours when compared to the three to four months for an IPO or several weeks for a loan approval. With a compelling story, an attractive video and some enticing rewards, entrepreneurs/businesses can almost immediately begin to raise funds. They again benefit from the centralisation of material relating to their idea/venture.

Unlike the traditional routes, crowdfunding does not require any upfront payments such as an application fee. Costs are only incurred upon successful completion of the campaign whereby the platform takes a percentage of the funds, as a fee, then distributes the remaining to the creator of the campaign. In this way, individuals, entrepreneurs and businesses are further encouraged to participate in crowdfunding for financing as opposed to the more traditional routes.

Crowdfunding also enables entrepreneurs to assess the viability of a product. With the exposure that crowdfunding campaigns create for the business, an entrepreneur is able to market an idea, and the *crowd* in turn is able to give feedback, whether through the amount invested or through reviews uploaded, or both. Support from investors may have the consequent impact of lowering the perceived risk for early-stage ventures. The rewards-based model provides entrepreneurs with the opportunity for market testing and demand measurement. By reaching their funding target, entrepreneurs acquire the capital necessary for their initial product run and also attain the *crowd's* support. This support acts as the

investors' endorsement of the product(s), consequently forming a support network for the entrepreneur. Investors further act as marketers for the product as they have a contingent interest in the success of the project.

Additionally, crowdfunding improves the discovery of market rates. Owing to the set-up of the financial sector in the ECCU, the banks generally control the lending rates and savings rates. The implementation of crowdfunding, however, will assist in the discovery of the real market price and return for financial aggregates such as loans. The ability to generate real market prices and real interest rates is intrinsic to the process. Ultimately, crowdfunding has the potential to diversify funding sources. This lowers businesses' funding risk and creates value for the system as a whole.

## **5.0 Case Study: HEMAV**

HEMAV, a start-up aimed at developing solutions using drones, decided to utilise the process of equity-based crowdfunding as it sought to acquire capital. The group did this through the Crowdcube platform, which had only recently opened a branch in Spain around that time. The platform offered them a professional solution in relation to this type of funding.

Firstly, the start-up needed to get through the strict Crowdcube filter, which statistics state that approximately only 30% of projects are successful. Several requirements that must be met include a structured project, with a business plan and a financing plan, and a return on investment proposal. Once past the filter, members of the start-up received expert advice and assistance from the platform related to the preparation of a professional presentation for their product, as well as updates and improvements of their business plan and their financial plan for the next three years. Crowdcube verifies that every item of financial data published is correct and true.

Following on from this step, the start-up now had to convince investors. To do this, a video was prepared; a motto was highlighted; and an event put on, all geared toward convincing as many investors as they could. A target within the range €150,000 and €200,000 was set, but

this was extended to €450,000 after early success. Consequently, approximately 20 per cent of the start-up was transferred to the investors. It usually took about 40 to 60 days to achieve the funding target, on average on the platform. However, after extending the target, it only took 6 days. There were 73 investors, with one being a major investor and the others, small investors. The platform divides investors into small investors, who acquire financial rights in the company that they fund, and major investors, who acquire policy rights along with financial rights.

The crowdfunding platform once again fulfilled advisory and management roles by assisting the start-up with the process of updating the commercial register with the new holdings. Transfer orders for the investments are transferred directly to the start-up after the 14-day review period that investors are given to review the legal documentation.

**Source:** BBVA Innovation Center

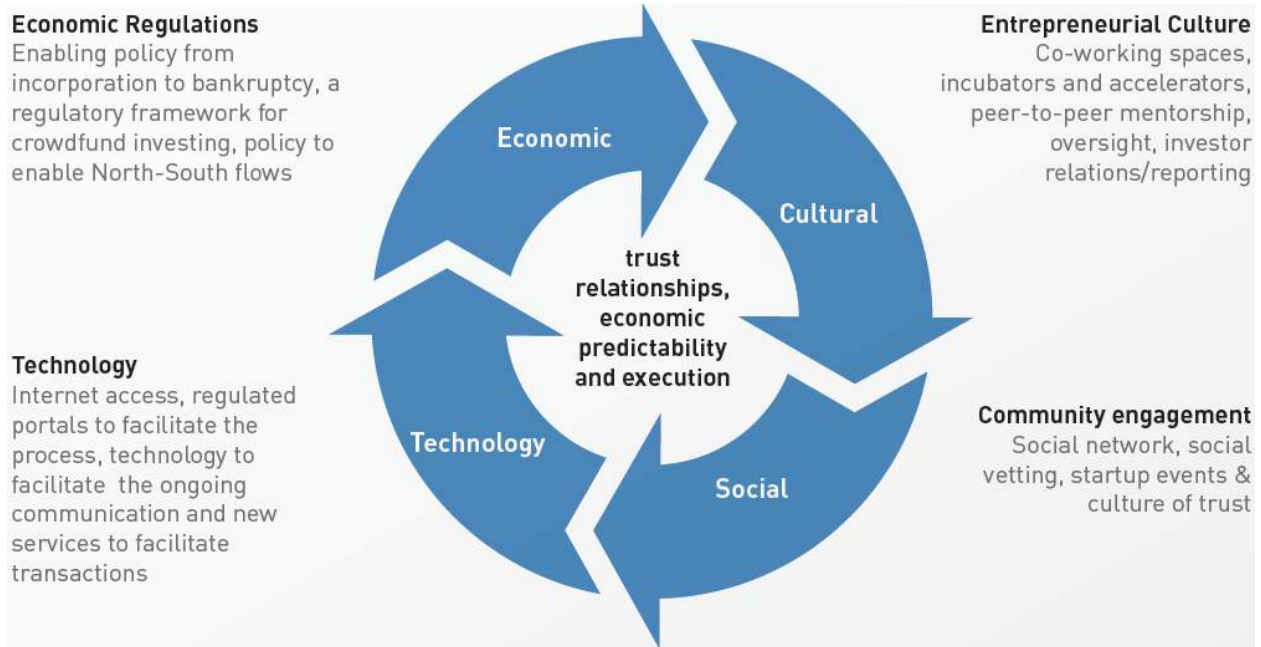
## **6.0 Policy Recommendations**

### **6.1 Measures That Can Be Taken to Introduce Crowdfunding**

The World Bank has identified several crowdfunding drivers that are of significance to developing countries (see Figure 5).



**Figure 5: Elements of a Robust Crowdfunding Ecosystem**



**Source:** The World Bank

Ultimately, an entrepreneurial culture is fundamental. Hence, initiatives to promote such a culture should be undertaken. Centres for innovation such as incubators, accelerators and/or structured co-working spaces should be established and used to harness entrepreneurial spirits. Support should be garnered from the government, development organisations and the private sector.

Moreover, policy should be established to facilitate crowdfunding, as well as entrepreneurship in general. Exceptions to securities regulations should be established to allow for the easy registration of equity offerings. Crowdfunding may be strategically tied to patriotic messages. The formation of a market alliance should also take effect.

From a social perspective, top social media experts or bloggers should be sought out so as to make use of the expertise in communicating with local and diaspora audiences. Media and educational events should be held so as to raise awareness and improve understanding of the

crowdfunding concept. Knowledge and skill sharing through the hosting of regular crowdfunding events with third parties may also be implemented.

In relation to the platform, a decision would need to be made on whether to buy an existing one, build a custom one, or use a white label platform. Lessons from the developed countries in this regard should be used. An assessment on the gaps in the existing technology for online financial transactions should be done, and improvements made where necessary.

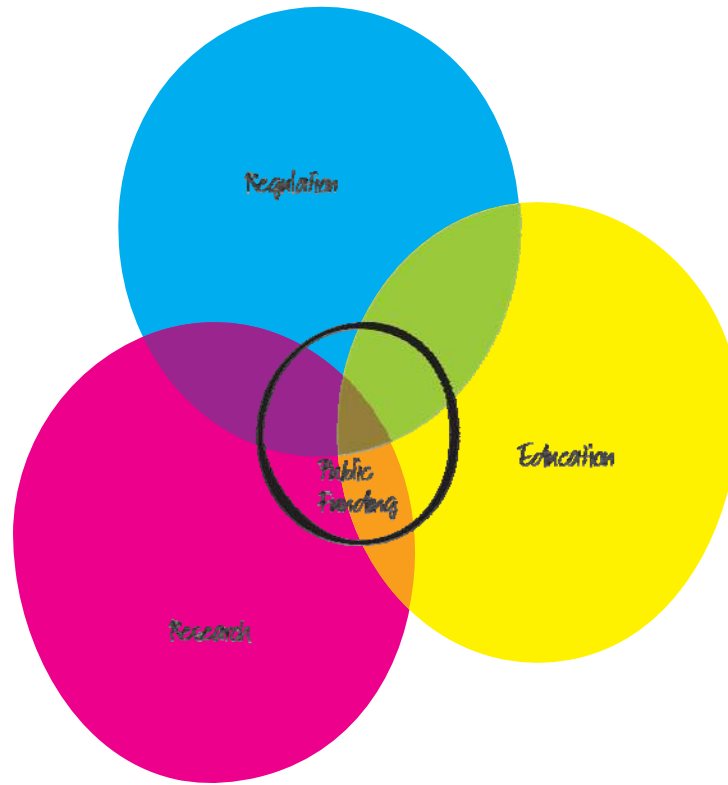
Continual education and communication should be carried out so as to foster professional investor and consumer confidence. The participation of women and girls should particularly be encouraged.

Finally, the World Bank has developed a high-level self-assessment tool to assist countries in assessing their readiness for crowdfunding (see appendix 1b), along with a legend for the interpretation for the results. The writer suggests that this assessment be undertaken before any implementation is sought.

## **6.2 The Proposed Framework/Plan for Crowdfunding**

As an alternative source of finance, crowdfunding brings with its own set of unique challenges and values. In accordance with De Buysere et al. (2012) the proposed framework should include three pillars, namely: regulation, education and research.

**Figure 6: The Pillars of the Crowdfunding Framework**



**Source:** A Framework for European Crowdfunding (2012)

Regulation is very vital as it will assist with the smooth undertaking of the crowdfunding process. However, as mentioned previously, regulation must not be too restrictive. The objectives of regulating crowdfunding should be to mitigate risk, build confidence in the marketplace and grow the market.

With respect to risk mitigation, regulation should support the notion of *atomisation*. Herein, funds are broken up into many small contributions consequently reducing the risk on individual portfolios. Another inherent feature of crowdfunding is transparency. In a crowdfunding set-up, information is more accessible and readily available than in the current traditional set-up. The transparency that crowdfunding provides should thus only be improved with regulation and not hindered. Within the *crowd* a diverse set of assessment techniques are

performed by the many participants. Regulation not limiting the creativeness of such techniques should be sought after.

Moreover, confidence in the marketplace is earned and built up over time. It is a direct result of the effectiveness of regulation and legislation. Consumers wish to be protected, but not constrained. Further, in order to facilitate the growth of the market, transaction costs must remain low for an atomised model to work and barriers to participation must be low since the assessment of models is largely dependent on the *crowd* participating.

Any regulatory framework that does not support and promote these inherent characteristics will consequently increase risk and reduce the value of crowdfunding. For example, regulation that treats crowdfunding as traditional finance will reduce transparency, participation by the *crowd*, and diligence, but raise the individual investment size. Other consequences include a reduction in engagement of the populace and the diversity of participants, and a rise in cost.

Attention should be placed on the platform passing several tests, namely operational and financial transparency, security of information and payments, platform functionality, customer protection, and operational procedures. Moreover, education is another key pillar. Education and training are fundamental aspects for the successful implementation of crowdfunding in the ECCU. The provision of information such as guidelines and tips on running a successful crowdfunding campaign, deciding on the best crowdfunding model for the particular venture and appropriate selection criteria to assist investors in deciding on which ventures to invest in, should be disseminated to all participants in the crowd. These are just a few ways to assist in promoting best practices. Lastly, there is great potential for the crowdfunding platform to accumulate huge data sets that may be used for research purposes. Data such as average investment amount categorised by the different models, the average age of investors, and demographics and income data will also become available. Academic institutions, as well as policy institutions such the ECCB and the OECS Secretariat, may now be able to carry out further, more meaningful research as data sets which were once non-existent, now become

available. This provides great potential for the further improvement of the platform and the concept of crowdfunding in the ECCU on a whole.

## **7.0 Conclusion**

The recent global economic and financial crisis of 2007-2009 set the conditions for the rise of alternative financing, more specifically crowdfunding. During the period following the crisis, the reduction in business lending and the acceleration of excess reserves led to a widening of the funding gap. Consequently, research on the suggested alternative financing model is deemed necessary in an effort to diversify funding sources within the ECCU. Along with the publication of the World Bank's report on crowdfunding's potential in the developing world, and the many referrals to its potential by various international organisations such as the UNDP and the Commonwealth, the crowdfunding phenomenon has gained traction in various countries. Of mention are Pitch & Choose, Carib Direct, and IsupportJamaica.com, all based in Jamaica.

This paper sought to assess the viability of crowdfunding as an alternative source of finance. This is primarily attempted in section four, which discusses the minimum necessary requirements based on the Netherlands' experience, and seeks to quantify the feasibility of the model through the application of some simplifying assumptions. This is further supported with the presentation of a case study using an equity-based crowdfunding example. Herein, the paper notes as a key precondition, a platform that conducts business professionally and ethically. Other critical inputs include an adequate and continual screening process, a minimum level of transparency, protection of lenders and investors, and borrowers and entrepreneurs. Moreover, by using the number of Facebook users in the region as the proxy for how 'social' a country is, and by applying several assumptions, the writer is able to confirm in a general sense that crowdfunding may be a viable endeavour for the region to undertake. This may be further assessed using the crowdfunding readiness self-assessment tool (see Appendix 1b).

Finally, the author proposes several initiatives that may be used for the successful implementation of the model. Such initiatives should be focused around the elements of a robust crowdfunding ecosystem as illustrated by the World Bank (see Figure 5). Additionally, the framework, shaped by the work of De Buysere et al. (2012), should include three pillars namely: regulation, research, and education, combined with a common element of public funding.

As crowdfunding is an entirely new phenomenon in the region, further primary research in areas related to entrepreneurship, start-up capital financing and the investment-saving culture may be required.

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## Appendix 1A

**Table 3: Number of Facebook Users in the ECCU 2013-2015**

	2013	2014	2015
Anguilla	6,360	6,600	8,200
Antigua & Barbuda	29,660	34,000	42,000
Dominica	24,160	28,000	32,000
Grenada	29,660	38,000	46,000
St. Kitts & Nevis	21,820	24,000	28,000
Saint Lucia	57,820	68,000	80,000
St. Vincent & the Grenadines	39,060	42,000	50,000

Source: ICT Pulse

**Table 4: Facebook User Penetration Rates in the ECCU 2013-2015**

	2013	2014	2015
Anguilla	40.4%	41.0%	51.0%
Antigua & Barbuda	33.7%	38.6%	47.0%
Dominica	34.0%	39.4%	44.0%
Grenada	28.2%	35.8%	43.0%
St. Kitts & Nevis	37.6%	41.4%	52.0%
Saint Lucia	34.2%	40.2%	44.0%
St. Vincent & the Grenadines	35.5%	38.2%	46.0%

Source: ICT Pulse

## Appendix 1B

### Crowdfunding Readiness – A self-assessment tool<sup>7</sup>

#### Instructions

1. Each question should be scored from 1 to 10, where 1 indicates “lowest/not many” and 10 indicates “highest/many.”
2. Sum up the scores for individual categories and the overall total and calculate the Readiness Ranking.
3. Plot the scores on the four-quadrant graph template (see Figures 4.1 and 4.2).
4. Compare the results with third party data sources and local market experts and subject matter experts to begin to identify gaps and areas of opportunity to improve the potential success of crowdfunding. This may be particularly valuable for developing nations to understand the opportunity and potential paths to success with crowdfunding.

#### Self-assessment

A. Technology: Technology and education are necessary components.

1. What is the level of Internet and/or mobile smartphone penetration in your country? (1 = low, 10 = high)
2. What is the most readily available speed of mobile connectivity in urban areas in your country? (1= no connectivity, 4 = 2G connectivity, 7 = 3G connectivity, 10 = 4G connectivity)
3. How engaged is the population via social media including LinkedIn, Facebook, Twitter, other local social networks? (1 = very low utilization, 10 = very high utilization)
4. What is the average education level reached in the country? (1 = less than 4 years, 10 = over 12 years of education)
5. Business skills (accounting, marketing, and so on) are learned? (1 = on the job, 10 = in education or formal training)
6. The banking system uses and supports electronic funds transfers, or are other Internet or mobile-money transaction enabled services available? (1 = not common, 10 = very common)

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B. Culture: Does a culture of entrepreneurship exist and is entrepreneurship considered a reputable career path?

7. As a career path, how favorably do people view entrepreneurship in your country? (1 = not very favorably, 10 = very favorably)

8. In making investments, how risk-tolerant are people in your country? (1 = people don't take risks with their investments, 10 = people understand risk and include a small portion of high risk investments as part of their investment strategy/portfolio)

9. How risk-tolerant are people in your country to changing jobs? (1 = people don't take risks with their careers, 10 = people understand risk and include changing jobs as part of their career advancement strategy)

10. In general, are actions more driven by more individualistic goals or group goals? (1 = people act individually, 10 = people makes decisions based on group dynamics)

11. How would you describe the general level of trust between individuals within the society/culture? (1 = building trusting relationship between individuals takes a great deal of time and experience, 10 = trusting relationships form quickly)

12. How much trust do individuals have in the businesses they have relationships with? (1 = it is unusual for businesses to build trust with their customers, 10 = brands/businesses can build strong bonds of trust)

13. How much trust is there between individuals and their government? (1 = low levels of trust, 10 = high levels of trust)

14. Incubators/accelerators in my country are actively teaching entrepreneurship? (1 = Incubators/accelerators are physical spaces with no educational programming, 10 = incubators/accelerators are physical spaces with active training curriculum on how to successfully start and grow a business.)

15. Entrepreneurship in my country is fostered by the government and/or NGOs? (1 = Not at all, 10 = Very much so)

16. People are accustomed to buying and selling goods and services online? (1 = buying and selling online is not common, 10 = buying and selling online is very common)

17. How comfortable are people using online rating mechanisms (for example, the like button, feedback, star ratings, and so on) on websites? (1 = not comfortable using online ratings systems, 10 = very comfortable using online ratings systems)

C. Regulation: Regulation can both enable and deter entrepreneurship and crowdfunding depending on its structure and scope.

18. What is the level of regulation/process complexity involved in starting a business today? (1 = very burdensome, 10 = very easy)

19. What is the level of regulation/process/expense around hiring and firing employees? (1 = very burdensome, 10 = very easy)

20. What is the level of regulation around going out of business/closing a business? (1 = very burdensome, 10 = very easy)

21. In evaluating financial regulation, to what degree does investor protection take precedence over the ability of businesses to raise money to start or grow? (1 = government is focused primarily on investor protection, 10 = government is focused primarily on access to capital for businesses)

D. Capital: The availability of capital is usually one of the most prominent missing elements when attempting to build a successful entrepreneurial ecosystem.

22. Financing for start-up is mainly provided by (1 = governments/banks, 10 = friends and family)

23. Financing for small businesses is mainly provided by (1 = governments/banks, 10 = friends and family)

24. Banks are active in lending to small businesses and start-ups (1 = yes, 10 = no)

25. Angel investors are actively making investments in early stage businesses in my country (1 = no, 10 = yes)

26. Early-stage venture capital funds are actively making investments in start-ups and small businesses in my country (1 = no, 10 = yes).

