

FINANCING RECOVERY: IMPLICATIONS OF NATURAL DISASTER INDEBTEDNESS ON THE FISCAL SUSTAINABILITY OF THE EASTERN CARIBBEAN CURRENCY UNIT (ECCU)

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Abstract

This paper addresses the issue of natural disaster expenditure and its impact on fiscal sustainability in the Eastern Caribbean Currency Unit (ECCU) countries. Most of these countries have financed recovery by acquiring loans and accessing emergency funds. When poor countries such as the ECCU States are faced with natural disasters, the cost of rebuilding becomes even more of an issue since they are already burdened with debt. This paper takes a two step approach to examine this issue. Firstly, it presents the results of surveys conducted on the effects of disaster expenditure on key players - budgetary, financing and disaster preparation and mitigation institutions. Secondly, it explores empirically the effect of natural disasters expenditure on fiscal policy cyclicity on a panel of ECCU states for the period 1980-2008. The study found evidence to suggest that natural disasters pressure governments to run procyclical fiscal policies. External public sector debt is highlighted as the most important channel by which this variable affects fiscal cyclicity.

Keywords: environmental vulnerability, natural disaster expenditure, fiscal sustainability, financing recovery, cyclicity.

1.0 Introduction

Fiscal sustainability of ECCU States is inherently fraught with uncertainty. Within these States policymaking decisions concerning fiscal policies have typically omitted the impact of environmental vulnerability on their budgets and balance of payments. Moreover, lending institutions have neglected to incorporate variables to account for environmental shocks within their debt and fiscal sustainability analysis. Such variables should be included since the quality of a country's fiscal policy is influenced by exogenous shocks to the economy and their ability to service debts.

The rising impact of natural disasters such as earthquakes, floods, landslides, volcanic eruptions and hurricanes is driving up the cost of disaster relief and reconstruction. Disaster recovery produces a cost to society and governments bear the majority of this cost. When poor countries such as the ECCU states are faced with natural disasters, the cost of rebuilding becomes even more of an issue when they are already burdened with debt. This pressures both the government and donor agencies.

The implication of natural disaster shocks is critical in determining fiscal sustainability since natural disasters expenditure can cripple an entire economy, lead to rising fiscal deficit and debt levels. New borrowing created to finance natural disaster rehabilitation and reconstruction costs can crowd out fiscal space for infrastructured Investment. If natural disaster expenditure leads to increased public debt, then the existing mix of fiscal and monetary policies would need to be corrected to ensure solvency. This study estimates empirically the cyclicity of natural disaster expenditure. The empirical investigation provides evidence that natural disaster expenditure forces governments of the ECCU to adopt procyclical policies, thereby causing severe biasness in the estimation of fiscal sustainability.

The broad objective of this study is two-folds. Firstly it is, to conduct empirical estimation and, secondly, to present the analyses on findings of the impact of natural disasters on fiscal sustainability by focusing on primary and secondary data collated through field research conducted on the ECCU for the period 1980-2008. The contribution of this study is thus the collection of primary data on natural disasters and secondly the empirical analysis of

the impact of natural disasters expenditures on the ECCUs' fiscal sustainability within the context of a fiscal cyclicity framework.

The remainder of this paper is organised as follows. Section 2 presents an overview of existing literature. In Section 3 cyclical models are employed to determine empirically the impact of financing disaster recovery on fiscal sustainability and the empirical results interpreted. Section 4 discusses the fiscal implications and policy recommendations are presented in Section 5. The conclusions are offered in Section 6.

2.0 Literature review

Developing countries are thought to be the most vulnerable to climate change as these countries have warmer climates. A high degree of vulnerability may result as a consequence of high incidences and high intensity of natural hazards. One attribute of climate change is global warming - the increase in the earth's atmospheric and oceanic temperatures, which results from an increase in the greenhouse and pollution. Global warming manifests itself through the progressive rise in sea level and the increased intensity and frequency of climatic episodes leading to natural disasters. There is considerable uncertainty about natural hazards and disaster risks. The impact of these events is multifaceted and extends beyond the economic realm.

It is the aim of this section to focus on five groups of risks: *humanitarian, ecological, economic, fiscal policy and balance of payments* by reviewing a series of literatures. The *Humanitarian* effect looks at the loss of life and the general social effect on the affected population. Secondly, the *Ecological* effect looks at the loss of arable land, forests and damage to ecosystems. The *Economic, fiscal and balance of payments* effect focuses respectively on the deterioration of economic growth, loss of fiscal revenue and the reduction in foreign exchange.

2.1 Humanitarian effects

Natural disasters have devastated countries causing significant loss of national income and employment income, rise in unemployment, injuries and loss of homes and human lives. Human suffering in emergency situations is often linked to adverse environmental impacts. They are linked to the effects of water contamination and depletion, environmental health deterioration and air pollution on the lives of the population. As a result, humanitarian assistance to victims of natural disasters is often aimed at improving food security for vulnerable populations in vulnerable countries. In times of crisis, such as natural disasters, the most vulnerable becomes the most affected. The same applies to poor countries versus rich countries.

Natural disasters can substantially reduce human capital only if there is a substantial loss of life. This conclusion is supported by Noy and Nualsri (2007). These researchers found that natural disasters destroys human capital and impacts negatively on economic growth. However, they did not find any statistically significant effect of natural disasters on the reduction of physical capital.

This study found that between 1980 and 2008 loss of lives within the region was insignificant. Forty-one (41) persons reportedly lost their lives in Grenada as a result of Hurricane Ivan. An estimated 200 farmers also lost their lives as a result of Hurricane Ivan's post-disaster syndrome.¹ Fifty-one (51) persons lost their lives in Montserrat: nineteen (19) deaths resulted from Hurricane Hugo in 1989 and thirty-two (32) from the eruption of Soufriere Hills Volcano. Five (5) persons died in St. Kitts from hurricane Georges (1998) and eighteen (18) were killed in St. Lucia by Hurricane Allen of 1980.

The most significant effect of natural disasters on the region's population resulted from the Soufriere Hills volcanic eruption in Montserrat. The damage caused Montserratians to experience financial hardship and significant reduction in their housing stock. As a result, 90 percent or two-thirds of the population was forced to evacuate/relocate and flee the island. During the early 1990s Montserrat's population was 10,000, but subsequent evacuations

¹*n.b. this figure was not included in the total loss of lives since it was not recorded in the official statistics but collected through primary research*

eventually reduced the island's population to approximately 2,726 in 1998. In 2008, Montserrat's population stands at just over 4000, a decline from approximately 12,000 in 1995.

The migration induced by the volcanic eruption caused Montserrat's productive sector to halt almost instantly. By extension, the migration hampered the island's economic development and prosperity. Evidently, natural disasters have the potential to disrupt social and economic development. This impact tends to be more severe in poor countries than in rich countries because the level and extent of poverty is more acute in poor countries. Similarly, within countries, the effects on poor households are usually greater than rich ones. There are three main reasons for this conclusion:

Firstly, poor people live in less well constructed homes. These structures are more susceptible to destruction by wind, flood or earthquake, than stronger, more expensive housing. In the ECCU, the housing sector accounts for the greatest percent (65%) of losses incurred as a result of natural disasters.

Secondly, poorer people have less schooling than richer people; thus, they enjoy fewer employment options. Most often poorer people work in the construction industries and the agriculture and tourism sectors as farmers, fishermen, taxi drivers, cruise operators, masons, carpenters etc. When a natural disaster strikes, these sectors are affected significantly. The survey found that the tourism sector is the second most important contributor to the ECCU's national income and during the period under review, this sector suffered the second greatest percentage loss in the aftermath of natural disasters. Natural resources and the productive sector of agriculture, forestry and fisheries suffered the third greatest loss in terms of damage.

Thirdly, the poor have small or no savings to protect themselves in crises and cannot afford insurance. Their losses then become a cost to the Government who bear most of the cost. In many instances they become the Government's contingent liabilities.

During the early stages of natural disasters, emergency housing/temporary shelters are provided by the Government who utilizes churches, schools and other public facilities. Governments bear a significant portion of the cost to operate these shelters. Moreover, in some instance, Governments provide medium term emergency accommodation of reasonable standard for residents who cannot afford to rebuild after a devastating event. Evidently,

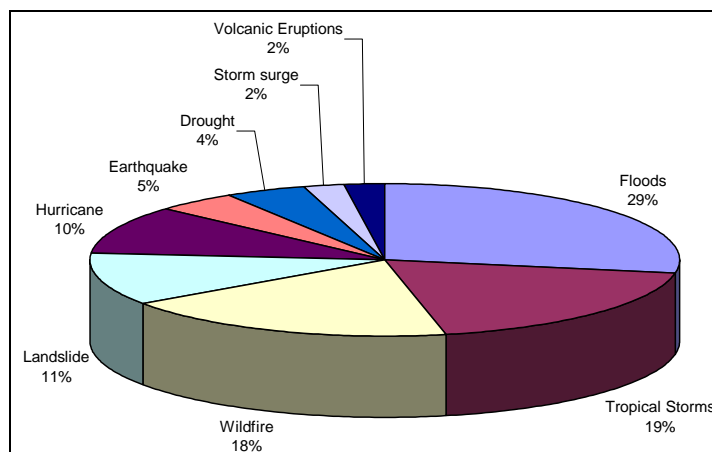
natural disasters can lead to reduction in human capital, increase incidences of poverty, hampers government's ability to attain the millennium development goals, reduce economic productivity, lower economic growth (real per capita GDP) and increase government expenditure. The foregoing analysis shows that natural hazards/disasters have humanitarian consequences and imposes financial pressure on governments and donor agencies.

2.2. Ecological Effects

Human capital and the ecosystem are important ingredients for survival and prosperity. Natural disasters can cause loss of arable land, forest and inflicts damage to ecosystems through floods and landslides. The impact is normally felt through the agriculture and tourism sectors. The disruption to the agricultural sector translates into decline in exports and increases imports. This leads to a deterioration of net exports – which usually translates into a deterioration of the balance of payments. A study by Ramussen (2004,11-12) supports this conclusion. Ramussen (2004) found that natural disasters could decrease long-run growth by irrevocably destroying agricultural, fishing and other natural resources. However, the long-run impact of natural hazards is not exclusively negative. Floods provide sediments that increase future production (Abbott, 2004, 351) and volcanic eruptions deposit ash which enriches the soil (Abbott, 2004, 170). This is evident in St. Vincent where the soil closest to the volcano is very rich in content and produces quality crops.