# MEASURING PRODUCTIVITY OF COMMERCIAL BANKS IN THE ECCU: A DEA-BASED MALMQUIST INDEX APPROACH



by

**Mr Kareem Martin**

## ABSTRACT

The banking sector plays a pivotal role in the economic development of the ECCU member countries. Estimates place the size of the commercial banking sector at 176.0 per cent of ECCU wide GDP. Hence, the evaluation of its efficiency and productivity is of paramount importance to all stakeholders. We employ a multiple input Data Envelopment Analysis and Malmquist Productivity Index to assess the efficiency and productivity changes of ECCU commercial banks over the period 1993-2014. We explore an intermediation approach and operating approach to identify the inputs consumed and the outputs created during the banks' production process. The technique was estimated assuming constant returns to scale technology.

The findings suggest that on average moderate productivity improvements were exhibited by all banks. However, foreign banks had more favourable technical change, while national banks experienced greater frontier catch-up. Technical efficiency among foreign banks and national banks were found to follow similar distributions, but post-financial crisis we observed a deterioration of foreign banks' efficiency while national banks' efficiency has trended upwards. The findings also suggest a positive relationship between institutional size and efficiency.

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## 1.0 Introduction

The financial sector of the Eastern Caribbean Currency Union (ECCU) remains a pivotal component of its small developing economies. Ogawa et al. (2013) estimate the size of the ECCU financial system to be US\$9.5b in total assets, or equivalently, 245 per cent of the union's GDP. The commercial banking sector, which accounts for upward of 70.0 per cent of these total assets plays a significant role in the growth and development of the sub-regional economies. Proponents of bank-based systems stress the role of banks in gathering information about firms and managers and therefore improving the allocation of capital and corporate governance; managing liquidity, cross-sectional, and intertemporal risk which enhances investment efficiency and economic growth; and mobilizes capital for the exploitation of economies of scale (Levine, 2002). In essence, these financial intermediaries ensure that excess funds in the economy are directed towards the productive sectors which require funding. The global financial crisis has revealed the increased vulnerability in the ECCU commercial banking sector with implications for regional growth. Since the crisis, there has been unprecedented discussion about the optimal size and ownership structure of banks in the union, with a recommendation for the amalgamation of national banks to increase their efficiency. Due to the macro-economic linkages of the financial sector it is crucial that we continually assess the performance of commercial banks; in an attempt to promote the development, efficiency, and stability of the banking and financial sector.

Real world evidence has shown that banking system vulnerability may stem from both internal and external sources. This paper aims at evaluating the internal efficiency of banks (by size and ownership structure) to determine how efficient ECCU banks have been in fulfilling their function of intermediating funds.

In light of the heightened vulnerability of the banking sector; this paper examines a new approach for evaluating a bank's efficiency using a data envelopment analysis (DEA) technique and the Malmquist Productivity Index (MPI) extension. Efficiency is considered a key factor of stability in the banking sector and we purport to show how efficient commercial



banks have been in discharging their functions over the period 1993-2014. The paper also proposes to identify potential areas of productivity improvement.

Adopting intermediation and operating approaches we estimate Malmquist productivity indices using a DEA frontier. We find that over the sample period commercial banks exhibited moderate productivity growth of 2.1 per cent annually. When this was analysed by ownership structure the foreign banks were found to rely profoundly on technological progress to enhance productivity, while national banks registered relatively high efficiency growth. The differences between the efficiency levels of foreign and national banks were relatively small under both approaches. The paper adds to the sparsely available DEA-based studies of commercial banks in developing countries, and is the only known study to incorporate the technique with ECCU-wide coverage.

The remaining sections of the paper are organised as follows. Section 2 gives a brief overview of the ECCU commercial banking sector; Section 3 provides a literature review on the empirical findings of DEA and non-DEA studies of efficiency and productivity. Section 4 deals with the methodology and the data used. Section 5 presents the results. Section 6 concludes.

## **2.0 Overview of the Commercial Banking Sector**

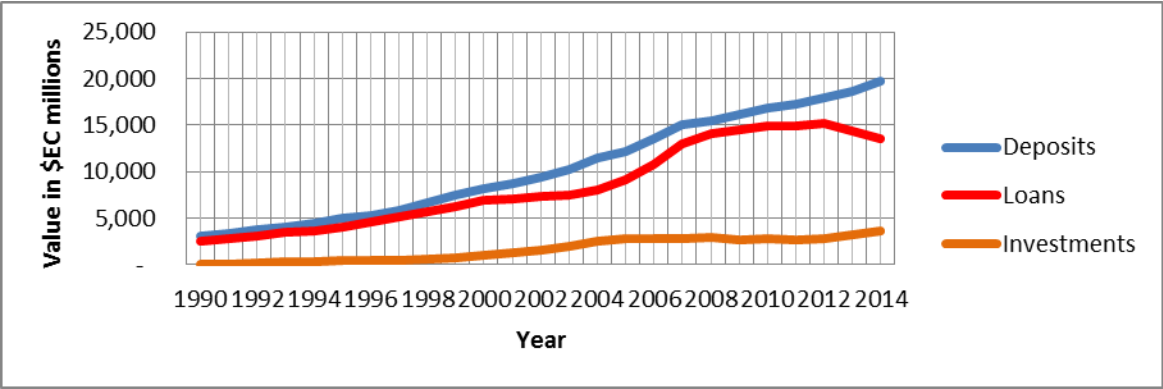
The ECCU comprises of eight countries, the six sovereign territories of Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines, combined with the United Kingdom overseas territories (Anguilla and Montserrat). The ECCU countries together with the British Virgin Islands and Martinique<sup>8</sup> are collectively called the Organisation of Eastern Caribbean States (OECS). The countries share a common regional central bank, the Eastern Caribbean Central Bank (ECCB) and a single currency, the Eastern Caribbean Dollar (EC). The East Caribbean dollar has been pegged to the United States dollar (US) since 1976 at a prevailing market rate of  $EC\$2.70 = US\$1.00$ .

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<sup>8</sup> Martinique became an official OECS associate member 4 February 2015.

The ECCU economies are predominantly bank-based with a union-wide total of 40 commercial banks in operation. The ECCB classifies these financial institutions as either national banks or foreign banks. Of the 40, there are 14 national banks and 26 foreign banks.<sup>9</sup> The foreign banks are dominated by three multinational financial institutions -- Bank of Nova Scotia, First Caribbean International Bank, and the Royal Bank of Canada.<sup>10</sup> The last two decades saw private foreign banks losing market share in the areas of loans, deposits, and other assets. Conversely, national banks have made considerable gains in market share fueled partly by a penetration pricing strategy that attracted customers away from competitors. Nonetheless, foreign banks account for just about 55.0 per cent of the total assets in the banking sector, while national banks account for 45.0 per cent. Presently, both banking groups face increased competition from non-bank financial institutions like insurance companies and credit unions. Credit unions in particular have become significantly important overtime; countries such as Dominica and Montserrat have expanding credit union sectors. In the interim commercial banks remain the primary depot for household savings, and the foremost source of financing for household, firm, and government expenditure. Commercial banks' assets were approximately EC\$27.7b as of March 2015, evidence of the absolute vastness of the sector relative to the size of the financial system. We document the growth of selected assets and liabilities in Figure 1.

Figure 1: Deposit, Loan, and Investment Growth: ECCU area (1990-2014)



<sup>9</sup> We define private national banks as locally or ECCU member owned, and foreign branch banks as owned by CARICOM nationals that are non-ECCU members and non-CARICOM nationals.

<sup>10</sup> The First Caribbean Bank Limited (FCIB) is the product of a 2002 merger between the Canadian Imperial Bank of Commerce (CIBC) and Barclays Bank.

Source: Eastern Caribbean Central Bank

We observe a relatively linear relationship between deposits and time, a reflection of a constant savings rate over the review period. At the end of March 2015 the level of total deposits stood at EC\$20.4b, with loans and advances at \$13.5b. Loans have generally moved proportionately with deposits; slight breaks in the structure are visible between 2001-2003 and again 2010 onwards. Financial institutions became extra cautious vis-à-vis credit extension in the post-financial crisis years. Regarding investments,<sup>11</sup> they expanded significantly between 1998 and 2004 with average growth of 26.0 per cent, but this rate has since subsided to just about 4.0 per cent annually. Commercial banks have maintained a relatively high level of investments since the inception of the Regional Government Securities Market (RGSM) in 2002.

Appropriate to the theme of this paper is a discussion of the changing composition of the commercial banking sector. Foreign banks have essentially reduced the scale of their operations overtime, while the national banks have obtained a larger hold of the market and increased physical presence. This is evident in the available data; observing the evolution of physical capital investments over the period 1993-2014 a clear downward trend is visible in foreign banks. Conversely, national banks have been increasing their physical capital expenditure for the past two decades, which has ultimately resulted in greater growth in operating costs (Figure 3).

## Evolution of Selected Cost Indicators

Figure 2: Physical capital investments by bank type (1993-2014)

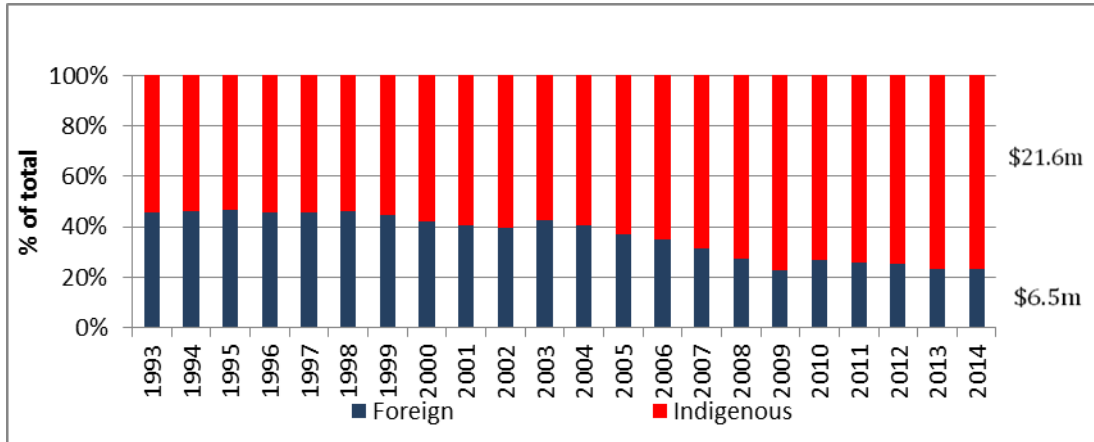
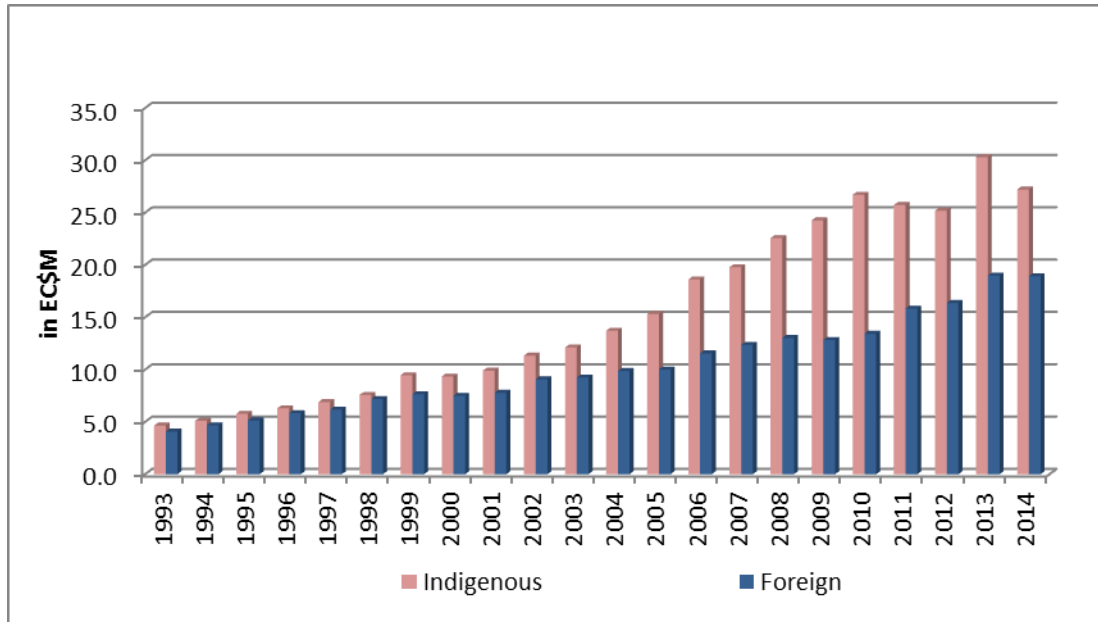


Figure 3: Operating costs by bank type (1993-2014)



Source: Eastern Caribbean Central Bank and author's calculations

<sup>11</sup> Investments are defined here as treasury bills, government securities, and other investments.

Other broad balance sheet items like total deposits and loans and advances show that on average national banks maintained a larger nominal value of loans on their books and a greater share of the total deposits. Fundamentally, the national banks have embodied a community bank characteristic, where the focus tends to be on the businesses and families where the bank operates. Moreover, lending decisions are made with the best interest of the local economy, households, and firms greatly considered.

Figure 4: Total value of loans by bank type (1993-2014)

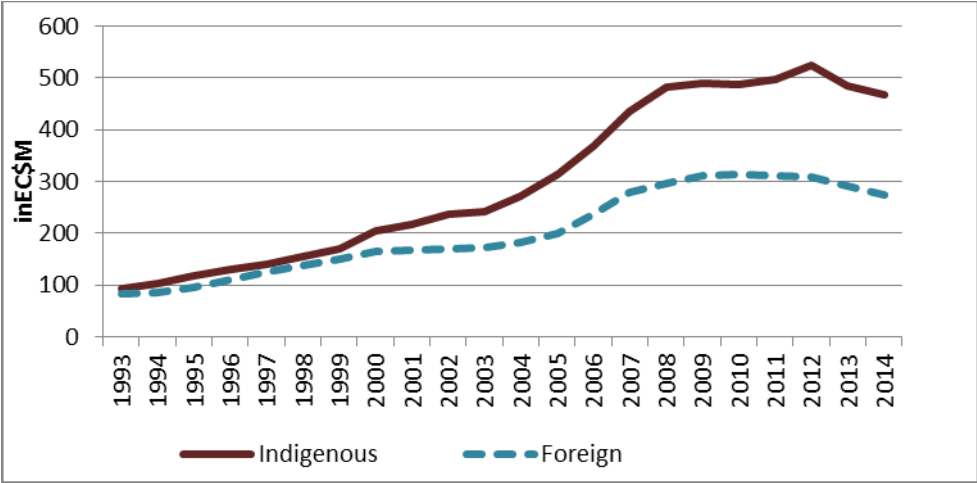
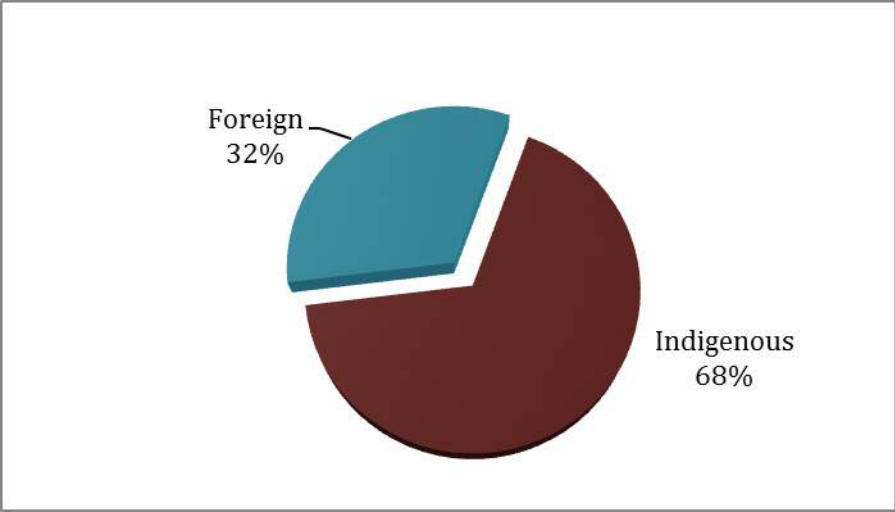


Figure 5: Total value of deposits by bank type (2014)



Source: Eastern Caribbean Central Bank and author's calculations

The locally owned banks have registered greater average loan values since 2000, widening the gap post-financial crisis years. The data also points to a greater deposit holding by national banks with 68.0 percent compared to 32.0 per cent for foreign banks. However, we must mention that these calculations exclude the Caribbean Union Bank (Antigua and Barbuda), RBTT Ltd. (Saint Kitts and Nevis), and First Caribbean International Bank (Saint Lucia).

### **3.0 Review of Literature**

The most widely applied measures of banking performance include the use of a variety of accounting and efficiency ratios and indices for performance and efficiency measures. This literature is extensive in developed countries with minimal coverage for developing economies. However, traditional accounting based measures of efficiency tend not to fully capture the multiple drivers of a bank's success or failures, in contrast to sophisticated methods like the DEA that yield efficiency measures which contain additional information for analysis (Fiorentino, et al., 2006). Additionally, ratio analysis does not control for individual bank outputs, input prices, or other exogenous factors faced by banks in the way that modern efficiency methodologies can, hence results may be misleading (Berger, et al., 2009). The empirical literature has now moved in the direction of modern methodologies for measuring banking efficiency. In what is considered an international literature review, Berger and Humphrey (1997) surveyed 130 studies on financial institution efficiency from 21 countries. The studies reviewed applied parametric approaches such as stochastic frontier analysis (SFA), thick frontier analysis (TFA), and distribution-free approach (DFA). Nonparametric approaches in the areas of data envelopment analysis (DEA) and free disposal hull were also utilised.<sup>12</sup> Berger and Humphrey (1997) concluded that both types of approaches had shortcomings; parametric approaches were restricted by their functional forms, while nonparametric approaches did not allow for a random error component that may impact performance. This review seeks to provide a brief summary of selected studies conducted on the ECCU commercial banking sector. Additionally, we present a cross section of the

international literature who have applied DEA or MPI type analysis to their financial sector studies.

Juan-Ramon et al. (2001) conducted an in-depth statistical analysis of banking performance in the ECCU. Specifically, the Herfindahl Index and the Wilcoxon Mann-Whitney nonparametric tests were used to examine ECCB area data from 1990-1998. The study noted that the market share of foreign banks declined during the nineties. Analysis of the Herfindahl index revealed no concentration of banks within or across countries. Moreover, Juan-Ramon et al. (2001) found that large banks tended to reduce their scale throughout the period. Further, foreign banks and private national banks exhibited similar efficiency distributions, however, foreign banks were more profitable. This was partly attributed to the higher interest rate spreads that foreign banks enjoyed compared to national banks. Polius and Samuel (2002) applied the Structure-Conduct-Performance (SCP) and efficiency hypotheses to data from 44 commercial banks in the ECCU. Using semi-annual data from 1991-1999 they estimated a pooled least squares with fixed effects that examined the relationship between profitability of banks and the structure of the banking market. Their findings suggest that commercial bank efficiency significantly impacts market structure. Peripherally, Polius and Samuel (2002) uncovered relationships between operational efficiency and proxies for market concentration, bank size, and market share, the latter two variables being negatively correlated.