Floods and landslides impact the ECCU countries each year, thus representing the most frequent events. Most are minor events and are often times not recorded. This study found that during the period 1980-2008 St. Lucia was affected by two significant landslides, the damage amounting to EC\$20,000. In 2002, five (5) persons were killed in St. Vincent and the Grenadines as a result as a result of floods and landslides. The agricultural sector sustained significant damage during floods which uprooted trees, caused rivers to overflow, flood fields and destroy cultivated land. The intensity of these events is not extensive each year. (*see figure 2.2.1*)

Figure 2.2.3 Occurrences by Event 1980-2008 (ECCU)



Source: Various National Disaster Agencies

Landslides cause damage to construction, roads, bridges, levees and canals. They affect agriculture and forestry through temporary loss of irrigation systems. They also cause localized losses of plants, vegetation and forest covers, crop damage and change the natural and man-made drainage systems. The largest and most environmentally significant landslide took place in St. Lucia and St. Vincent and the Grenadines in 1997 and 2008 respectively. In St. Lucia, a series of landslides started in March 1997 culminated with a series of major events in November 1997. No lives were lost, although the socio-economic impact was substantial. There were temporary evacuations of 600 residents; loss of an access road to banana producing areas; loss of income through fisheries and tourism related sales; loss of approximately 40 acres of land; loss of bananas and tree crops especially citrus and cocoa and destruction of cocoa drying sheds and banana boxing plants. During September 2008, St. Vincent and the Grenades suffered from the effects of seventeen (17) landslides, one of which resulted in one (1) death.

2.3. Economic Growth

Even with concessionary loans and generous aid from the international community, post-disaster losses may disrupt both economic growth and development programmes. The majority of studies on the secondary effects of natural disasters focus on the overall growth of the economy examining both short and long-term effect. Raddatz (2007) and Rasmussen (2004), Benson and Clay (2004), Coffman and Noy (2009), Dacy and Kunreuther (1969) and

Albala-Bertrand (1993a, 1993b) characterise natural disasters as mere exogenous shocks that temporarily disrupt an economy, that is, the short-term effect. These studies have shown that trends in GDP increases after the occurrences of natural disasters and thus provide evidence of a positive relationship between natural disasters and macroeconomic variables in the short run.

Recent studies have shown that natural hazards can have long-term effects on economic performance, Skidmore and Toya (2002); Noy and Nualsri (2007), Gassebner et al. (2008) and Yang (2006). Skidmore and Toya (2002) use cross sectional dataset on 89 developed and developing countries for the period 1960-1990 and found that the impact of natural hazards on economic growth varies by type of disaster. They argue that climate-related disasters tend to have a positive effect on growth, whereas geologic disasters have either a negative or insignificant impact. In turn, Odell and Weidenmier (2004) argue that the 1906 San Francisco earthquake had a substantial impact on financial markets, contributing to permanent changes in the institutional structure of the United States.

The secondary effect not only impacts on the overall economic growth of the economy. The effect is also felt through mechanisms such as production; the loss of aggregate income and employment and the spillovers on consumption profiles; increased imports resulting from the need to purchase intermediate goods and raw materials for repairs; and, lower government revenue. Thus, the damages and indirect costs and impact spill over to the external balance, that is, the balance of payments, the level of indebtedness.

Noy et. al. (2008) used data on a panel of developed and developing countries to regress GDP growth rate on five key determinants of disaster costs: illiteracy, institutional strength, GDP per capital, government consumption and exports. With the use of Hausman and Taylor (1981) methodology to overcome the possibility of correlation between country specific effects and the independent variable in a dynamic panel of developed and developing countries, Noy et. al. (2008) found that developing countries, and smaller economies, face much larger output declines following a disaster of similar relative magnitude than do developed countries or bigger economies. The study also found that countries with higher per capita income, higher degree of openness to trade, and higher levels of government spending are better able to withstand the initial disaster shock and prevent further spillovers into the macro economy.

In the short-run, major natural disasters have a negative impact on economic growth (GDP). This is attributed to reduced productivity resulting from damage to infrastructure and plant, loss of agricultural output and general economic activities. In the year immediately following the event, GDP growth frequently rebounds as a result of rehabilitation and reconstruction activities, which are often financed by external sources. However, in the long-run, disasters can have both positive and negative effects on economic growth.

One strand of literature argues that natural disasters may induce growth because of increased rehabilitation and reconstruction activities (Skidmore and Toya. 2002). The other argues that the impact of natural disasters on long-term growth is negative (Benson and Clay, 2003). Benson and Clay (2001) observe that major disasters influence the composition of public spending and funding patterns, distort short and medium-term investment plans, and hence adversely affect economic growth potential, particularly in economies that are dependent on public investment.

In comparison, the World Bank (2003) found that natural disasters have no significant impact on growth. A number of studies on examining events in some Eastern Caribbean States found that natural disasters frequently lead to reduction in the GDP. Among these are one by Auffret (2003a) which examined the impact of 16 natural disasters on the Latin America and Caribbean countries. Auffret found that 1 percent of the GDP in direct damage reduced same-year GDP growth by 0.5 percentage point. Charvériat (2000) who analysed of 35 events found that the same-year GDP growth fell in 28 cases, with an overall median reduction of 1.7 percentage points. Meanwhile Crowards (2000b) found that during that same-year GDP growth fell by an average of 3.1 percentage points following 21 major disasters.

Natural disasters hamper economic growth as activities in the productive sector slows. Severe hurricanes and volcanic eruptions within the region demonstrate the typical after disaster effect on GDP. In the year during the passage of Hurricane Ivan (2004) Grenada's GDP fell by 5.7 from a growth of 7.1 percent, in 2003. This contraction was attributed to the destruction wrought by hurricane Ivan, in September, which resulted in declines in value added in agriculture, hotels and restaurants, manufacturing, construction, and wholesale and retail trade. The year following Ivan the GDP rebounded, registering a growth of 11.0 percent due to

increased investment and capital inflows. Economic activity in Dominica expanded in 2007 (real GDP 1.8 percent), but at a slower rate relative to the increase in 2006 (real GDP 3.8 percent), as a result of hurricane damage (i.e Hurricane Dean) to food and vegetable crops in August 2007.

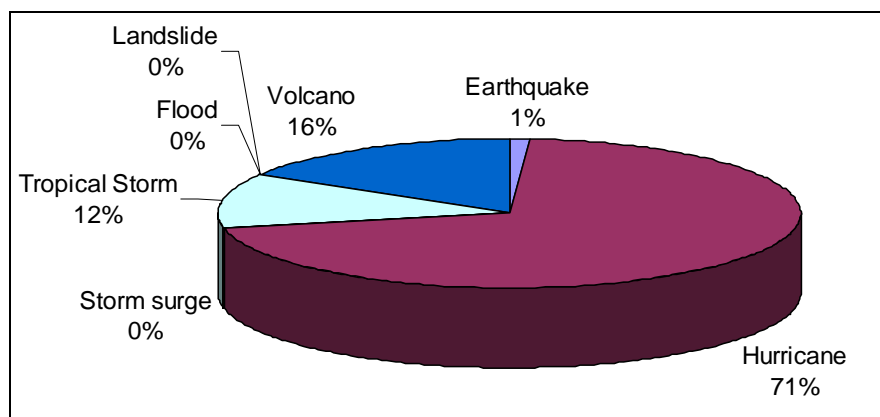
In Montserrat, the GDP fell in seven consecutive years after the volcanic eruptions; 1995-2003. The highest decline was registered at -20.0 percent in 1997. The economy rebounded in 2004-2005 but declined again in 2006 due to increased volcanic activity. Prior to the eruption, the 1994 GDP grew at 1.0 percent. Hurricanes Louis and Marilyn in 1994 resulted in a reduction in St. Kitts-Nevis's rate of growth to 3.5% in 1995. The years 1996 and 1997 were periods of recovery but hurricane Georges in 1998 led to a reduction in the rate of growth to 1.0%. In Antigua and Barbuda, GDP declined by 5.0 percent in the year of Luis and Marilyn (1995), in the previous year (1994) GDP grew at 6.2 percent. In each year of a severe natural disaster economic growth of Antigua and Barbuda declined: hurricanes - Georges (1998) a growth rate of 4.9 percent, Jose & Lenny (1999), 4.9 percent and Omar (2008) 2.8 percent. *(See Appendix A)*

2.4 Fiscal Effect

Noy and Nualsri (2008), yield some useful predictions, but to a large extent, disasters' impact on revenue and spending depend on the country-specific macroeconomic dynamics occurring following the disaster shock, and the unique structure of revenue sources (income taxes, consumption taxes, custom dues, etc.) and large expenditures.

The graph (*figure 2.4.1*) table of average losses across the region between 1980 and 2008 indicate that the greatest economic loss resulted from hurricanes (EC\$5.8 billion equivalent to 71 percent of total losses), followed by volcanic eruptions (1.4 billion, equivalent to 16 percent of total losses) then tropical storms (EC\$1 billion equivalent to 12 percent of total losses). Although hurricanes constitute the greatest financial loss no hurricane has destroyed an entire economy as is the case of volcanic eruption consequences in Montserrat.

Figure 2.4.1 Average Economic Loss (%) by Category 1980-2008 (ECCU)



Source: Various National Disaster Agencies

Surveyed institutions were asked to identify the main type of event (natural hazards/disasters) that had the greatest negative impact on the government's financial resources. The result shows that 99% of the most significant events were hurricanes. Among these events the worse natural disasters by economic loss were hurricane Ivan 2004 (Grenada)– EC\$2,417 million, Soufriere Hills Volcanic eruption (Montserrat)- EC\$1,350 million, hurricane Allen 1980 (St. Lucia)- EC\$250 million, hurricanes Jose and Lenny 1999 (Antigua and Barbuda)- EC\$247 million, earthquake 2004 (Dominica)- EC\$90 million, Hurricane Lili 2002 (St. Vincent and the Grenadines)- EC\$35 million and hurricane Georges 1998 (St. Kitts-Nevis)- EC\$1.3 million. (Table 2.4.1)

Table 2.4.1 Major Natural Disasters

Event	Year	Country	Damage (EC\$M)
Hurricane Ivan	2004	Grenada	2,417.00
Soufriere Hills Volcanic eruption	1995, 1996 & 2006	Montserrat	1,350.00*
Hurricane Georges	1998	St. Kitts & Nevis	1,035.13
Hurricane Allen	1980	St. Lucia	250.00
Hurricane Jose & Lenny	1999	Antigua & Barbuda	247.00
Earthquake	2004	Dominica	90.00
Hurricane Lilli	2002	St. Vincent & the Grenadines	35.30

Source: Various National Disaster Agencies

Nine (9) hurricanes affected Dominica and resulted in an estimated loss of EC\$338.9m, while Grenada suffered from 6 tropical storms and two major hurricanes. The total estimated cost of the two hurricanes amounted to EC\$2,620m. Montserrat was affected by two severe hurricanes, one earthquake of significance and a series of volcanic eruptions. The estimated total loss resulting from these events was approximately EC\$2,047.1m. St. Kitts and Nevis was affected by eight (8) major hurricanes. The total cost of these events was estimated in excess of EC\$1,942m. Two significant hurricanes occurred in St. Vincent and the Grenadines and these costs amounted to an estimated EC\$39.4m. The effects of 5 events: one tropical wave, two tropical storms and two hurricanes amounted to a total cost of EC\$39.6m. St. Lucia was affected by, two tropical storms at an estimated cost EC\$250.0m, three tropical waves with approximate expenditure of EC\$15.7m, four hurricanes amounting to 294.7m in financial losses, and one earthquake (1990) resulting in the loss of EC\$579,996. The total estimated cost of these events amounted to EC\$561.3m.