In a more recent study, Hodge (2012) examined the relationship between competition and efficiency in Antigua and Barbuda, Grenada, Saint Kitts and Nevis and Saint Lucia. Despite the dominance of the commercial banking industry in the financial sector, Hodge suggests that ECCU banks are inefficient producers of financial services. Quarterly data from 1998-2007 were used to estimate a panel data model for the Panzar-Rosse methodology and the Lerner index; which were the measures of competition. Efficiency was computed using the SFA and DEA techniques; where an intermediation approach was adopted. The inputs (funds, physical capital, and labour) were used to produce the outputs (deposits, loans, other earning assets).

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<sup>12</sup> Of the 130 studies surveyed 69 used nonparametric approaches where 62 were DEA, 5 were FDH, 1 was IN, and 1 MOS.

Hodge (2012) found that generally the banks were technically efficient but suffered from cost and allocative inefficiency. Additionally, with the support of Granger-casuality tests the author indicated the presence of a negative relationship between competition and efficiency. These results lend support to the banking specificities hypothesis.

There exists a growing and promising body of research on total factor productivity (TFP) and efficiency growth in the banking sector. TFP measures the productivity improvements generated from technical progress and efficiency changes (Daniels and Tirtiroglu 1998). In the literature it is commonly measured by two approaches. A parametric approach which involves the econometric estimation of a production or cost function, and a non-parametric approach which computes the rates of TFP indices through an index of outputs divided by an index of inputs. The Malmquist Productivity Index (MPI) is one of these non-parametric approaches that measures productivity growth. It reflects either progression or regression in efficiency in the frontier technology overtime in a framework consisting of multiple inputs and outputs (Tone 2004). Malmquist (1953) was the first to conceptualise the index, but it has been studied and developed notably by Caves et al. (1982) and Fare et al. (1994). Numerous studies have since applied the technique to assess the productivity changes in the banking sector. In addition to the Malmquist index, the DEA technique has been used expansively to assess the efficiency of financial institutions over the last 30 years. The technique measures efficiency by analysing homogenous DMUs in a sample, every DMU is compared with an identified frontier leader to highlight the efficient and inefficient units. The firms that reside on the efficient frontier are the best practice and considered efficient the firms under the frontier are thus, relatively inefficient.

In efficiency studies, results tend to vary with the selection of input and output variables. The literature is dominated by three approaches: the production approach, the intermediation approach, and the modern approach. The production approach classifies banks as traditional firms producing services for customers (Benston, 1965). Variables included in this approach are the physical inputs needed to perform transactions, process financial documents etc; while the outputs are the services the banks provide to clients (deposit accounts, loans, advisory



services). Under the intermediation approach, the main function of the bank is intermediating funds between savers and borrowers. As such, the inputs tend to be deposits, operating expenses and other liabilities used in the creation of loans, investments, and other assets. This approach has a number of variants, the asset approach<sup>13</sup> by Sealy and Lindley (1977) is particularly popular. Finally, the modern approaches introduce into the analysis, measures of risk and the quality of bank assets and probability of failure. The ratio-based CAMEL approach is the best incarnation of this modelling type.<sup>14</sup> In the absence of consensus on the optimal variable specification, a number of approaches have been adopted in the literature.

Using an input-oriented DEA model, Favero and Papi (1995) examined the technical and scale efficiency of 174 Italian banks in 1991. The input-output mixtures applied were the intermediation and asset approaches. Under the asset approach labour, capital, loanable funds, and financial capital were the inputs, while the outputs were loans, investments in securities and bonds, and non-interest income. The average efficiency scores were 79 per cent and 84 per cent, under constant and variable returns to scale respectively. The intermediation approach resulted in average efficiency scores of 88 per cent constant and 91 per cent variable returns to scale. Loanable funds (including current and savings accounts) were transferred from inputs to outputs under the approach.

A DEA-Malmquist methodology was applied by Drake (2001) to estimate the relative efficiencies of major United Kingdom banks. Annual panel data 1984-1995 was used in his investigation. Drake employed an intermediation approach with fixed assets, number of employees, and deposits as inputs and liquid assets, other income, investments and loans as outputs. He also employed a production approach where inputs were fixed assets, number of employees; and outputs were loans, investments, deposits, other income, and liquid assets. Four models were assessed; model 1 looked at institutional size and efficiency, model 1a tested the effect of bad debt as an additional input, model 2 was a modified production

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<sup>13</sup> This approach models banking activity strictly as a financial intermediary, using deposits, labour, and capital as inputs with loans, investments, and other assets as outputs.

<sup>14</sup> CAMEL here is reference to Capital Adequacy, Asset Quality, Management, Earnings, and Liquidity.

approach, and model 2a considered bad debt as an additional input in model 2. The obtained efficiency scores were 87 per cent for model 1, 88 per cent for model 1a, 56 per cent for model 2, and 57 per cent for model 2a. Additionally, the author's findings indicated the existence of increasing returns to scale for the smaller banks in comparison to the larger banks, albeit, the larger banks tended to be more efficient. Overall, the UK banks experienced positive productivity growth over the period.

Kirikal (2005) utilised a MPI approach to analyse the productivity of Estonian banks, the first such use of the technique in the Estonian context. The study showed that Estonian banks experienced an average of 25.6 per cent annual productivity growth during the period 1999-2002. Generally, it was found that Estonian banks improved their productivity as a result of technological progress. Similarly, using a non-parametric Malmquist index approach Raphael (2013) measured the productivity changes of Tanzanian commercial banks from 2005-2011. The author reported that the mean efficiency changes of large domestic banks were higher compared to small banks and large foreign banks. He also found that the small banks had a higher TFP growth rate when compared to the other bank groups. This was attributed to small banks' superior investments in technological innovation to ease their cost of production. The efficiency gains observed for the banking groups were due to technical efficiency rather than scale efficiency.

The growing trend in the modern literature is directed towards the use of sophisticated methodologies for measuring bank efficiency. Multiple studies have been conducted globally that utilise a variety of techniques and models. DEA and some of its extensions have emerged as the most widely used approaches in the present literature. These DEA methods have established themselves as true improvements over traditional ratio analysis. They can accommodate multiple inputs and outputs and be decomposed into specific components of efficiency. Therefore, areas of strength or relative inefficiencies in firms are identified. The Malmquist productivity index allows for the comparison of productivity changes in the banking industry as well as comparisons within groups, again identifying potential areas of development. This paper explores the above methodologies in the context of ECCU banks,

expanding on previous work by Hodge (2012), with a longer time dimension and Malmquist index extension.

## 4.0 Methodology and Data

### 4.1 The Malmquist Index and DEA

Data Envelopment Analysis (DEA) is a linear programming based technique credited to Charnes, Cooper, and Rhodes (1978) which shows how data-based activity models can be solved to assess productive performance. In contrast to parametric approaches that estimate functional forms and fits a regression to the input-output data points, DEA constructs a production-possibility set which is enveloped by a piece-wise linear frontier. Hence, all observed points will lie on or below the constructed frontier. Assuming a dataset with  $K$  inputs and  $Q$  outputs for  $N$  DMUs (firms), then for the  $i$ -th firm,  $K$  inputs are represented by the column vector  $x_i$  and  $Q$  outputs by  $y_i$ . The  $K \times N$  and  $Q \times N$  matrices represent the data for all firms. Given the assumption of constant returns to scale and utilizing the duality in linear programming, we derive the envelopment form of the problem:

$$\begin{aligned}
 & \max \theta \\
 \text{st} \quad & -y_i + Q\lambda \geq 0 \\
 & \theta x_i - K\lambda \geq 0 \\
 & \lambda \geq 0,
 \end{aligned} \tag{1}$$

Where  $\theta$  is a scalar and the technical efficiency score of the  $i$ -th DMU and  $\lambda$  a  $N \times 1$  vector of constants. The value for  $\theta$  is estimated for each DMU, by solving the linear programming problem once for each firm in the sample ( $N$  times). In accordance with Farrell (1957)  $\theta \leq 1$ , with values equal to 1 indicative of technically efficient DMUs.

Fare et al. (1989, 1994) exploited the connection between Charnes et al., (1978) and Caves et al., (1982) and introduced a DEA estimation method for the Malmquist productivity index. The MPI is a measurement of productivity changes along a specified time dimension. It can

be decomposed into changes in technology and efficiency using the DEA methodology. We can express the MPI with distance functions (D) using observations at time  $t$  and  $t + 1$ :

$$MPI_t^I = \frac{D_t^I(x^{t+1}, y^{t+1})}{D_t^I(x^t, y^t)} \quad (2)$$

$$MPI_t^{t+1} = \frac{D_t^{t+1}(x^{t+1}, y^{t+1})}{D_t^{t+1}(x^t, y^t)} \quad (3)$$

The  $I$  denotes the input-oriented approach of the MPI model. The distance function  $D_t^I(x^{t+1}, y^{t+1})$  gives the maximum proportional change in inputs required to make  $(x^{t+1}, y^{t+1})$  viable relative to time  $t$  technology. Similarly,  $D_t^I(x^t, y^t)$  generates the maximum proportional change in inputs required to make  $(x^t, y^t)$  practical for time  $t$  technology. Likewise, we use technology at  $t + 1$  as a benchmark and define a period  $t + 1$  based Malmquist index (Equation 3). The Malmquist productivity change index is the geometric mean of two Malmquist productivity indices (Equation 2 and 3):

$$MPI_t^I = \left[ \left( \frac{D_t^I(x^{t+1}, y^{t+1})}{D_t^I(x^t, y^t)} \right) * \left( \frac{D_t^{t+1}(x^{t+1}, y^{t+1})}{D_t^{t+1}(x^t, y^t)} \right) \right]^{1/2} \quad (4)$$

The total factor productivity growth is positive between two periods given an  $MPI > 1$ , while  $MPI < 1$  equates to productivity decline, and  $MPI = 1$  indicates stagnation. Further decomposition of the index into technical change and efficiency change is possible, according to Fare et al. (1989) the following is an equivalent representation of (4):

$$MFI_t^g = \underbrace{\left( \frac{D_t^{t+1}(x^{t+1}, y^{t+1})}{D_t^t(x^t, y^t)} \right)}_{EFFCH} * \underbrace{\left[ \left( \frac{D_t^t(x^t, y^t)}{D_t^{t+1}(x^t, y^t)} \right) * \left( \frac{D_t^t(x^{t+1}, y^{t+1})}{D_t^{t+1}(x^{t+1}, y^{t+1})} \right) \right]^{1/2}}_{TECHCH} \quad (5)$$

or

$$MPI = EFFCH * TECHCH \quad (6)$$

The first term (EFFCH) represents the efficiency change between period  $t$  and  $t + 1$  reflecting a "catch-up effect" to the frontier. EFFCH is greater than, equal to, or less than 1 if the firm is converging, static, or diverging from the production frontier. The second term (TECHCH) measures the technological change in the production technology (a frontier shift), similarly, it is improving, unchanged, or deteriorating when its value is greater than, equal to, or less than 1. The technical efficiency component is further decomposed into scale efficiency and pure technical efficiency by applying both constant and variable returns to scale (CRS, VRS) DEA frontiers to calculate the distance functions. The Malmquist index in (5) contains four different distant functions which must be computed solving four linear programming problems. If we assume constant returns to scale, the following input oriented DEA-type linear programming problems are solved:

$$\begin{aligned} [D_t^t(x_t, y_t)]^{-1} &= \min_{\theta, \lambda} \theta, \\ \text{st} \quad & -y_{it} + Q_{it}\lambda \geq 0 \\ & \theta x_{it} - K_{it}\lambda \geq 0 \\ & \lambda \geq 0, \end{aligned} \quad (7)$$

$$\begin{aligned} [D_t^{t+1}(x_{t+1}, y_{t+1})]^{-1} &= \min_{\theta, \lambda} \theta, \\ \text{st} \quad & -y_{i,t+1} + Q_{i,t+1}\lambda \geq 0 \\ & \theta x_{i,t+1} - K_{i,t+1}\lambda \geq 0 \\ & \lambda \geq 0, \end{aligned} \quad (8)$$

$$\begin{aligned}
& [D_t^{f+1}(x_{it}, y_{it})]^{-1} = \min_{\theta, \lambda} \theta, \\
\text{st} \quad & -y_{it} + Q_{t+1}\lambda \geq 0 \\
& \theta x_{it} - K_{t+1}\lambda \geq 0 \\
& \lambda \geq 0,
\end{aligned} \tag{9}$$

$$\begin{aligned}
& [D_t^f(x_{t+1}, y_{t+1})]^{-1} = \min_{\theta, \lambda} \theta, \\
\text{st} \quad & -y_{t+1} + Q_t\lambda \geq 0 \\
& \theta x_{t+1} - K_t\lambda \geq 0 \\
& \lambda \geq 0,
\end{aligned} \tag{10}$$

Solving the above problems for each firm in the sample and for each period generates the index of interest (Malmquist productivity). This paper exploits a user written Malmquist Productivity Index-DEA frontier Stata program, introduced by Lee et al. (2011).

#### 4.2 *Data and Specification*

We use annual commercial banking data for the period 1993-2014 compiled from the income statements and balance sheets reported to the ECCB. The data covers 37 commercial banks<sup>15</sup> across the ECCU area; all eight territories are represented in the analysis. Summary statistics for the variables are presented in Table 1; they include deposits, personnel expenses, operating expenses, physical capital, loans and advances, and investments. These variables are described in greater detail later in the section.

Table 1: Summary Statistics (1990-2014): Selected ECCU Commercial banks

Variable	Mean	Std. Dev	Minimum	Maximum
Deposits	296.4	278.3	3.5	2822.9
Personnel Expenses	4.9	3.9	0.3	31.2
Operating Expenses	12.1	10.5	0.7	95.1
Physical Capital	7.9	8.5	0.1	60.0
Loans and Advances	237.4	228.5	0.2	1468.6
Investments	49.5	121.8	0.1	1826.6

Note: denoted in EC\$M

The DEA approach requires a homogenous set of firms that utilize the same resources in an attempt to create the same products, albeit, in varying proportions. We can assume that this requirement holds within the ECCU given that banks operate under a common regulatory and legislative framework. There is some ambiguity on the optimal specification of outputs and inputs in efficiency studies. While a number of approaches have been used in the literature, for the purpose of this study we apply an asset-based variant of the intermediation approach and an operating approach to assess the efficiency and productivity of the sample banks. This should enable the examination of robustness among the efficiency scores generated under both approaches. Table 2 summarizes the input-output specification of the approaches.

Table 2: Specification of Inputs/Outputs

Approach	Inputs	Outputs
Intermediation approach	x1 = Deposits x2 = Labour x3 = Operating expenses x4 = Physical Capital	y1 = Loans and Advances y2 = Investments
Operating approach	x1 = Operating Expense x2 = Interest Expense	y1 = Interest income

<sup>15</sup> Caribbean Union Bank (Antigua and Barbuda), RBTT Caribbean Ltd. (Saint Kitts), and First Caribbean International Bank (Saint Lucia) are excluded from the study. Full data for the period under review was not readily available for these banks.

Using this intermediation approach we identify deposits ( $x_1$ ), labour ( $x_2$ ), operating expenses ( $x_3$ ), and physical capital ( $x_4$ ) as the inputs required to produce loans and investments. We note that this approach applies classical theory of the firm to the production process of the commercial banks. Under the operating approach we view banks as firms with the main objective of revenue formation (interest income) from total expenses incurred (operating expenses and interest expenses). We present the results of these estimations in the next section.

## 5.0 Results and Analysis

As a precursor to the discussion of the empirical results from the input-oriented DEA-Malmquist index, we conduct a correlation analysis to examine the relationship between the identified inputs and outputs. The correlation matrix (Table 2A) indicates that a positive relationship among the input and output variables. As expected, a positive and significant relationship was observed between deposits and loans (0.872), labour and loans (0.810), and operating expenses and loans (0.841). Lending support to our particular choice of input and output specification. The variables with the lowest correlation coefficient were physical capital and investments (0.295).

### 5.1 *Efficiency of the Banking sector*

The results of the input-oriented DEA estimation are presented in Table 3A. They cover the period 1993-2014 and express results under the assumption of constant returns to scale. Thirty-seven banks were tested under the intermediation approach, while thirty-four banks were used in the operating approach. The results highlight visible inequalities among the technical efficiency scores generated by both approaches. We observed an average technical efficiency score of 80.3 per cent under the intermediation approach and 76.8 per cent under the operating approach. This result is likely a reflection of the disproportionate growth in the input variables (particularly deposits) when compared to the growth in our output variables. A bank is said to be technically efficient if it is producing a maximum quantity of outputs from a minimum level of available inputs. Generally, efficiency levels rose during the 1990's



peaking in the year 2000, since that point the efficiency level of ECCU banks have deteriorated.

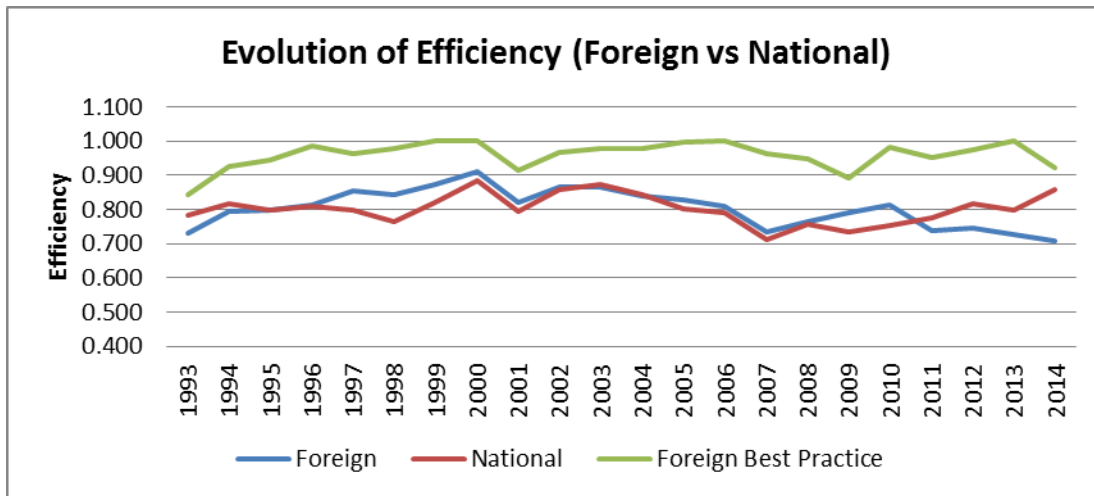
Expanding the analysis, we assess the relationship between a bank's institutional size and its level of efficiency. We use the value of total assets to differentiate between large and small banks.<sup>16</sup> The data suggests that larger banks operated more efficiently on average than smaller banks under both approaches. Large banks averaged efficiency scores of 77.7 per cent and 85.4 per cent under the operating approach and intermediation approach respectively. The small banks registered efficiency scores of 75.8 under operations and 76.4 under intermediation approaches. Isolating the three largest banks in the sample, we obtain efficiency scores of 90.5 under the intermediation approach and 85.6 under the operating approach. Suggesting a possible U-shaped relationship between size and efficiency, indicating increased efficiency with the scale of operations. Studies such as Hughes et al. (2001) find evidence of economies of scale that increase with bank size, once the bank's risk-taking and capital structure are controlled for in the model. Generally, our data showed that larger banks tended to operate closer to the frontier than the smaller banks in the sample.