Payment for these economic losses have attributed to the increase in these countries fiscal deficit. An accumulation of fiscal deficits in the Eastern Caribbean States represents a mortgaging of future tax revenues rather than a buildup of inflationary pressure. Thus, the cost of hurricane reconstruction, added to an already existing capital projects, may lead to an increase in the cost of future projects and affects governments ability to deliver essential services.

Several papers discuss the implications of natural disasters for fiscal policies on the basis of case studies: IMF (2008), Wildasin (2007), ECLAC (2006) and Crowards (2000b) who conducted a case study analysis of the ECCU by examining the before and after effects of natural disasters on macroeconomic variables. Few studies explore the empirical fiscal impact of natural disasters, for example, Heipertz and Nickel (2008), Benson and Clay (2004).and Schuknecht (1999). Heipertz and Nickel (2008) concluded that the total effect (including the direct and indirect impact) of extreme weather events on public finances varied between 0.3 to 1.1 per cent of GDP. Schuknecht (1999) estimated a fixed effect model for 25 developing countries to study whether countries with different exchange rate regimes engage differently in expansionary fiscal policies around elections. In his regression, he included catastrophes as a

control variable indicating that these weaken government's fiscal position through budget-financed relief measures and revenue loss. He found a strongly significant negative effect of catastrophes on fiscal balances (Schuknecht, 1999).

Other studies were conducted by Coffman and Noy (2009); Halliday (2006); Horwich (2000); Narayan (2001); Selcuk and Yeldan (2001); Vos et al. (1999), Cavallo and Noy (2008); Cuaresma et al. (2008) and Noy (2009). These works examine specific disaster events - such as hurricane Mitch in Honduras, the Kobe earthquake in Japan, and estimate some of the specific costs and consequences of those individual events. A UN report indicated that the cost of rebuilding devastated Central American countries after Hurricane Mitch of 1998 has highlighted the problems of debt repayment and debt relief that these countries are still facing (a repayment of about US\$200 million a day from Honduras and Nicaragua, two of the worse hit areas). In May 2001, the international community agreed "to seek a moratorium on debt service payments for the world's most highly -- indebted countries in "exceptional" situations -- such as those plagued by civil wars, floods and natural disasters -- and to facilitate access to debt relief for post-conflict countries." (UN, 2001)

A number of studies have addressed a variety of dimensions regarding the economic and financial impact of natural disasters including Fox (1995; 1996), Zeckhauser (1996), Skidmore and Toya (2002), Horwich (2000), Albala-Bertrand (2000) and Skidmore (2001). Skidmore and Toya (2002) study examined the effect on a few Caribbean economies. Skidmore and Toya's (2002) showed that, after conditioning on other determinants, the frequency of climatic disasters was positively correlated with human capital accumulation, total factor productivity growth and GDP per capita growth.

Studies of the impact of natural disasters on countries' debt were conducted by Benson and Clay (2004) and Cochrane (1994). With the use of a growth model of Kenzy and identifying negative shocks in the form of lessening public and private capitals and augmenting government expenditure for emergency, Benson et. al found that natural disasters can reduce the confidence level of a country, enlarge the debt rate or foreign loans and increase the debt stock with declining investment and long-term growth.

A study by Heger M et. al (2008), “Analysing the Impact of Natural Hazards in Small Economies” estimated the main macroeconomic impact of disasters, that is, a deteriorating fiscal balance, a collapse of growth and a worsening external balance, as a consequence of damage resulting from the event that took place in small economies. The study included all ECCU States with the exception of Montserrat. The IMF (2003) found that five large exogenous shocks in Africa were associated with same-year increases in fiscal deficits of up to 3 percent of GDP. However, in many cases natural disasters appear to have had very little impact on fiscal balances, perhaps because countries are constrained by existing expenditure envelopes (Benson and Clay, 2003a).

Taking a more comprehensive assessment of impacts for a larger group of economies in the Caribbean region (in this case, members of the Eastern Caribbean Currency Union, that is, Antigua and Barbuda, Dominica, Grenada, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines—and two dependent territories of the United Kingdom, Anguilla and Montserrat), Rasmussen (2004) studied the ECCU States. The study found that a short-term impact of disasters was an immediate contraction in output as well as a significant worsening of external balances, with a median increase in the current account deficit amounting to approximately 10.8 per cent of GDP. He also pointed to a worsening of the fiscal balance, resulting from higher expenditure and lower receipts, which he argued contributed to an approximately cumulative increase in median public debt (measured as a percentage of debt) of 6.5 percentage points over three years.

Nearly all past studies of the financial impact of natural events and disasters have tended to employ a single event study and estimates the impact by focusing on economic growth (GDP) and international trade. This study differs from others in that it examines natural disasters from a fiscal sustainability point of view and considers natural disaster expenditure as a macro-economic adjustment variable.

2.5 Balance of Payments

Natural disasters impact negatively on the external sector through reduced export earnings and temporary spikes in imports. Specifically, the reduction of exports is attributed to decreased production capability, and the increase in imports results from the importation of

construction materials and other particulars. These adjustments can eventually lead to deterioration of the fiscal balance and balance of payments as all ECCU States derive a significant proportion of revenue and foreign exchange from the taxation of international trade and transactions.