We note that majority of the foreign banks consistently operated at higher efficiency levels than the national banks; hence an assessment was done of these groups individually. The foreign banks generated an average technical efficiency score of 80.3 per cent over the sample period, while the national banks averaged an efficiency level of 80.2 per cent under the intermediation approach. The operating approach generated efficiency scores of 77.5 per cent for foreign banks and 75.2 per cent for national banks. The national banks have converged with regards to the function of intermediation but foreign banks maintain more lean operations. We recall that Ramon et al. (2001) found that private national banks and private foreign banks exhibited similar efficiency distributions. Graphing the individual efficiency scores (Figure 6) we do note a similarity in the trend overtime.

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<sup>16</sup> Banks with total assets exceeding EC\$600m are considered large, banks with total assets less than EC\$600m are considered small. This differentiation was the arbitrary choice of the author.

Figure 6: Technical Efficiency Foreign vs National (1993-2014)



Source: Author's calculations

As Figure 6 shows, both series have moved in tandem with only a slight deviation 1996-1998. The real divergence is noticed post 2010, with the efficiency of national banks on an upward trend as opposed to a downward movement in foreign bank efficiency. Both groups have restricted credit since the financial crisis, but national banks on average have increased investment holdings as loan amounts diminish, in contrast foreign banks have registered declines in both asset groups. Graphing a series containing the foreign best practice banks also helps to explain the observed convergence; the best practice foreign banks have become relatively less efficient in comparison to national banks overtime.

## 5.2 Productivity Analysis

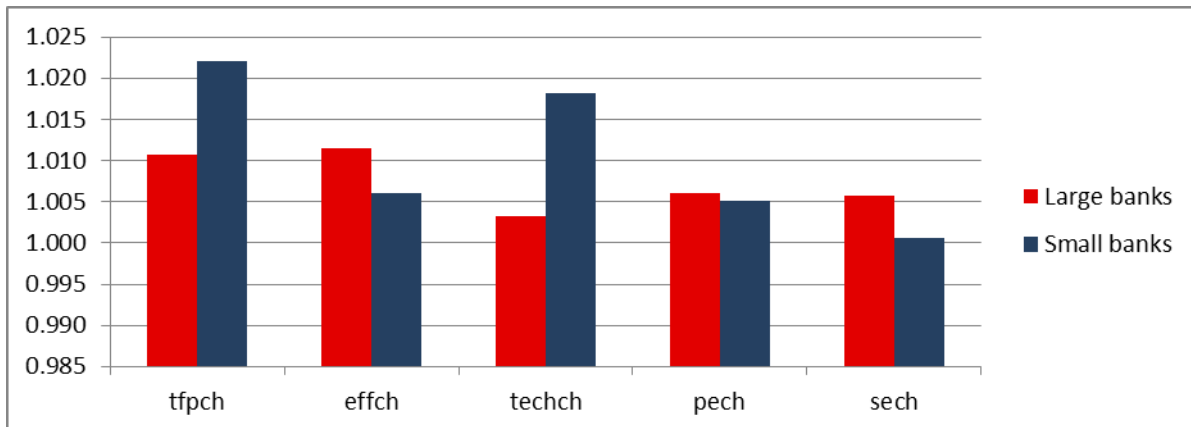
The productivity changes are summarised below in Table 4, it shows the changes in total factor productivity and its corresponding components over the period 1993-2014. We employed an intermediation approach where the specified outputs were loans and investments; created by the multiple inputs--deposits, operating expenses, labour, and physical capital. Productivity over a time dimension arises as a consequence of improvements in technical or scale efficiency (catch-up effect) along with frontier shifts resulting from technological changes. The results indicate that ECCU banks experienced average productivity growth of 1.7 per cent annually over the sample period. The total productivity improvement over the

period was measured to be 36.1 per cent, with the largest productivity growth rate (15.6 per cent) observed 1999-2000. The productivity improvement was a result of equal changes in efficiency and technological progress of 1.1 per cent annually, a total period change of 22.7 and 24.0 per cent respectively. When we further decompose the technical efficiency component, scale efficiency change over the period is 0.6 per cent, while pure technical efficiency change was 0.5 per cent annually. Thus, on average, banks have improved their efficiency more by changing the scale of their operations.

The Malmquist productivity indices provide us with the tools for comparing groups within the sample of banks. We find that foreign banks experienced 2.1 per cent productivity growth over the period, while national banks had productivity change of 0.9 per cent annually. Foreign banks have exhibited greater growth in technical change (1.7 per cent) when compared to national banks (0.1 per cent) during the period. This implies that the foreign banks have relied more consistently on technological innovations to reduce their costs of production. In contrast, national banks' productivity changes have arose from improvements in efficiency as they catch up with the best practice banks. The national banks averaged efficiency gains of 1.6 per cent annually, while foreign banks average 0.8 per cent. Scale efficiency was the main contributor to the observed improvements in overall technical efficiency. Thus the banks have benefitted from efficiency growth as they attempt to identify their optimal size.

In Table 6A we present the productivity changes of the banks by size. Large and small banks both registered productivity improvements across all the total factor productivity indicators. However, small banks exhibited greater productivity change, attributed to relatively higher benefits from technological changes. Suggesting that small banks were able to shift their production possibility frontiers outwards, augmenting their maximum output capacity given their inputs. The large banks recorded greater annual efficiency change at 1.1 per cent and greater scale efficiency change over the period of study. The lack of the benefits derived from size has essentially warranted small banks to be more productive in order to compete with the larger banks.

Figure 7: Productivity changes by bank size



Notes: Total factor productivity change (tfpch), Efficiency change (effch), Technical change (techch), Pure technical efficiency change (pech), Scale efficiency (sech).

Source: Author's calculations

The results from the operational approach were robust to the conclusions obtained from the intermediation approach. Small banks relied on technological change to support their productivity growth while larger banks exhibited superior efficiency gains to improve their productivity over time.

## 6.0 Conclusion

The commercial banks in the ECCU have experienced rapid growth in assets over the past two decades. As the dominant sector in the financial system they are a critical component in the continued development of the region. The global financial crisis revealed vulnerabilities in the banking sector with implications for growth within the economies. The close relationship between commercial banks and the macro-economy warrants continued assessment of the performance of these financial entities.

A major observation was the varying results produced by using different approaches to measuring a bank's outputs and inputs. However, the overall conclusions from the results were consistent and robust with minimal divergences. The foreign and national banks shared a similar efficiency pattern over the period, with a disparity observed after the 2008 financial crisis, where national banks began supplementing their declining loan portfolios with

investment instruments. Moreover, the foreign banks who have maintained a best practice status over the sample period have been reducing their scale overtime and losing efficiency as a consequence. Overall the banks in the ECCU needed to reduce inputs by an average 21.5 per cent or increase output by a similar amount to attain relative frontier efficiency. The data also suggests a positive relationship between bank size and efficiency, shown by the superior efficiency enjoyed by the larger banks in the sample. This alludes to the existence of possible economies of scale in the ECCU commercial banking sector.

An interesting finding was the relatively large gap between the technical changes registered by the foreign banks and the national banks. The local banks only attained an average of 0.1 per cent technological progress, compared to 1.7 per cent for foreign banks. The foreign banks have relied more on technological advancements to enhance their productivity, while the national banks have gained more from efficiency growth or catching-up to the frontier effects. Hence, there exists a potential efficiency and productivity benefit from more investments in innovative technologies and systems to reduce related costs of production.

The flexibility of the DEA and Malmquist methodologies allows for a diverse set of outputs and inputs under different approaches. Therefore, future research could employ the techniques with different sets of variables to uncover alternative relationships and trends. Some researchers have suggested the use of value-added approaches, since they take into account the cost of funds and measure the average interest rate spread. They posit that this approach trumps the intermediation and production approaches, producing more unbiased and non-trivial results. Moreover, modern approaches that utilise the components of CAMEL introduce into the estimations the probability of bank failure and becomes a valuable monitoring tool. Despite, these potential benefits, we must add that the DEA methodology does not ideally take into consideration measurement errors and is highly susceptible to statistical noise.

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## Appendix

Table 2A: Correlation matrix

	Deposits	Personnel Expenses	Operating Expenses	Physical Capital	Loans and Advances	Investments
Deposits	1					
Personnel Expenses	0.8206	1				
Operating Expenses	0.8108	0.8804	1			
Physical Capital	0.5011	0.6005	0.5374	1		
Loans and Advances	0.8716	0.810	0.8412	0.485	1	
Investments	0.7461	0.5493	0.4777	0.2945	0.4677	1

Table 3A: Average Technical Efficiency of ECCU Banks 1993-2014

Year	Intermediation Approach	Operating Approach
1993	0.749	0.793
1994	0.802	0.824
1995	0.797	0.832
1996	0.813	0.797
1997	0.836	0.822
1998	0.815	0.852
1999	0.856	0.865
2000	0.902	0.862
2001	0.812	0.802
2002	0.863	0.808
2003	0.869	0.753
2004	0.843	0.814
2005	0.818	0.723
2006	0.804	0.767
2007	0.727	0.706
2008	0.761	0.662
2009	0.772	0.685
2010	0.792	0.729
2011	0.752	0.676
2012	0.771	0.668
2013	0.751	0.722
2014	0.761	0.727
<b>Mean</b>	<b>0.803</b>	<b>0.768</b>

Source: Author's calculation

Table 4A: Malmquist index summary of mean changes 1993-2014



<b>Period</b>	<b>tfpch</b>	<b>effch</b>	<b>techch</b>	<b>pech</b>	<b>sech</b>
1993 ~ 1994	1.009	1.108	0.918	1.043	1.067
1994 ~ 1995	1.004	1.002	1.002	1.003	1.002
1995 ~ 1996	1.021	1.028	0.993	1.002	1.027
1996 ~ 1997	1.024	1.035	0.994	1.039	0.994
1997 ~ 1998	1.093	0.981	1.109	0.981	0.999
1998 ~ 1999	1.038	1.057	0.984	1.023	1.034
1999 ~ 2000	1.156	1.073	1.087	1.042	1.028
2000 ~ 2001	0.989	0.898	1.115	0.958	0.940
2001 ~ 2002	0.981	1.079	0.916	1.029	1.050
2002 ~ 2003	1.002	1.011	0.993	1.014	0.998
2003 ~ 2004	0.985	0.967	1.020	0.987	0.981
2004 ~ 2005	1.075	0.974	1.104	0.969	1.008
2005 ~ 2006	1.018	0.982	1.035	0.994	0.990
2006 ~ 2007	1.060	0.902	1.179	0.936	0.965
2007 ~ 2008	1.021	1.061	0.966	1.012	1.055
2008 ~ 2009	1.028	1.038	0.991	1.001	1.035
2009 ~ 2010	0.976	1.033	0.947	1.025	1.007
2010 ~ 2011	0.933	0.950	0.984	0.972	0.978
2011 ~ 2012	1.065	1.050	1.012	1.025	1.018
2012 ~ 2013	0.946	0.973	0.973	0.994	0.979
2013 ~ 2014	0.936	1.026	0.918	1.046	0.979
<b>Mean</b>	<b>1.017</b>	<b>1.011</b>	<b>1.011</b>	<b>1.005</b>	<b>1.006</b>

Notes: Total factor productivity change (tfpch), Efficiency change (effch), Technical change (techch), Pure technical efficiency change (pech), Scale efficiency (sech).

Source: Author's calculations

Table 5A: Malmquist index summary (Foreign vs National)

Foreign Banks						National Banks				
Period	tfpch	effch	techch	pech	sech	tfpch	effch	techch	pech	sech
1993 ~ 1994	1.002	1.129	0.892	1.068	1.065	1.022	1.070	0.966	0.999	1.071
1994 ~ 1995	1.008	1.011	0.999	1.015	1.000	0.996	0.987	1.008	0.980	1.007
1995 ~ 1996	1.021	1.027	0.993	0.997	1.032	1.022	1.029	0.994	1.011	1.019
1996 ~ 1997	1.045	1.062	0.988	1.052	1.008	0.984	0.985	1.004	1.017	0.969
1997 ~ 1998	1.149	0.989	1.154	0.988	1.000	0.990	0.965	1.027	0.967	0.998
1998 ~ 1999	1.034	1.048	0.989	1.026	1.020	1.045	1.075	0.973	1.016	1.060
1999 ~ 2000	1.165	1.059	1.111	1.044	1.012	1.141	1.099	1.044	1.038	1.058
2000 ~ 2001	0.972	0.899	1.085	0.949	0.950	1.020	0.896	1.171	0.975	0.920
2001 ~ 2002	0.999	1.060	0.943	1.025	1.036	0.949	1.114	0.865	1.038	1.075
2002 ~ 2003	0.999	1.005	0.995	1.011	0.995	1.008	1.021	0.991	1.019	1.002
2003 ~ 2004	0.995	0.972	1.024	0.992	0.982	0.967	0.956	1.014	0.978	0.979
2004 ~ 2005	1.082	0.982	1.101	0.973	1.011	1.063	0.959	1.110	0.962	1.000
2005 ~ 2006	1.026	0.984	1.040	0.995	0.989	1.003	0.979	1.027	0.992	0.991
2006 ~ 2007	1.085	0.906	1.201	0.942	0.961	1.015	0.894	1.139	0.924	0.970
2007 ~ 2008	1.014	1.053	0.967	1.011	1.048	1.035	1.074	0.964	1.014	1.068
2008 ~ 2009	1.072	1.049	1.024	1.003	1.044	0.939	1.017	0.926	0.997	1.019
2009 ~ 2010	0.955	1.040	0.921	1.045	0.993	1.019	1.019	1.000	0.984	1.036
2010 ~ 2011	0.894	0.900	0.993	0.937	0.962	1.002	1.037	0.967	1.033	1.004
2011 ~ 2012	1.069	1.036	1.027	1.011	1.016	1.059	1.076	0.984	1.049	1.022
2012 ~ 2013	0.935	0.967	0.966	0.993	0.979	0.966	0.983	0.986	0.997	0.979
2013 ~ 2014	0.927	0.983	0.945	1.026	0.960	0.951	1.104	0.870	1.084	1.014
<b>Mean</b>	<b>1.021</b>	<b>1.008</b>	<b>1.017</b>	<b>1.005</b>	<b>1.003</b>	<b>1.009</b>	<b>1.016</b>	<b>1.001</b>	<b>1.003</b>	<b>1.012</b>

Notes: Total factor productivity change (tfpch), Efficiency change (effch), Technical change (techch), Pure technical efficiency change (pech), Scale efficiency (sech).

Source: Author's calculations

Table 6A: Malmquist index by institutional size

Large Banks						Small Banks				
Period	tfpch	effch	techch	pech	sech	tfpch	effch	techch	pech	sech
1993 ~ 1994	1.003	1.099	0.916	1.059	1.040	1.013	1.025	1.004	1.031	0.996
1994 ~ 1995	0.973	0.972	1.001	0.966	1.010	1.027	1.007	0.973	0.979	1.029
1995 ~ 1996	1.076	1.056	1.020	1.032	1.025	0.980	1.035	0.993	1.034	0.997
1996 ~ 1997	1.024	1.034	0.994	1.046	0.989	1.023	0.994	1.171	0.985	1.009
1997 ~ 1998	0.986	0.964	1.028	0.976	0.986	1.174	1.052	0.986	1.022	1.029
1998 ~ 1999	1.041	1.064	0.981	1.023	1.041	1.035	1.093	1.134	1.050	1.040
1999 ~ 2000	1.070	1.047	1.026	1.031	1.013	1.222	0.879	1.127	0.966	0.912
2000 ~ 2001	1.015	0.923	1.100	0.947	0.975	0.969	1.095	0.917	1.010	1.085
2001 ~ 2002	0.969	1.058	0.915	1.055	1.003	0.991	0.996	1.000	1.016	0.983
2002 ~ 2003	1.012	1.030	0.985	1.010	1.018	0.994	0.970	1.020	0.987	0.984
2003 ~ 2004	0.983	0.962	1.021	0.988	0.976	0.987	0.968	1.118	0.981	0.989
2004 ~ 2005	1.066	0.983	1.086	0.955	1.032	1.082	0.978	1.026	0.979	1.000
2005 ~ 2006	1.035	0.988	1.048	1.014	0.977	1.004	0.920	1.172	0.957	0.963
2006 ~ 2007	1.038	0.878	1.188	0.908	0.967	1.077	1.031	0.975	0.996	1.044
2007 ~ 2008	1.046	1.100	0.954	1.033	1.069	1.003	1.065	1.004	0.998	1.064
2008 ~ 2009	0.973	1.001	0.974	1.005	0.995	1.067	1.041	0.954	1.023	1.014
2009 ~ 2010	0.953	1.023	0.939	1.027	0.998	0.993	0.912	0.982	0.944	0.968
2010 ~ 2011	0.986	1.002	0.985	1.011	0.991	0.895	1.080	0.985	1.041	1.026
2011 ~ 2012	1.067	1.008	1.050	1.002	1.006	1.065	0.939	0.985	0.978	0.961
2012 ~ 2013	0.977	1.021	0.955	1.017	1.003	0.924	1.024	0.929	1.066	0.959
2013 ~ 2014	0.930	1.028	0.904	1.021	1.005	0.940	1.024	0.929	1.066	0.959
<b>MEAN</b>	<b>1.011</b>	<b>1.011</b>	<b>1.003</b>	<b>1.006</b>	<b>1.006</b>	<b>1.022</b>	<b>1.006</b>	<b>1.018</b>	<b>1.005</b>	<b>1.001</b>

Notes: Total factor productivity change (tfpch), Efficiency change (effch), Technical change (techch), Pure technical efficiency change (pech), Scale efficiency (sech).

Source: Author's calculations

**THE EFFECTIVENESS OF FISCAL CONSOLIDATION  
IN ACHIEVING DEBT REDUCTION**



*by*

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# **The Effectiveness of Fiscal Consolidation in Achieving Debt Reduction**

## **1.0 Introduction**

Elevated and increased public sector debt has plagued the small states of the Caribbean region for a multitude of years. Stagnant growth, combined with banking, currency and other crises and natural disasters have been major contributors to this issue with the situation being further, exacerbated by the global financial crisis of 2008-09. Facing diminished growth prospects, many Caribbean governments embarked on fiscal expansions in hopes of igniting economic recovery. These policy measures led to rapid increases in public debt worldwide, within the Caribbean average regional debt to GDP ballooned to an estimated 75 per cent in 2010 from 59 per cent in 1999, with 14 countries ranking within the world's top 30 indebted nations. Concerns about the sustainability of prevailing debt levels led to a drastic change in policy debates from unemployment reduction and growth to fiscal consolidation. Taking the bitter medicine before the economy deteriorated further due to rising public debt became the mantra of many multilateral organizations and economists. In the post global financial crisis years (2013), Jamaica became one of the first Caribbean countries to engage the International Monetary Fund (IMF) for assistance signing an Extended Fund Facility, with widespread calls for other Caribbean countries to follow suit. In February of 2015 the Monetary Council of the Eastern Caribbean Central Bank (ECCB) agreed to the need for implementation of fiscal consolidation measures to achieve the previously agreed debt to GDP target of 60 per cent by 2020.

Fiscal consolidation, austerity, or any other moniker by which it is known has no set definition in the literature. However, it is defined in this paper as a policy measure geared to reducing or eliminating budgetary deficits through either spending cuts or increases in taxation or a combination of both with the explicit aim at alleviating the debt burden. Fiscal consolidation has been met with varying degrees of disagreement in some economic circles: While some question the timing of implementation given the current economic outlook, others posit that it

is a self-defeating exercise, with the side effects of the medication outweighing its effects on the disease. This disagreement has even extended to empirical works within the field.

Some researchers have found consolidation efforts to be expansionary, as the non-Keynesian effects outweigh the Keynesian, therefore increasing the policies' effectiveness as a debt reduction tool. Others, however find the policy contractionary in the short run as growth falls in response to consolidation, however, returning to its pre-shock path in the long run as debt decreases.

This paper seeks to address if previous episodes of fiscal consolidation within the Caribbean have been successful in achieving meaningful debt reduction, using two alternative approaches, which will be elaborated further in the paper. The remainder of this paper is structured as follows. Section 2, summarizes the body of literature on fiscal consolidation with a particular focus on its effects on debt. In section 3, the fiscal consolidation challenges faced by the region are outlined. Section 4 presents a descriptive analysis of the data, while the methodology employed in this study is explained and the results outlined in section 5. Section 6 outlines some policy recommendations and section 7 concludes and states limitations and avenues for future research.

## **2.0 Literature Review**

A plethora of literature has been posited on the effects of fiscal consolidation, however with a general lack of consensus. These conflicting views are present in both theory and empirical studies. Traditional Keynesian economics points to consolidation having adverse effects on growth and even spur a recession as a result of its impact of aggregate demand. Therefore depending on the size of the fiscal multiplier, consolidation efforts may be counterproductive in reducing debt burden. Alternative theory counteracting this result posits that the Keynesian effect is only partial and not the net effect, stating that these policies may have expansionary effects on the economy. This school of thought is referred to as expansionary fiscal contractions.



The idea behind this theory is that reductions in government will lead to a fall in interest rates and a supposed crowding in effect will take hold increasing private investment and thus spurring growth. Moreover, it also signals to consumers, if the effort is viewed as credible, that spending cuts today will imply the need for less future taxes. In anticipation of future increased disposal income, households increase their consumption today as they seek to smooth out lifetime consumption and therefore stimulate demand and hence growth. Support for this idea is found in a vast array of empirical work. Blanchard (1990) contends that tax increases can be expansionary if they generate sufficient expectations of less dramatic tax increases or reductions in future. The work of Alesina and Ardagna (2010) also confirmed this result highlighting that fiscal consolidation can be expansionary in the short run, with the composition of consolidation having a bearing on its subsequent success. They also went on to explore the effects of the composition of consolidation, both growth and reducing debt. Their results indicated that in both cases that spending-based consolidation efforts were more effective than their tax based counterparts in reducing debt as well as being less likely to generate recessions. This result would imply that fiscal consolidation would be an effective medium through which to reduce debt burdens within a country. On one hand higher rates of growth would reduce the countries debt burden through reduction of the interest rate growth differential and on the other hand the fiscal gains stemming from deficit reduction would significantly lower the debt stock.

Alesina's and Ardagna's (2010) findings were however, rejected by the IMF (2010). They cited that their result is largely as a consequence of the choice of proxy for fiscal consolidation. They concluded that the use of the cyclically adjusted primary balance has a tendency to bias results towards showing expansionary effects and suffers from two main problems: 1) measurement errors and 2) they ignore the motives of the policy. As a remedy to this challenge, the IMF (2010) proposed the use of a policy action based approach to identify periods of fiscal consolidation and found that fiscal consolidations tend to have contractionary effects on the economy. However, they did agree with Alesina's and Ardagna's findings that the composition of consolidation matters, noting that spending-based fiscal consolidations were less contractionary and therefore more effective in debt reduction. This result is also

confirmed by the paper of Biggs, Hassett and Jenson (2010). The authors, using both IMF and Alesina and Ardagna's methodology they found that typically unsuccessful fiscal consolidations were composed of at least 53 per cent tax increases. Erceg and Lindé (2012) delved deeper into the study of the composition of fiscal consolidation focusing on the effects of such policies in a currency union. They contended that tax-based consolidations have less adverse effects on output in the short run than their expenditure-based counterparts, with the converse holding true over the long run. This may have implications for prospects of consolidation driven debt reduction within the ECCU, at least in the short run. The authors also state that the effects of such consolidation are dependent on the degree of monetary accommodation present.

The actual effect of fiscal consolidation in the short run however, is widely dependent on the size of the fiscal multiplier. A vast array of literature comment on the size of the multiplier and its determining factors, some of which including the exchange rate regime, the level of openness and the whether or not the economy is in recession. Additionally, Auerbach and Gorodnichenko (2011), note that fiscal multipliers are generally much higher in recessionary periods as opposed to others. This study however, did not include Caribbean nations. Guy and Belgrave (2012) found in their study of selected Caribbean Islands that the cumulative multipliers are quite low. They reported cumulative multipliers of 0.3 over 24 quarters and noted further that they were even negative for some of the countries studied.

In terms of exchange rate regime, multipliers are expected to be higher for countries that employ a fixed exchange rate regime. Therefore the contractionary effects of consolidation are expected to be higher under these arrangements. The findings of Beetsma et al. (2012) appear to have confirmed this idea. Using IMF action-based data on consolidation, they investigated the impact of budgetary consolidation under different exchange regimes. Their results indicated that the contractionary effects of consolidation are much worse under fixed exchange rate regimes as opposed to others. In the medium to long run however, Gros (2011) cites that most models assume that fiscal consolidation only decreases demand in the short run but output returns to its pre shock path in the long run while debt remains on its new lower path.

Additional empirical studies have sought to explore the impacts of fiscal consolidation on debt. Amo-Yartey et al. (2014) identified fiscal consolidations as a 1.0 per cent improvement in cyclically adjusted primary balance over one or two years. Its impact on debt was then analyzed four (4) years subsequent to the year prior to consolidation. In a 2012 paper by Amo-Yartey and colleagues they outlined the usage of primary balance to GDP as alternative measure in studies they reviewed. A majority of the work involving econometric models highlighted, piggy back off the recommendation of Favero and Giavazzi's (2007) paper. They found that previous studies of fiscal policy had been widely misspecified due to the omission of debt feedback in the model. This feedback should enter the VAR as an endogenous variable; previous failure to do so has led to effects of fiscal policy being estimated on unsustainable debt paths. Citing that this is as a result of failure to account for fiscal policy shocks today constraining their future paths via the governments inter temporal budget constraint. The prescribed variables to enter this feedback equation are interest rate on debt, inflation, real GDP growth and the primary balance. Cherif and Hasanov (2010 and 2012), Anaya and Pienkowski (2015) and Eyraud and Weber (2013) all use variants of this approach to establish the effects of austerity shocks on debt each producing mixed results. Eyraud and Weber however used this approach to confirm results of their simulation analysis. This analysis was run under the assumption that the initial fiscal multiplier was high with the effect on output fading after some time. Many studies of this nature also draw on similar assumptions. Their results indicate that for highly indebted nations, noticeable declines in the debt to GDP ratio took at least three years to manifest, as the effects of consolidation on growth wore off.

Based on the foregoing, the prevailing literature has failed to make a general consensus on the measure and effects of fiscal consolidation on debt. The literature, however, paints a clearer picture as to the optimal structure of consolidations, indicating spending based consolidations are more favourable under a vast array of circumstances.

### **3.0 Challenges of fiscal consolidation in the Caribbean region**

There are many challenges that hamper the possibility of successful consolidations within the Caribbean. Many of which are embedded in the challenges these countries face as a result of being small island developing states. These challenges include: susceptibility to natural disasters, small size, high vulnerability to external shocks and fiscal rigidities.

#### *Natural Disasters*

According to the IMF the Caribbean islands have an 18 per cent chance of a hurricane in a given year. Hurricanes and other tropical storms or cyclones usually cause varying degrees of flooding and destruction, causing catastrophic and widespread social issues. These hurricanes sometimes amass damages in excess of 200 per cent of GDP in the cases of the effects of hurricane Ivan and hurricane Georges in Grenada and St Kitts and Nevis respectively. These disasters also have an indirect effect on tourism through the devastating impacts on main source markets such as the United States. The incidence of severe tropical weather systems have necessitated further borrowing by Caribbean states to rebuild necessary infrastructure, due in part to the lack of timely and sufficient grants. Many countries such as Saint Lucia and St Vincent and the Grenadines and those countries outlined above have all engaged the IMF under their Rapid Credit facility to aid in recovery efforts. Moreover, natural disasters places pressure on both government revenues and expenditures. This is due to increased capital expenditure to rebuild infrastructure, as well as losses to various industries stymie the tax collections within the affected industries and other government revenues potentially derailing fiscal consolidation. With predictions that these events will occur with more frequency and intensity in the future as a consequence of global warming, these challenges may be further exacerbated. Additional to tropic cyclones a potentially equivalent, although less frequent threat is manifested in the form of earthquakes and tsunamis. However, no tsunamis have materialized to date. These events pose similar threats to not only fiscal consolidation and debt but livelihood of Caribbean people as a whole.

### *Small Size and vulnerability to external shocks*

The small size of Caribbean countries also has significant implications for fiscal consolidation, as they limit the scope for improving and widening the tax base. This size also limits the scope for diversification within the Caribbean which makes them more vulnerable to shock. Most Caribbean countries, particularly those within the ECCU, are mainly tourist dependent and this industry is greatly affected by a host of external shocks stemming more recently from terrorist attacks, recessions in source markets and other shocks. These shocks have historically had depressing effects on the countries of the Caribbean, including the most recent of which the global financial crisis. Expansionary fiscal policy and the adverse effects of shocks has led many countries to the IMF namely Jamaica due to greatly increased debt burdens.

### *Fiscal Rigidities*

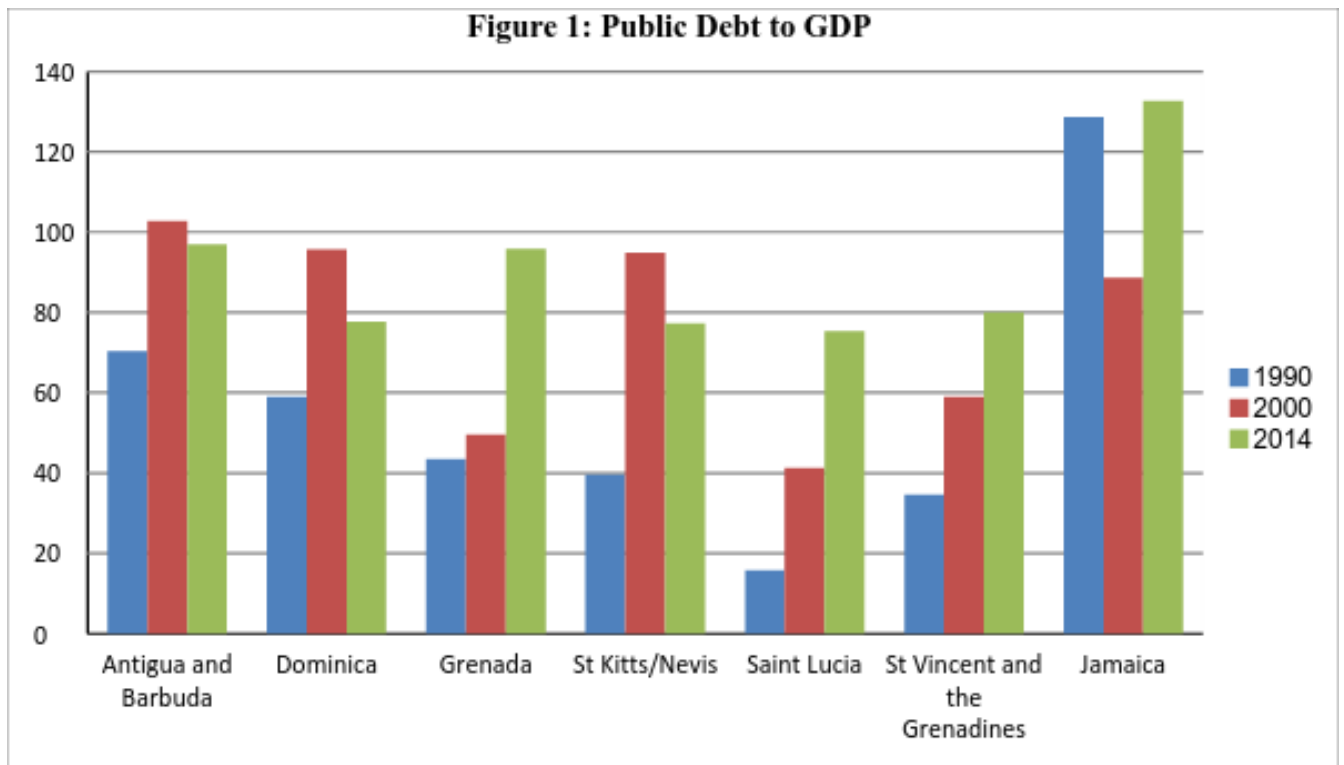
In the Caribbean government expenditures are heavily tied to interest payments, wages and social security commitments and other pension and long term commitments. This limits the scope for reductions in fiscal expenditures, making consolidations more challenging. Additionally, guarantees of long term tax holidays to various multinational corporations especially those within the tourism industry curtails the expansion of the tax base. Despite these challenges Caribbean governments have committed to reducing debt to sustainable levels through more sustained fiscal consolidations. The next section of the paper outlines the data used in this study to examine the research question.

## **4.0 Data and stylized facts**

The data used in the analysis for this study consists of the primary balance and debt to GDP for both the ECCU and Jamaica. The ECCU data used in this study excludes both Anguilla and Montserrat due to lack of any prevailing debt issues or crisis during the period studied. This study employs a data set spanning from 1990 to 2013. Additional variables include: tax and total revenue, capital and current expenditure, inflation, interest payments and both GDP at market prices and real GDP. The data for ECCU were taken from the ECCB AREMOS and DMAS databases. Data pertaining to Jamaica were taken from the Bank of Jamaica

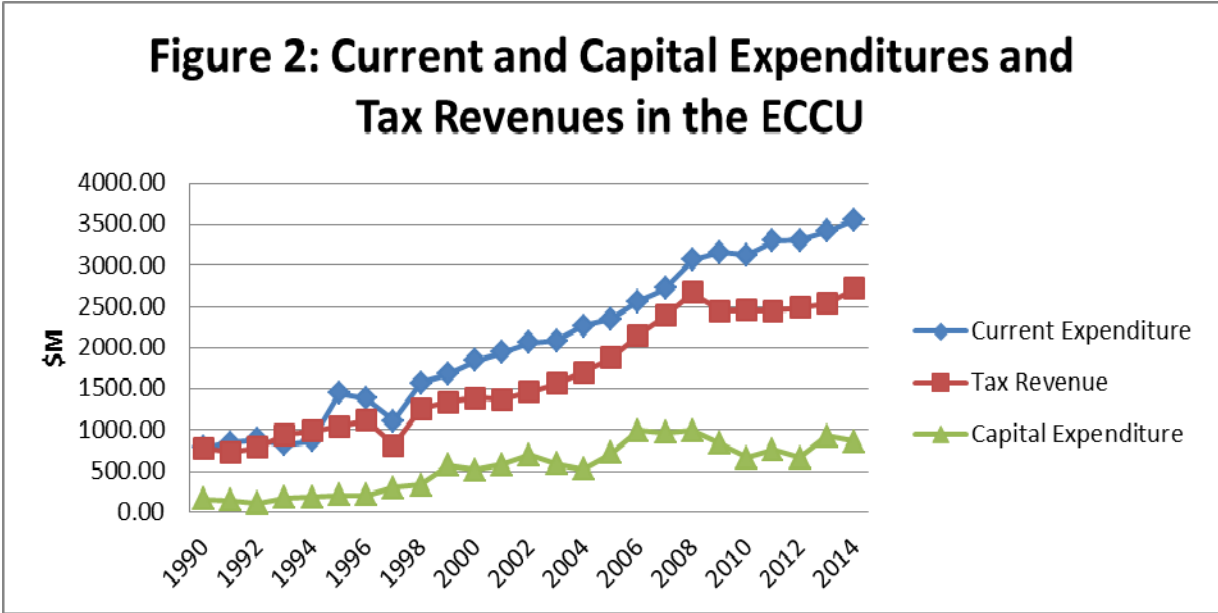
website with the exception of GDP at market prices which was derived from the World Bank database.

Figure 1 illustrates the debt to GDP ratio with the 7 countries studied in three years 1990, 2000 and 2014. All countries with the exception of Jamaica saw significant increases in debt between 1990 and 2014. With all countries studied recording significant fluctuations in debt to GDP ratio between these two same points. The only uniformed movement in debt was observed subsequent to the world financial crisis with all countries seeing some deterioration of their debt to GDP ratios between 2008 and 2010.



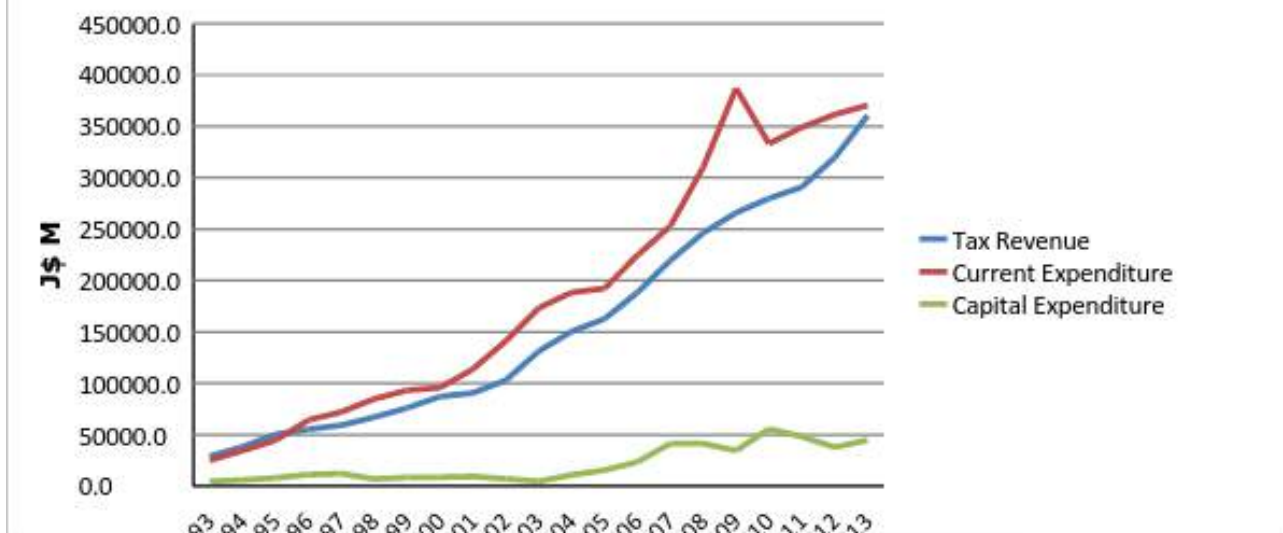
Source: ECCB and BOJ

The main tools in the government’s arsenal to control the level of public debt are the manipulation of tax revenues and expenditures. Figures 2 and 3 illustrate the evolution of both current and capital expenditures and tax revenues to GDP for both the ECCU countries and Jamaica respectively. Over the span of the data both current expenditures and tax revenues increase significantly. Tax revenues however lag behind the current expenditures as expected in the face of rising public debt.