Talvi and Vegh (2000) alluded to non policy variables that affect governments. These researchers found that fluctuations in the tax base of developing countries are much larger than in the G-7 countries. They also argued that political distortion makes it costly to run budget surpluses due to the pressures they create to increase public spending. As a result, fiscal resources may be wasted rather than be used to retire debt, since full tax smoothing would be required. The same is true when the economy is hit by negative shocks to the tax base such as natural disasters. In their model, Talvi and Vegh (2000) predict that given distortions, optimal fiscal policy behaves in a procyclical way. When GDP increases, taxes are lowered, government expenditure rises and budget surpluses are ≤ 0 . On the other hand, if GDP falls, taxes increase, expenditure lowers and triggers budget deficit.

Gassebner, Keck and Teh (2006) investigated the impact of major disasters on international trade flows of developing countries including St. Kitts. The authors found that the democracy level and the area of the affected country are key forces in driving the impact of these events. A study by Easterly and Kraay (2000) on the issue of volatility of small States suggests that the greater degree of openness is likely to be a more relevant source of the greater volatility in terms of trade shocks. The ECLAC (2000) examined the impact of 42 significant natural disasters in Latin America and the Caribbean and found that, on average, deterioration in the balance of payments in these countries amounted to approximately one-third of the estimated damage.

Crowards (2000b) found that 21 major natural disasters led to an average worsening of the trade balance owing to an increase in import growth and, to a lesser extent, a reduction in export growth. These are reflected in the balance of payments. Benson et al. (2001) found that a country's dependence on agricultural exports is an important indicator of the magnitude of the deterioration in the trade balance. This is specifically the case of ECCU States, as exports are

shocks in these economies and are closely associated with volatile agricultural production, particularly banana earnings.

This research found that an analysis of the merchandise trade balances of Grenada and St. Kitts-Nevis shows the significant impact natural disasters had on these countries trade balances and by extension foreign revenue. The passage of Hurricane Ivan led to a 21.6 percent decline in merchandise exports, due to the loss of banana, nutmegs and other crops in addition to the trade war on Windward Island Bananas. Exports declined for five consecutive years from representing 6.8 percent of GDP in 2004 to represent 3.9 percent of GDP in 2008. Imports on the other hand declined by 9.0 percent in 2004, increased by 12.7 percent and 16.1 percent in 2005 and 2006 respectively due to increased consumption and investment needs after the disaster. With respect to St. Kitts and Nevis, merchandise exports declined by 10 percent in 1998. Dominica's merchandise exports declined to 15.6 percent of GDP in 2003 down from 17.1 percent of GDP in 2002. This weak performance was attributed to a decline in acreage under cultivation, a tropical storm in late 2002 and a drought in the first half of 2003. (*see Appendix B*)

The literature review presented above supports the view that natural hazards and disasters have the potential to cause humanitarian concerns, impact a country's ecological system, retard economic growth, increase fiscal deficits and reduce foreign earnings. These have significant financial implications for both the government of the affected economy, donor agencies and lending institutions, since the impact and cost and these events is unpredictable. Finances are needed to off-set the expenditure induced; however, governments cannot raise taxes to finance the added expenditure. Moreover, the productive sector is destroyed hence it becomes too difficult to regenerate positive national income and increase exports and foreign revenue. As a result governments rely on donor agencies and in extreme circumstances they acquire loans. Loans in themselves should act as investment mechanisms, to generate revenue and pay for themselves; however, they cannot act as such when acquired for covering the cost of natural disasters. Instead, they can potentially bias country's public indebtedness and fiscal sustainability.

3.0 Estimating the Impact on Financing Disaster Recovery on Fiscal Sustainability

Research in both the social and natural sciences has been devoted to increasing our ability to predict disasters, prepare for them and mitigate their costs. Not many researchers have focused on estimating the fiscal consequences of disasters. This research is unaware of any research that attempts to quantify the impact of natural disasters on the public debt of the ECCU using cyclical models. Most of the existing studies have examined the impact by undertaking case studies and qualitative analysis. These include studies by ECLAC, IDB and Crowards (2004). ECLAC estimated losses throughout Latin America and the Caribbean from disasters occurring over the period 1975-2002, found that the total cost was approximately US\$92 billion, or an annual average of US\$3.4 billion. IDB disaster-related loan activities since 1995 were roughly US\$475 million per year and amounted to only a fraction of the annual regional losses. Natural disasters in the United States (US) have caused economic losses in the tens or even hundreds of billions of dollars. The government has played a large financial role in responding to (uninsured) natural disasters. During the period FY1989 to FY2008, the Congress appropriated \$250 billion dollars for disaster assistance.

The complex and multi-faceted processes of post-disaster recovery and reconstruction extend well beyond the immediate period of restoring basic services and infrastructure. Immediate restoration of services can take a few weeks, whereas full recovery can extend beyond many years. During that period the emphasis is either placed on re-creating what it was before or on improving the built environment, (including the larger physical environment) and the quality of life. In the meantime, trade and fiscal deficits rise, physical infrastructures are enhanced, short-term jobs are created and the level of institutional preparation and prevention are improved. As a result, governments have a large role to play in financing recovery.

The cost of full recovery can potentially cost governments millions of dollars. With underdeveloped private sector and capital markets, individual governments utilize various instruments to finance the cost of disasters. Among these are the use fiscal resources, in the form of adjusting budgets, taxes, and acquiring new borrowings, grants and aid from external donors. Some governments earmark a portion of the budget in a form of contingency fund that

can be tapped whenever disaster strikes. This is not the case of the ECCU States as this study found that the budgetary authorities for all seven ECCU States do not make provision in their annual budgets for disaster rehabilitation and reconstruction. However, approximately 5% of the total annual budget is allocated for disaster preparedness and mitigation. This expenditure is channeled through the National Disaster Agency, which provides technical assistance for disaster mitigation. The importance of this organization was not recognized until recent years. In St. Vincent, the agency was established in 2002. In Grenada four (4) persons were employed prior to Hurricane Ivan and in the aftermath of Ivan the number of employees increased to fourteen (14).