Source: ECCB

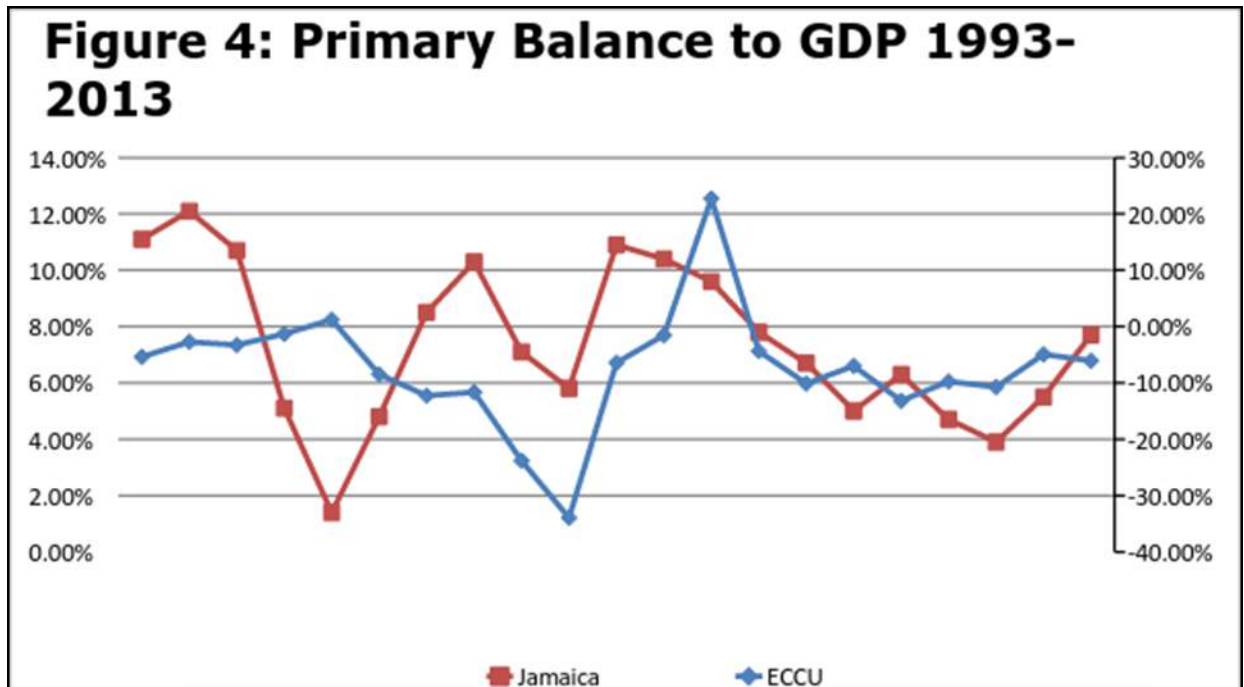
**Figure 3: Current and capital expenditures and Tax Revenues 1993-2013**



Source: BOJ

This increased debt observed in the Caribbean, albeit due to a host of external factors, may be due to inability to maintain fiscal discipline. Government’s intentions are widely captured by the primary balance to GDP. Figure 4 below depicts the primary balance to GDP for the ECCU countries studied and Jamaica respectively. Significant fluctuations in these balances in the ECCU provide some evidence for the upsurge and fluctuations in debt and provide possible evidence of fiscal consolidations taking place over the periods analyzed. Jamaica’s primary balance while exhibiting some similar fluctuations tended to be generally higher than those ran in the ECCU. This was probably necessitated by high interest payments as a result from high debt burden from the beginning of the period examined. Additionally the fluctuations in both primary balance to GDP and debt to GDP may indicate relationship between the two choice variables which is explored in more detail below.





Source: BOJ and ECCB

In the next section of this paper the proposed framework for analysis of the findings is outlined.

## 5.0 Methodology

A plethora of studies have been conducted on fiscal consolidation, however they focused primarily on the growth effects of this policy. This paper applies various complementary empirical techniques to ascertain the effectiveness of fiscal consolidation as a tool for debt reduction. This relationship is analysed through two main avenues. The first of which is an event study, whereby fiscal consolidations are identified and the reactions of the outcome variable, debt to GDP, is analysed to gauge its subsequent success. Following that an ex-post decomposition of the debt to GDP ratio into identified determinants is carried out around identified successful fiscal consolidations within the event study. Both of the approaches are further explained in the subsequent sections.

## 5.1 Event Study

Similar to the methodology highlighted in both Amo-Yartey et al (2012) and Lambartini and Taveres (2005), an improvement of 1 or 1.5 percentage points of primary balance to GDP ratio is employed as the proxy for fiscal adjustments. This is as the primary balance is widely viewed as a proxy capable of capturing government policy intention. For the purposes of this study, in addition to this proxy formal debt restructuring undertaken by any country during the period is tracked. Additionally in order to further capture policy intent an event study approach is taken. Fiscal consolidations identified by the primary balance to GDP proxy will be disregarded if any substantive evidence to contravene the policy intent or provide alternative explanations for the improvements in the primary balance is identified. That is if any evidence that the reason for changes in primary balance is not as a result of fiscal consolidation. This is primarily conducted through the use of published IMF staff reports, Article 4 consultations, agreements and other announcements. Additionally, prevailing events during the period of study such as debt forgiveness or restructuring and any other event which may have affected the government's fiscal operations are accounted for. To identify fiscal consolidations in keeping with the definition used in this paper the following framework is employed. A fiscal consolidation would be deemed to take place if there is a sustained one percentage point increase in primary balance before grants to GDP for at least two consecutive years. Additionally, if there was an announcement and execution of a debt restructuring exercise within a country in a given period the events effect on debt is tracked. These debt restructuring exercises however are not considered as fiscal consolidations.

A consolidation is viewed to be completed when the improvement in the primary balance dips below criterion level or becomes negative or zero. Its ensuing effect on debt is analyzed by examining the first year of an identified fiscal consolidation to the year after completion of the consolidation identified by the proxy. This event is deemed successful if there is at least a 2 per cent decline in debt to GDP ratio over the period analysed. The view in some of the prevailing literature is that positive effect of consolidation on debt to GDP should be more evident within the medium to long term usually examined within a 3-5 year period when the negative growth effects of contraction should begin to taper off. Due to this the success range

is then altered to determine if its effects on debt differ. It is worth noting that there is a lack of sustained fiscal consolidations within the region and in some cases rapid reversals of the improvement in primary balance to GDP, which necessitated the shortening of the success range in order to exclude the effects that these developments may have had on debt dynamics.

## **5.2 Results**

Initial analysis of the proposed framework found 14 episodes of fiscal consolidations, 10 of which were deemed successful based on the criterion. One of the unsuccessful recorded consolidations in Dominica remained unfinished as at the end of the period examined. The preliminary results were then analyzed further within the events based approach to determine if any changes in primary balances were not related to a fiscal consolidation policy.

One such case rejected was in Jamaica in the 1990s. During the period large primary balance surpluses were consistent with tight demand management policies geared towards tackling high interest rates and inflation which peaked at about 80 per cent in 1991 according to the BOJ (1999). Therefore any reduction in debt to GDP seen was a byproduct of the policy and not the main intent. This reduced the successful consolidations to nine (9). Additionally the remainder of the mid to late 1990s was focused primarily on the response to the domestic banking crisis prevailing at the time.

Similar evidence wasn't found for identified consolidations within the ECCU. Table 5 in the appendix displays the successful consolidations recorded; (Y) indicates the year in which a consolidation is identified and the change in debt to GDP presented in the table is based on the initial criteria or within the final year in the case of events that remained uncompleted at the end of the dataset. The results show an absence of sustained consolidations within the countries examined, none persisting longer than 4 years, with the majority lasting the minimum required two years. The results also indicate that the inclusion of a debt restructuring exercise in a consolidation effort were generally more successful than otherwise.

The most successful and longest consolidation recorded over the span of the data belonged to St Kitts and Nevis recording over 47 per cent decrease in debt to GDP. Their experience was accompanied by the announcement and execution of a debt restructuring exercise. This exchange involved asset swaps as well as offered a choice of 20 year bonds with a 40 per cent face value reduction or a 45 year par bond according to Durant (2012). Jamaica also implemented two short debt restructuring exercises neither of which required creditors to take any haircuts to principal of their investments; both of these were preconditions to an IMF agreement. The first arrangement fell apart due to failure to meet required conditions and saw no reductions to the countries debt to GDP. Subsequent negotiations under a new Government regime netted an agreement involving severe fiscal consolidations requiring a primary surplus of 7.5 per cent of GDP post debt restructuring. The first year of the agreement did produce positive results with the country recording a 2.0 per cent decrease in debt to GDP, with the IMF and Government officials alike predicting the trend to continue.

In 2004 Dominica also underwent a debt restructuring exercise amidst a recorded fiscal consolidation and is similar to St Kitts and Nevis as it was post default. To date it is the longest on record for the Caribbean, with final settlement coming in 2012. The results of this effort may however be skewed owing to the effects of the 2008-09 global financial crisis. The country recorded a 21.0 per cent decrease in debt to GDP during the final year of the recorded consolidation and the year of announcement. A further 11.0 per cent decline was achieved up until 2008.

Another post default restructuring that took place is Antigua and Barbuda but however hasn't yielded similar results in terms of debt to GDP, failing to meet the criteria laid out for success. Antigua and Barbuda however, did record a successful fiscal consolidation between 2003 and 2005, driven mainly by reductions in capital expenditures accompanied by improvements in revenue collections. The reductions in capital expenditure were however short lived due to increased spending requirements brought about by the impending Cricket World Cup of 2007. Despite this reversal debt continued to fall in the country owing to successful negotiations with the Italian Government in 2005 where they agreed to clear loans totaling US\$ 196.0m, about

26.0 per cent of GDP through a cash payment of US\$14.2m IMF (2006), resulting in a 22.4 per cent reduction in debt from 2005 through 2008.

The remaining consolidations and the ones detailed above, similar to Antigua and Barbuda's experience were mainly centred on capital as opposed to current expenditure cuts accompanied by improvements in revenues. Revenue increases came primarily through improvements in collections or widening of the tax base through addition or amendment of existing tax measures.

Grenada is the only country without a successful fiscal consolidation however they did have a successful debt restructuring exercise in 2004 and 2005. Their debt restructuring however didn't include any reductions in principal on debt exchanged; they recorded an 8 per cent reduction in debt to GDP by the end of 2005. It is worth noting that extending the ranges, although affecting the overall changes in debt to GDP, rarely changed the successful consolidations to unsuccessful while unsuccessful consolidations remaining unsuccessful based on the success criteria.

As stated above the effects of consolidation on debt dynamics are expected to be visible in the medium to long term as a result of the contractionary effects of fiscal consolidations, whose magnitude is dependent on the size of the multiplier. The criterion for success outlined in the event study may produce inflated results. To account for this potential upward bias, the success range for consolidations in terms of its effect on debt dynamics is extended slightly. The range of study, now moves from 2 years prior to identification of a successful fiscal consolidation (t-2) to two years post (t+2). The identification criteria remained the same as outlined in the event study. The second year of the required change in primary balance will be viewed as time (t). Additionally the success criterion isn't changed. Under this approach the successful consolidations falls moderately from 9 to 7, with the remaining successes being for the most part less effective in terms of debt reduction. This approach allowed for the effects of fiscal effort on debt to GDP to be charted and the relationship between the two variables

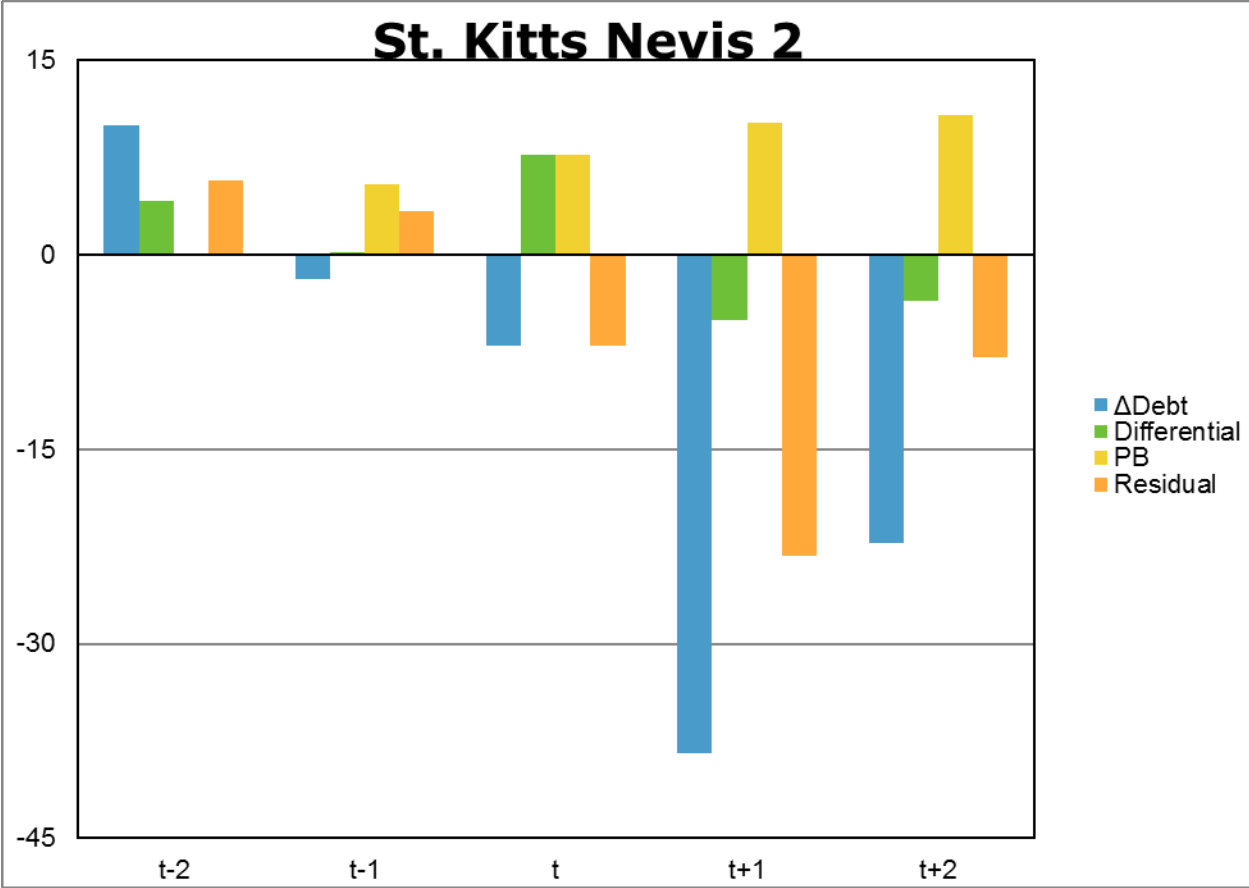
more closely observed. This chart informs the second approach undertaken in study. The manner in which this decomposition is conducted is detailed in the following section.

### **5.3 Debt Decomposition**

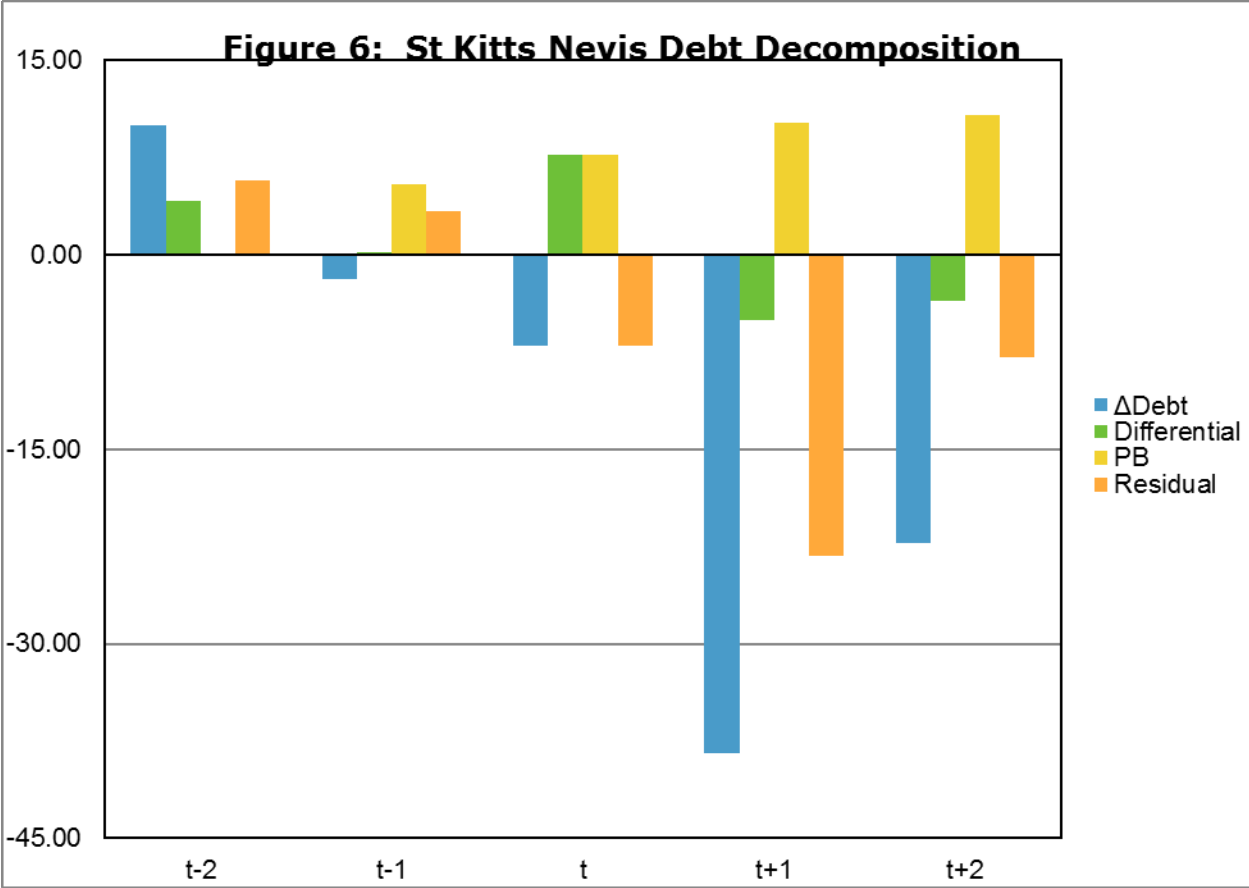
This approach seeks to break down the debt dynamics within the identified successful fiscal consolidations to ascertain the actual role fiscal effort played in the observed reduction of public debt. Public debt dynamics are impacted by a host of factors outside of government fiscal effort. These include debt restructuring and forgiveness, nominal exchange rate, inflation, real GDP growth and the interest rate on debt. Within the debt decomposition the impacts of the primary balance, inflation, real GDP growth, and nominal exchange rate fluctuations are explicitly accounted for. Other events such as debt restructuring and forgiveness, changes in grants and other exogenous shocks not captured by the other included variables are contained within the residual. The three main outcomes reported for ECCU countries are the residual, primary balance and the interest growth rate differential. When the interest growth differential is positive, debt to GDP is expected to increase as interest payments on public debt grow at a faster rate than gross domestic product and vice versa. However it is worth noting that when the growth rate is higher than the rate of growth of interest it may account for a portion of the improvement in the primary balance due to economic growth impact on fiscal accounts. For Jamaica a fourth variable, the effect of nominal exchange rate fluctuations is added. These fluctuations are examined by tracking changes in the Jamaican to US dollar nominal exchange rate. According to some of the results presented in literature nominal depreciations usually predate successful fiscal consolidations. Additionally, these developments are expected to curb some of the contractionary effects of fiscal consolidation and as a result improvements in the debt to GDP ratio would be observed earlier. Additionally, in order to further isolate fiscal effort the changes in tax revenues and capital and current expenditures are highlighted during consolidation years as identified by the event study. The results of this analysis are presented in detailed within the appendix with a few selected successful consolidation depicted below.

The most successful fiscal consolidation identified by the event study was St Kitts and Nevis between 2010 and 2014. Figure 5 below depicts the decomposition results of this effort. The results for St Kitts and Nevis indicate that fiscal effort as measured by the primary balance before grants played a moderate role in accounting for the significant reduction in debt observed over the period. A majority of significant changes in primary balance stems from increases in total revenue over the years analyzed. The jump in total revenue could be as a direct result of the recent success of the Citizenship by Investment Programme (CBI). The CBI programme contributing a large portion of the 60 per cent increase in non-tax revenue during the period highlighted.

In terms of direct fiscal effort the consolidation was mixed. These adjustments were implemented under the guidance of a new IMF programme with both increases in taxes and decreases to both current and capital expenditures. Tax revenues increased dramatically in 2011 by 2.41 per cent of GDP, which is mainly a result of electricity tariff adjustment, new excise, and value added taxes introduced in the latter part 2010. This increase however tapered off in the subsequent years remaining relatively stable. On the expenditure side both current and capital expenditures taken as a percentage of GDP fluctuated however, both seeing net reductions of 1.19 and 0.71 per cent of GDP respectively. However, a majority of the reduction in debt to GDP over the period is captured by the residual; the main contributor to this may be the positive results of the debt restructuring exercise pursued by the government starting at the end of 2011. Another main contributor is the significant spike in CBI inflows growing by approximately 172 per cent from 2011 to 2012 and maintaining its high level in 2013 although declining slightly. Additionally during the years of more pronounced reductions in public debt a negative interest growth differential contributed to improvement public debt. However, the policies implemented under the IMF program show that the positive impact on fiscal accounts of the interest growth differential didn't fully account for changes in this balance.

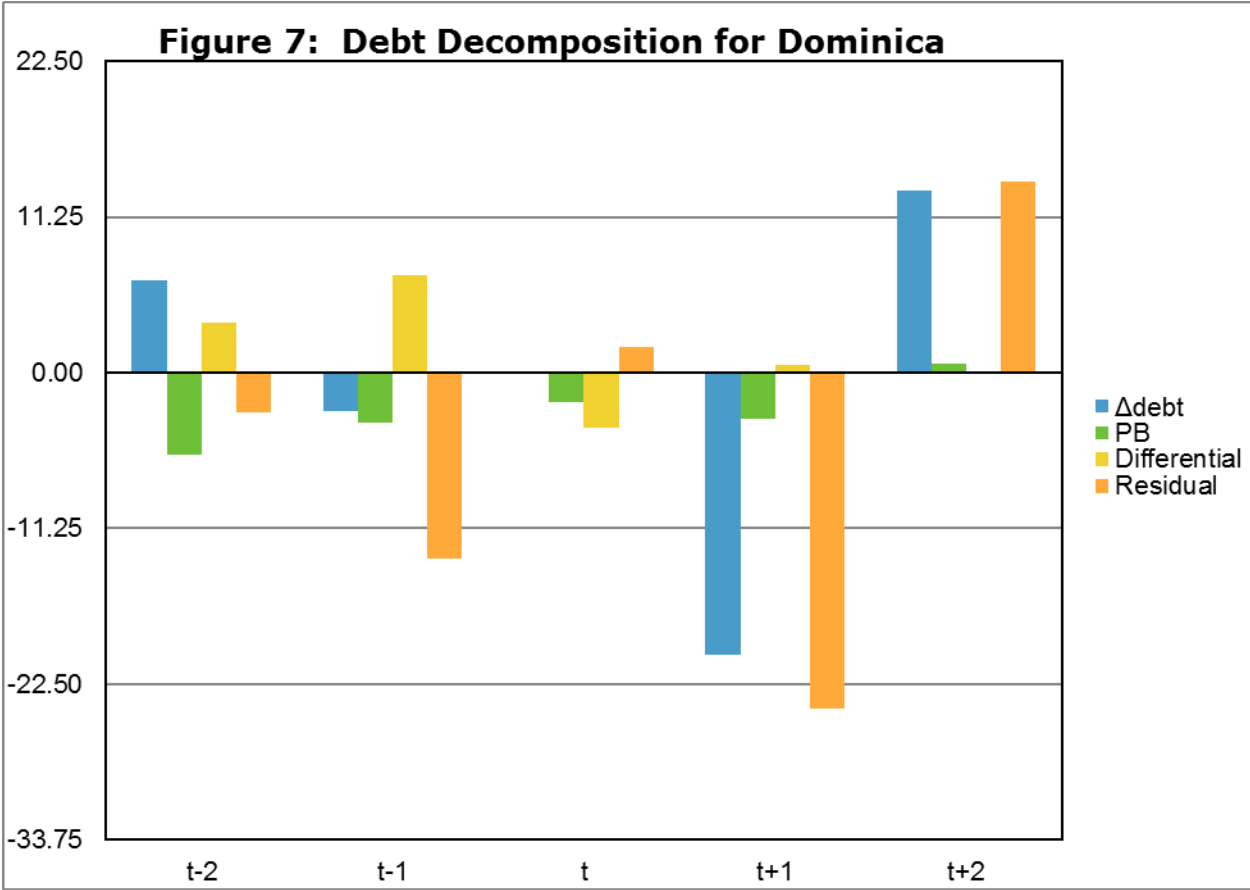






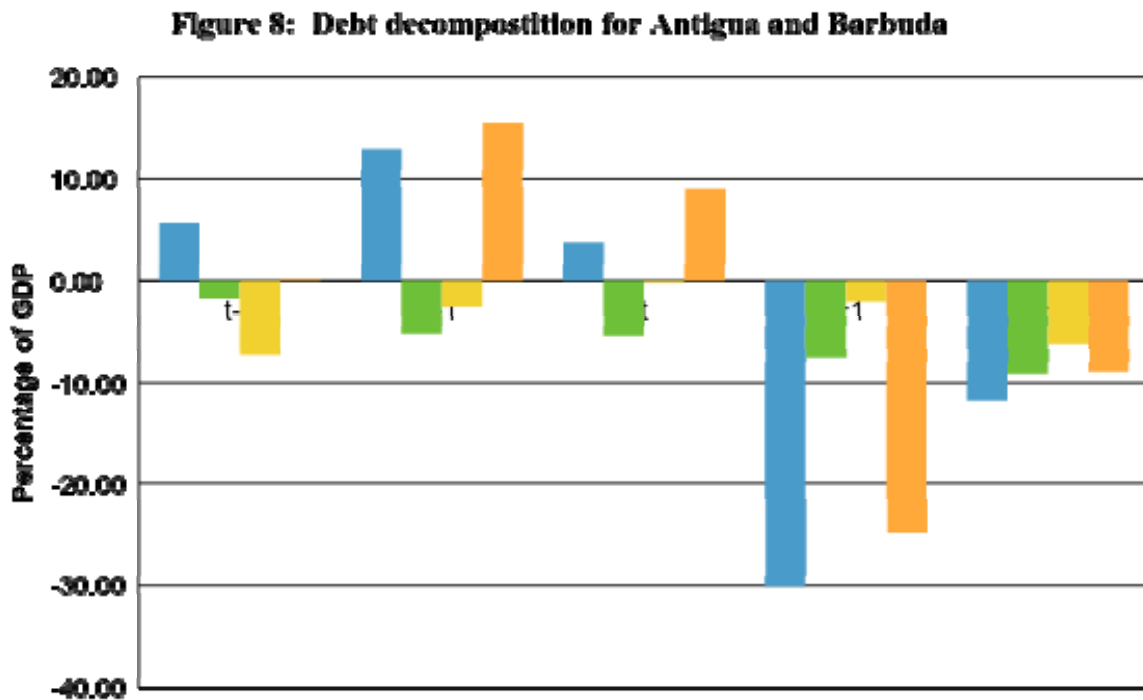
Another successful consolidation, inclusive of a debt restructuring, occurred in Dominica starting in 2002. The corresponding changes in debt dynamics are charted between 2001 and 2005, the results of which are detailed in figure 6 below. As stated above this debt restructuring lasted 8 and a half years. As in the case of St. Kitts and Nevis the residual accounts for a majority of the observed reduction in debt to GDP over the period studied, with primary balance improvements having more moderate effect on public debt. Similarly to St Kitts, dramatic increases in grants account for a large portion of the change in primary balance after grants and therefore feeding into the residual. Additionally, the residual spikes subsequent to the start of the debt restructuring possibly accounting for the other portion of the residual balance. In terms of actual fiscal effort within the two consolidation years the effort is mixed, with reductions in expenditures and increases in tax revenues being observed at different time periods. IMF (2003) points to the programme being slightly more revenue based encompassing 1.5 per cent of the 2.5 per cent adjustment in terms of GDP. A majority of the

changes observed in 2002 was attributed to the reduction in capital expenditure of about 2.65 per cent of GDP and a 1.36 per cent increase in tax revenues accounting for a majority of the adjustment in 2003. This 1.36 per cent came from increases in sales tax and introduction of customs service fee.



In Antigua and Barbuda between 2002 and 2006, results similar to those detailed above indicate that changes to the primary balance to GDP partially explained the changes in the public debt to GDP. A majority of the changes in debt to GDP are however, explained by the residual especially in 2005. In 2005 an agreement for debt forgiveness was reached for the country. Additionally, there was a significant increase in grants during that year. These increases are largely attributed to grants received by the Chinese Government to aid in the building of the Sir Vivian Richards Stadium for the Cricket World Cup. The increase in

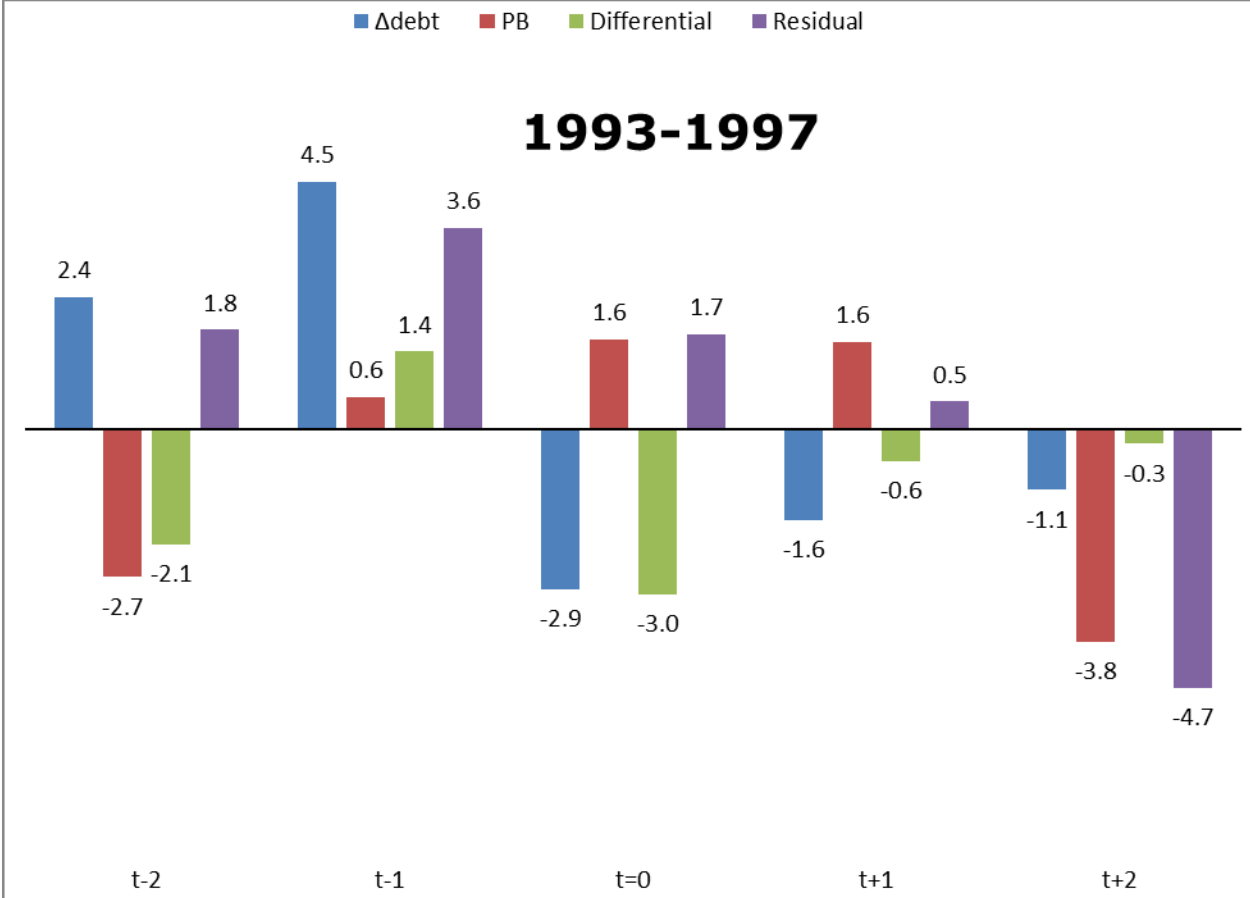
primary balance attributed to fiscal effort was mixed. A large portion of the 2003 improvement with come reductions in both current and capital expenditures falling by 3.33 per cent and 1.68 per cent respectively with tax rates increasing by 0.60 in 2003 and 0.72 per cent of GDP in 2004. This reduction in capital expenditure lasted until 2006 when construction and renovation projects were conducted ahead of the ICC Cricket World Cup. The results are depicted in figure 7 below.



In the case of St Vincent and the Grenadines between 1993 and 1997 results depicted in figure 8, there was no debt forgiveness or restructuring or other significant identifiable external factor which affected the debt dynamics; this is evidenced by low residuals. In fact of all the countries studied, both identified consolidations in St. Vincent and the Grenadines present the smallest residuals. In St Vincent between 1993 and 1997, positive improvements in the

primary balance to GDP accounted for a vast majority of the reductions in public sector debt observed over the period. This is widely attributed to significant reductions in capital expenditures to GDP falling by 2.71 per cent of GDP and 1.73 per cent of GDP in 1994 and 1995 respectively, accompanied by a more moderate net increase in tax revenues of about 1 per cent of GDP over the corresponding years.

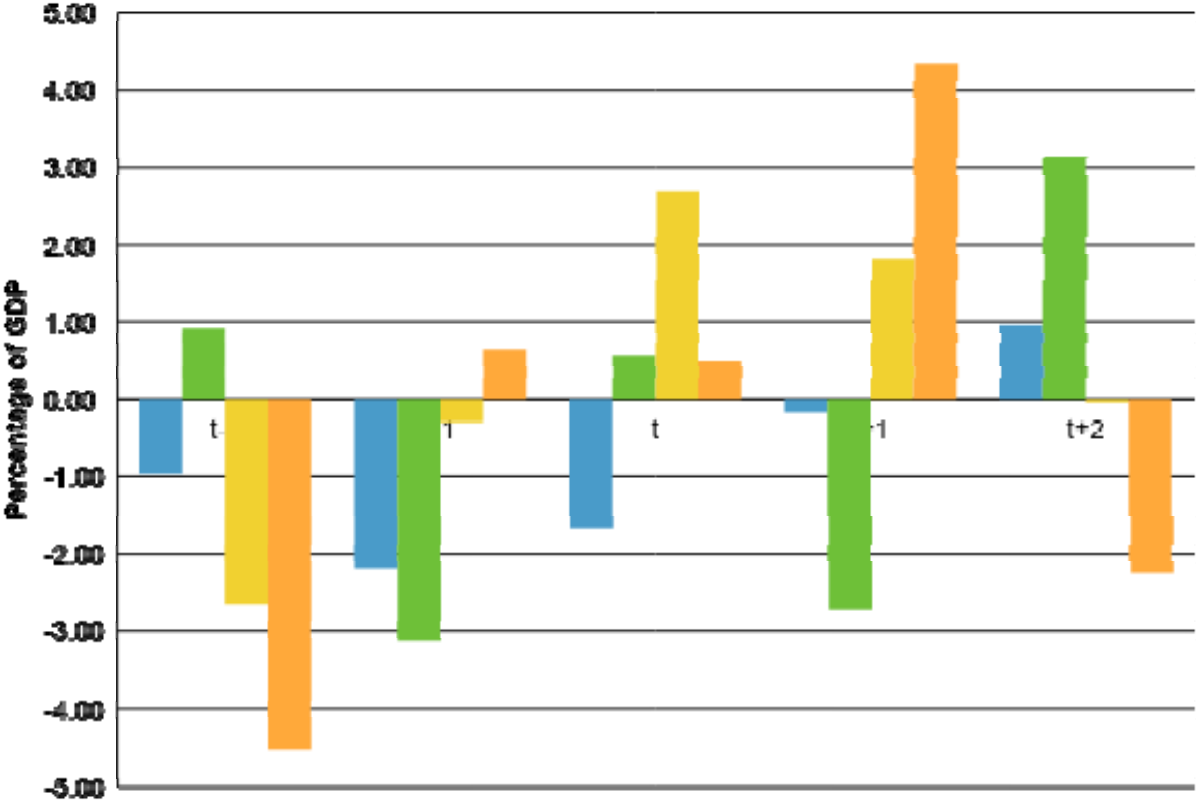
**Figure 9: Debt Decomposition for St Vincent and the Grenadines**



Similar to St Vincent and the Grenadines there were no debt restructuring or other exogenous factors affecting debt in St. Lucia. During the period debt fell at a reducing rate and is mainly due to fluctuations in the interest growth differential. The primary balance before grants in this case however, accounted for a large portion of changes in public debt. A large contributing

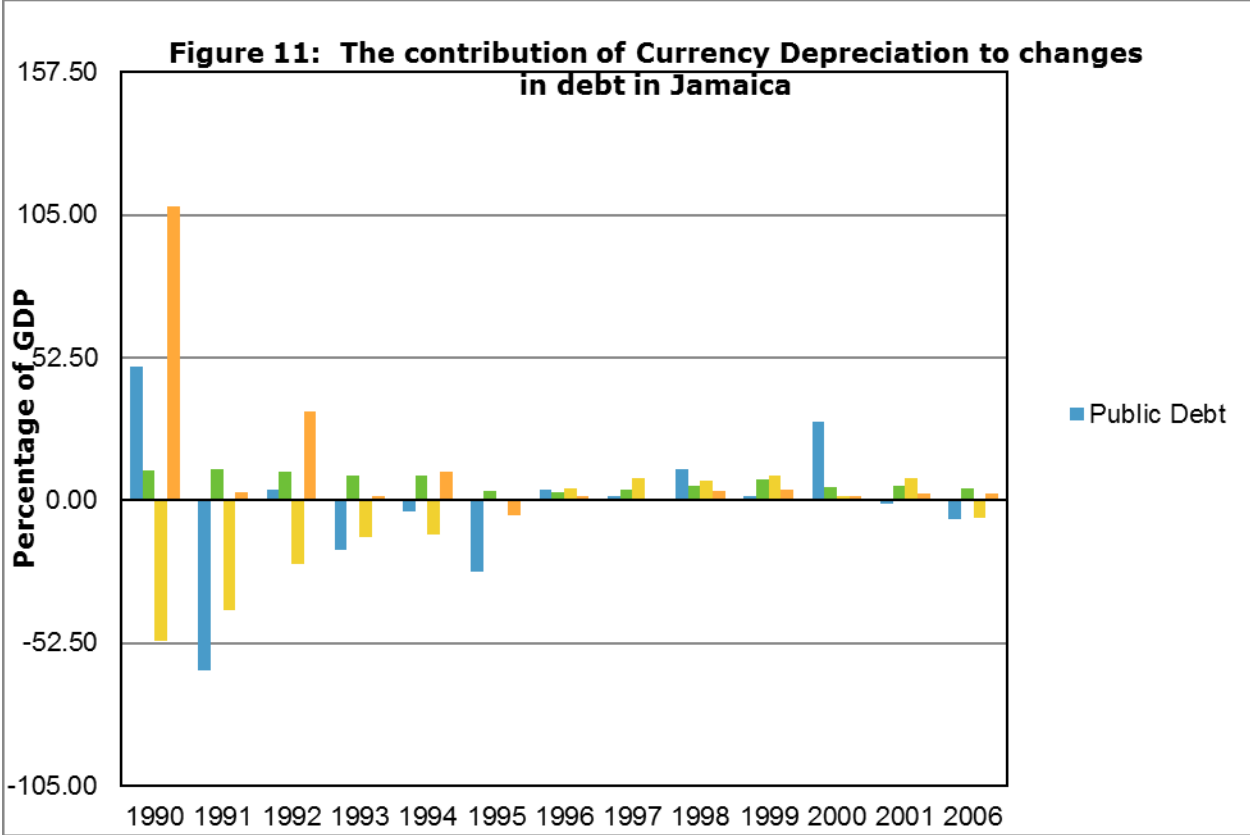
factor to the residual stems from significant increases in grants in 2008 and 2009. Unlike the others highlighted above the fiscal consolidation effort in 2006 and 2007 was mostly expenditure based with negligible movements in tax revenues as a percentage of GDP. During the consolidation years current and capital expenditures fell by a net of 3.56 and 2.33 per cent of GDP respectively.