Irrespective of the source of finance, the affected economy will experience a sudden influx of capital. This flow of capital which is intended to help smooth the effects of the shocks on output also triggers an artificial economic boom. In booms, countries can borrow more easily and thus increase public spending. This facilitates overspending. It is also linked to the procyclicality of capital flows, which facilitates overspending in good times and make it more difficult to apply expansionary policies in bad times. As a result, fiscal policies, which should mitigate the effect of exogenous shocks, become procyclical. Natural disasters cause fiscal policies to react procyclical: as natural disasters expenditure increase, fiscal deficit, public debt and government expenditure increases. Procyclicality is define as any economic quantity that moves in the *same* direction (is positively correlated) over time with the state of the overall economy. In contrast, "countercyclical" refers to any economic quantity that moves in the *opposite* direction (is negatively correlated) with the state of the overall economy. In many instances, this has been the primary source of macroeconomic volatility because fiscal imbalances are exacerbated and the severity of the shock is amplified.

Standard neoclassical and Keynesian approaches suggest that fiscal policy should ideally be countercyclical, with fiscal deficits declining when the economy is expanding and increasing during economic downturns. The neoclassical theory of fiscal policy (Barro, 1979) conveys that tax smoothing is a way to accommodate transitory shocks to activity, as long as the intertemporal budget constraint is fulfilled. In such circumstances, public debt fluctuations act as a buffer stock for shocks to activities, and enable fiscal policy to play its countercyclical role.

3.1 Empirical Methodology

This study introduces a model for testing empirically for pro-cyclicality of fiscal policy in the five (5) ECCU States. The objective is to show that in the aftermath of a natural disaster, government spending is highly pro-cyclical. When fiscal policy is procyclical, fiscal sustainability can be aggravated and public sector debt can increase. The empirical strategy employed by this study follows very closely that of Talvi and Vegh (2005). Talvi and Vegh (2005) based on a large sample of less developed countries, show that government spending and taxes are highly pro-cyclical. These authors developed a model of political pressures to explain this finding. Unlike Talvi and Vegh (2005) this study develops a model of financial pressure imposed by natural disasters. The focus is placed on the pro-cyclicality of government spending rather on than financing. The issue of procyclicality of fiscal policy is important because it reveals to a large extent the constraints faced by governments in attaining and maintaining sustainable fiscal policies.

The strategy consists of two models. In Model one, the relationship between government spending aggregates and economic growth is used to characterize the cyclicity of fiscal policy estimates. In this model, government spending as a percentage of GDP is regressed on an intercept and real GDP growth. Model two takes a disaggregated approach. In this model, the study regresses overall fiscal balance (OFB), government expenditure (GOV_EXP), gross domestic product (GDP), interest payment on public debt (INTP) and public sector external debt (DEBT) on natural disaster capital expenditure (NDCE). A disaggregated approach is potentially useful in highlighting the components of government spending that are most prone to procyclicality resulting from natural disaster expenditure. Tables 1A and 2A display the results of these regressions referred to in models one and two.

3.2 Data

The empirical analysis uses annual data for the period 1990-2008. Data on real GDP, imports, exports and expenditure were extracted from various statistical offices and the Eastern Caribbean Central Bank. Fiscal balance, government revenue (which includes current revenue,

capital revenue and capital grants) and government expenditure were collected from the Ministries of Finance. Data were disaggregated as follows: government current expenditure - broken down into interest payment on debt (IPD) and other expenditure (OEXP), government capital expenditure disaggregated into natural disaster capital expenditure and non natural disaster spending (NCDE). The key variable which measures the impact of natural disasters is natural disaster capital expenditure. The sample consists of seven ECCU countries: Antigua and Barbuda, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. The data set is annual in frequency and covers the period 1990-2008

(a) The model 1

The goal is to show empirically that natural disasters can force ECCU governments to implement fiscal policies that are procyclical. Regarding the cyclical conditions variable, some authors use measures of growth instead of output. This study however measures growth. The analysis utilizes panel data from 1990-2008 to estimate the following simple model that was suggested by Fatas and Mihov (2005) and Lane (2002):

$$\Delta \log GOV_{EXP_{it}} = \alpha_1 + \beta_1 \Delta \log GDP_{1it} + v_{it} \quad (1)$$

This test examines the response of the rate of change of expenditures (G_{it}) to the rate of growth of output (GDP_{it}). The coefficient β_{it} serves as the measure of fiscal cyclicity of public spending. It measures the elasticity of government expenditure with respect to output growth. The degree of cyclicity of the fiscal variable is usually determined by looking at the sign and size of the coefficient β . A positive value of β implies procyclical behaviour; a value above unity implies a more-than-proportionate response to fluctuations in disaster spending.