**Figure 10: Debt Decomposition for St. Lucia**



The remaining successful fiscal consolidations highlighted are located within the appendix. Even without the presence of debt forgiveness and restructuring the residual still accounted for a vast majority of the changes in debt dynamics. The primary balance before grants taken as a percentage of GDP and growth and interest rate differentials had positive albeit less persistent effects on the evolution of debt dynamics.

Additionally in order to test the results in literature that fiscal consolidation is less contractionary within countries that have a floating exchange rate the effects of nominal depreciation on debt are charted for Jamaica. The results are depicted in figure 10 below. These results indicate that nominal depreciations played a significant role in explaining changes in public debt. However, due to the absence of a successful fiscal consolidation for Jamaica under many of the conditions outlined within the methodology the results in literature couldn't be explicitly tested. The lack of a successful fiscal consolidation within Jamaica however, may indicate that nominal exchange rate depreciations have little impact on their successes in the Caribbean. This result however, must be tested further.



## **6.0 Policy Recommendations**

The combined results of both techniques would indicate that fiscal consolidations in the Caribbean have moderate effects on debt with relative high probability of success as opposed to the rest of the world. This success however, has failed to translate into large scale long term reductions in debt. In fact with few exceptions, namely St. Kitts and Nevis, debt to GDP has returned to its pre-consolidation levels and in some cases higher. In order to inform policy prescriptions the focus must now be turned to highlighting the reasons for this outcome. In order to do this one question must be answered. Is this outcome strictly a function of lack of sustained consolidation efforts caused by fiscal indiscipline amongst individual governments or a combination of external factors beyond their control?

Within the time period studied, attempted fiscal consolidations, whether successful or unsuccessful, are generally associated with an agreement with some current or potential creditor. In most cases as a precondition or conditionality of an IMF loan agreement. However without fail when these restrictions are lifted or the loan breaks down, the primary balance to GDP starts to slip for the countries studied, in some cases almost a 180 degree turn. Additionally, a lot of the main reductions in debt are attributed to large spikes in the residuals which capture a lot of the short term or one off factors that affect debt. These include: spikes in grants, debt restructuring or forgiveness and programmes like the citizenship by investment programme. These results are indicative of lack of fiscal discipline or lack of sustained effort to pursue consolidation. If this is the case the policy prescriptions is to be focused solely on finding a way to encourage governments to maintain fiscal discipline and having the necessary checks and balances in place to ensure it continues. However, there are other underlining reasons for fiscal slippages that have nothing to do with fiscal indiscipline on the part of the government. These include: high occurrences of natural disasters and susceptibility to external shocks which all small island developing states are characterised. This must be included in any policy prescription. There is no doubt however that long term reduction in debt cannot be reached without each country living within their means and exhibiting high degrees of fiscal discipline. This section will highlight some avenues to successfully reducing debt through fiscal consolidation.

Firstly, governments within the ECCU and Jamaica must commit to fiscal consolidation. This should be done through the commitment to implementation of strict fiscal rules with the goal of meeting debt to GDP target. Greenridge et al (2012) found that public debt starts to impact growth prospects at about 55 per cent of GDP within Caribbean countries. The Monetary Council of the ECCB has set a target of 60 per cent of GDP for 2030 for all ECCU countries. The implementation of fiscal rules will help to quell the lack of commitment to sustained consolidations within the country based on lack of government commitment. Rules should be centred on non-exogenous shock spending ceilings, tax revenue and other revenue floors and certain primary surplus targets inclusive of both expenditure and tax reforms. Amo-Yartey et al. (2012) posits that as at 2011 countries such as St. Kitts and Nevis, Jamaica and Grenada would need to run surpluses in excess of 6 per cent of GDP to reach this target. Individual governments however, given the possible distributional effects of fiscal consolidation must refrain from cutting government measures aimed at reducing poverty and income inequality. As such expenditure reforms should focus first on efficiency improvements within the public sector and then cuts to non-essential spending while safeguarding social safety nets and other similar programs. It may be useful to cut pay and pensions to central government officials first, especially in various Caribbean countries like Jamaica where it is widely believed by the common man that politicians are corrupt and overpaid. This would help to quash some of these feelings and indicate the government's commitment to improving the fiscal position. In terms of tax reforms, governments should focus measures on broadening the tax base as opposed to tax increases within the constraint of the overall size of the tax base. Policies also must be put in place to improve tax collections, especially in the case of Jamaica where high tax delinquency is prevalent. This may take the form of new legislation giving government agencies more authority to pursue tax evaders as well as stricter punishment under law to act as a disincentive.

Moreover, an independent committee should be implemented to facilitate the enforcement of fiscal rules. Jamaica currently has a committee that ensures the government adheres to the stipulations laid out within their current IMF agreement; a similar committee should be formed



post agreement with the mandate of enforcing new fiscal rules. This new committee could be formed within the Bank of Jamaica in order to ensure greater level of independence from the government. In the absence of realisation of this reality the committee overseeing the IMF agreement could take on this task. For the countries within the ECCU a similar committee could be formed within the ECCB. This council would have a representative from each member country's government as well as a team of bank economists and set up in such a way that no individual country has autonomy over another and as such ensure independence from any individual member country. This committee would initially formulate the rules under which individual countries will set their fiscal policy. The committee will also outline the conditions under which countries are allowed to deviate from the rules in the presence of various shocks as well as oversee its implementation and ensure the adherence to the guidelines set out by these individuals. Additionally general amendments or any other major decision undertaken by the committee can only occur if all countries sign off. This kind of committee could slowly be worked into being one regional fiscal discipline committee for the Caribbean within the CARICOM or a part of a new body.

Secondly, fiscal consolidations can fall off track due to a host of external shocks and contingent liabilities as a result Caribbean governments must better insulate themselves from these shocks. The most likely and predictable shocks stem from hurricanes and other similar natural disasters. In the face of predicted increases in frequency and intensity of these episodes owing to the effects of global warming, the potential catastrophic impacts of these events should be placed in the forefront of government thinking. This is as past tropical cyclones have necessitated increased borrowing within the region as a direct result of the destruction caused and as a result lead to further debt accumulation. This is as governments don't have the luxury of reliance on grants due to their lacking in both timing and adequacy, especially going forward under current economic climate. The first way to curb this is to incorporate fiscal buffers within fiscal rules; as insurance for such disasters. As it stands currently the governments studied are all members of the Caribbean Catastrophe Risk Insurance Facility (CCRIF), which depending on the policy a country has it is entitled to a pay-out as much as \$100 million in the event of a natural disaster that fits that prescribed pay-out criteria. ECCU

governments should seek to position themselves under maximum coverage under this policy, if not already, without compromising their ability to adhere to their fiscal rules. Moreover, governments should, fiscal space permitting, set aside additional funds above the fiscal buffer or reserves in the event of external shocks not limited to just hurricanes to quell borrowing needs whenever they come to fruition.

Finally, government's fiscal policy must remain geared to achieving medium and long term growth through facilitating an environment for greater small business integration, entrepreneurship and private sector development. This private sector development could additionally aid in the reduction of the public sector wage bill through workers transitioning from the public to private sector as a result of increased opportunities. This would also take care of some of the fiscal rigidities within current expenditure. This is as growth remains the best and least disruptive strategy in terms of debt reduction.

## **7.0 Conclusion, Limitation and Recommendation for further study**

Within the ECCU and Jamaica fiscal consolidations have been marginally effective as a tool of reducing debt. Primary balance, the main proxy used for fiscal consolidation, failed to totally explain the evolution of public debt over the period of study. The debt decomposition positing that a vast majority of the changes in public debt is explained by the residual, with significant spikes during large debt reductions. Upon further inspection it was evident that these spikes coincided with similar increases in grants; although appearing infrequently and other events such as debt restructuring or forgiveness. This result indicated that a majority of the reduction in debt over the year stems from one off events and not of long term debt reduction facilitated by fiscal tightening. Despite the efforts and other events detailed, with few exceptions public debt remained high and in most cases exceeding pre-consolidation levels within the countries studied. This was viewed to be as a direct result of lack of sustained efforts by the government's to actually pursue fiscal consolidation and discipline as a means of long term debt reduction. Most of the consolidations studied appear to be more a policy enacted to aid in the negotiation with a creditor or pre-condition or condition of a creditor lending the country namely the IMF. As a result of this in order to eliminate some of the restraints from pursuing fiscal consolidation the implementation of fiscal rules were proposed. Additionally, the large

residuals may indicate the need to take a holistic approach in debt reduction not focusing solely on the fiscal reductions.

Although netting a few useful conclusions, this paper like all empirical papers failed to elude some limitations which have impacts on the viability and robustness of its findings. First the inability to ascertain specific fiscal policy information for the countries studied to aid in identifying and assessing the composition of fiscal consolidations may have led to omissions of actual consolidation attempts. This also hampered the analysis of the composition of these consolidations. Additionally, the alternative proxy used to identify consolidations suffered from a few weaknesses. These include: its failure to omit changes due to business cycle fluctuations and other factors contributing to debt reduction that have nothing to do with fiscal consolidation, making inferences drawn from the proxy a bit misleading. The event study approach was hence taken to ease the effects of this limitation but however could not account for everything. The debt decomposition also suffered from a few limitations. Firstly, some of the variables such as inflation based on GDP deflator and real interest on debt had to be substituted for within the debt decomposition equation which may have hampered the results. Additionally, a majority of the variables included within the equation for nominal depreciation had to be derived and may include measurement errors. These errors may have contributed to the large size of the residuals within the countries studied.

Although presenting a few limitations there are many useful extensions and alternative approaches for this analysis. First, the debt decomposition could be redone accounting for the impact of debt restructuring and other items, where data are available, that may be present within the residual to see what exactly has spurred the changes in debt dynamics within the Caribbean. Additionally, this study could be extended to include a formal econometric model. One possible approach is to expand on the VAR framework proposed by Favero and Giavazzi (2007). It may prove a useful exercise to see if this framework can be amended without compromising robustness to ascertain if it may be a suitable alternative to answer the proposed research question. Thirdly, a similar comparative study on fiscal consolidations could be conducted amongst a wider group of Caribbean countries, to ascertain if the outcomes amongst

differing Caribbean countries are more in line with those posited in literature. Finally it may also prove a useful endeavour to revisit this study from a debt approach, which is to study directly all the tools that has led to the reduction of debt where observed amongst Caribbean countries.

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Appendix

Figure 12: St. Vincent and the Grenadines 1998-2002

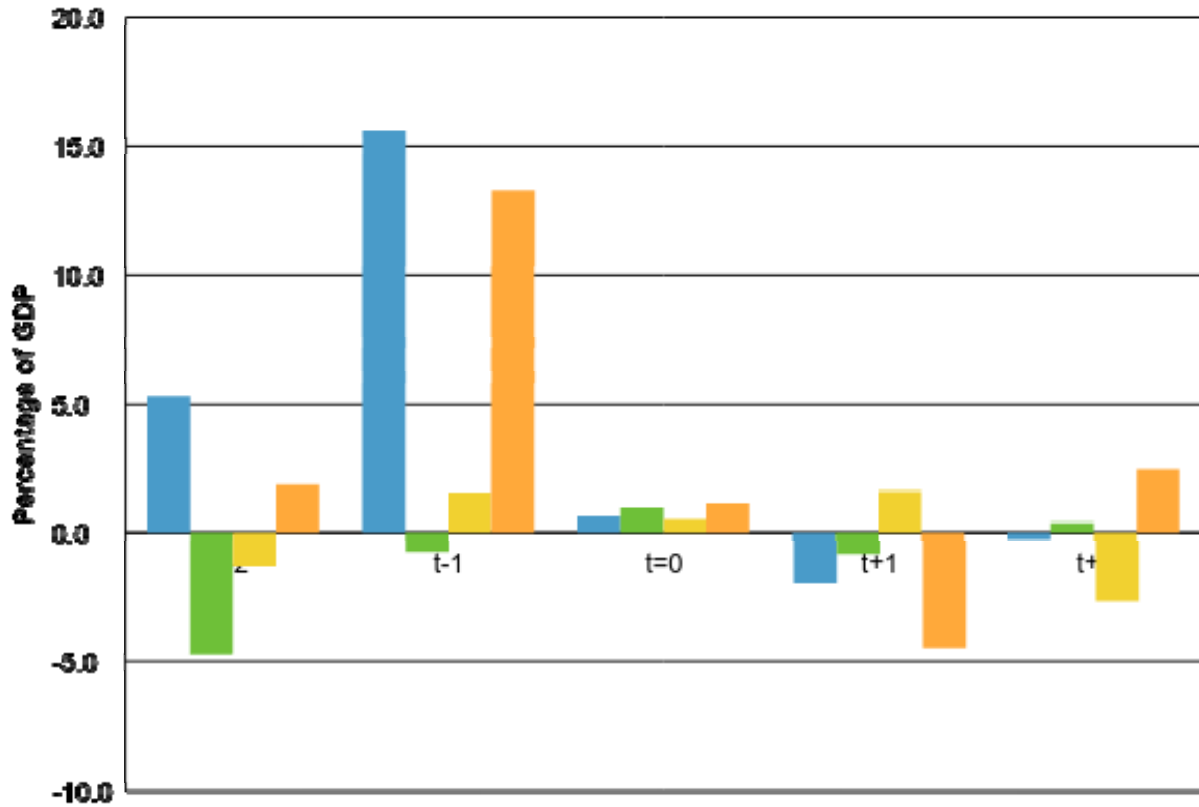


Figure 13: Dominica 1994-1998

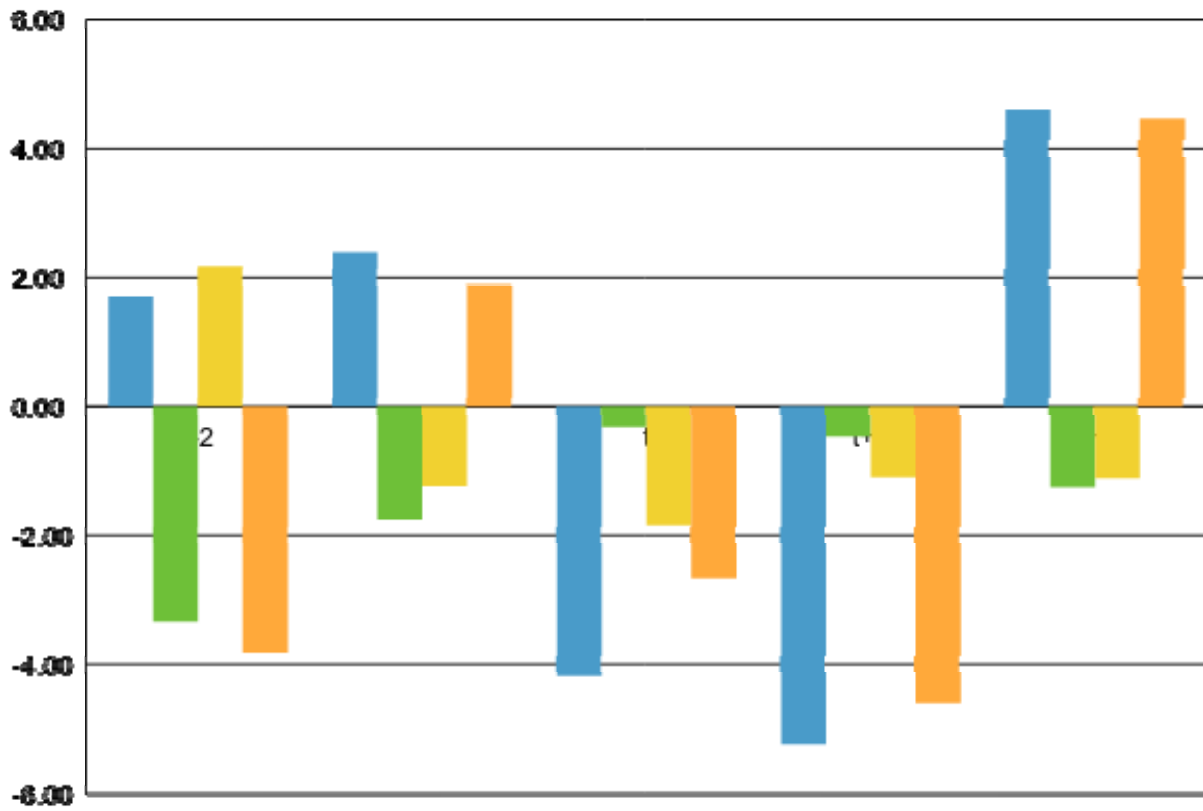




Figure 14: St. Kitts Nevis 2004-2008