(b) The model 2

Model 2 examines the response of the rate of change in natural disaster capital expenditure to rate of change in the underlining fiscal variables. Given that there is no single definition of fiscal policy in the existing literature on fiscal debt sustainability, this study

regresses five fiscal variables on natural disaster expenditure. To estimate the impact of these variables on natural disaster expenditure growth, the study estimates the following regressions:

$$OFB_{s,t} = \alpha_0 + \alpha_1 \Delta \log NDCE_{s,t} + \varepsilon_{s,t} \quad (2)$$

$$LOGGOV_{EXP_{s,t}} = \beta_0 + \beta_1 \Delta \log NDCE_{s,t} + v_{s,t} \quad (3)$$

$$GDP_{s,t} = \gamma_0 + \gamma_1 \Delta \log NDCE_{s,t} + z_{s,t} \quad (4)$$

$$INTP_{s,t} = \delta_0 + \delta_1 \Delta \log NDCE_{s,t} + w_{s,t} \quad (5)$$

$$LOGDEBT_{s,t} = \varphi_0 + \varphi_1 \Delta \log NDCE_{s,t} + \omega_{s,t} \quad (6)$$

where OFB is the fiscal balance over nominal gross domestic product, GDP is real GDP growth rate, INTP is interest payments on public sector debt, NDCE is natural disaster capital expenditure, GOV_EXP represents government expenditure and IMP is the percentage change in imports. These variables are included since they affect the state of the economy and more importantly because they contribute significantly to public sector debt. The coefficient β is the parameter of interest which reflects the procyclicality of government expenditure; it measures the elasticity of government expenditure with respect to output. Equations (1-6) are estimated by ordinary least squares, with a correction for first-order.

3.3 Results

This section reports the estimates of the fiscal rule embodied in equations (1-6) for the sample of seven (7) ECCU States. The results of model (2) are presented in Table 1A and 2B. Table 1A reports consolidated estimates for the entire Union as a unit, whereas Table 2A reports the estimates for each individual State. The results of Table 1A show that GDP, INTP and DEBT are much more important in explaining procyclicality in natural disaster expenditure than (GOV_EXP) government spending and the overall fiscal balance (OFB). The empirical results thus suggest that natural disaster expenditure can have an impact on debt sustainability and play a role as a procyclical tool.

An application of model one (1) to panel data of the ECCU States over the years 1990-2008 yields coefficient β , 0.291. This indicates that fiscal policy in the ECCU is pro-cyclical. An

additional characteristic of ECCU States that might bias pro-cyclicality of fiscal policy upwards is natural disaster expenditure. As was mentioned in Section 5, ECCU States are affected each year by natural hazards and disasters. These events absorb much of government revenue to support mitigation and rehabilitation efforts such as rebuilding and constructing roads, bridges, sea walls and buildings. Such expenditure creates a spurious correlation between fiscal policy and output, thus shocking the growth path. This effect, that is, the effect of natural disasters capital expenditure on fiscal variables is estimated in model 2.

In model 2, the average cyclicity across states for coefficients OFB and GOV_EXP are 0.19 and 0.29 respectively, as reported in Table 1A. These variables are positive and significant, pointing to a procyclical reaction of fiscal policy. The coefficients GDP, INTP and DEBT are negative and highly significant pointing to a counter cyclical policy reaction of these variables to natural disasters expenditure and by extension environmental shocks.

Table 2A shows the volatility of natural disaster expenditure in that it varies across ECCU States. This table presents the results of the regression of equation (2-6), where variables are regressed one by one to each State. The dependent variable is $\Delta NDCE$ and the regressions also include a constant, which is not reported. Across States, the beta coefficient of OFB is negative in ANU (-2.95), GRN (-3.89), SKB (-8.74) and SVD (-2.13). These values indicate that states, on average, run counter cyclical policies, decreasing the overall fiscal balance when natural disasters capital expenditure decreases. On the other hand, the coefficient OFB is positive for DOM (2.33), MNI (2.07) and SLU (2.55), indicating procyclicality.

The beta coefficient for DEBT is positive in DOM (1.79), GRN (5.88) and SKB (6.94). The values indicate that these states, run procyclical policies, increasing the external debt when natural disasters capital expenditure increases. Across all states the coefficients of fiscal balance and external debt exceeds $\beta = 2.30$. The results provides strong evidence that fiscal balance and debt are mostly affect by natural disaster expenditure The cyclicity pattern of Grenada is similar to those of St. Kitts and Nevis. The pattern of GDP is similar in Montserrat and St. Lucia. The pattern of government spending is the same in all states except Dominica. The results in Table 1A and 2A provide considerable support that natural disaster expenditure determines variations of fiscal policy cyclicity across the ECCU countries. However, it should

be noted that, in general, estimates for the positive and insignificant coefficients should be taken with caution, as they are based on a relatively small number of observations (19).

Table 1A: Cyclical Properties of Natural Disaster Capital Expenditure
Full sample of 7 ECCU countries

Variable	OFB	Log_GOV_EXP	GDP	INTP	Log_DEBT
Coefficient	0.195	0.285	-0.071	-0.113	-0.027
Std. Error	0.091	0.025	0.008	0.019	0.015
t-statistics	-2.072	11.508	-9.292	-5.695	-1.811
Prob.	0.0402	0.000	0.000	0.000	0.073
Mean	-2.966	40.648	875.948	3.071	58.714
Median	-2.824	35.287	761.810	2.904	54.100
St. Dev.	5.0147	17.343	566.918	1.889	25.824
No. of Observations	133	133	133	133	133
No. of Countries in the Sample	7	7	7	7	7

Table 2A: Cyclical Properties of Natural Disaster Capital Expenditure
Variables

Country	Variables				
	OFB (logn)	Log_GOV_EXP (log N)	Log_GDP	INTP	DEBT
ANU	-2.955 (2.823)	0.0840 (0.026)***	0.214 (0.059)***	-0.121 (0.308)	-2.171 (2.373)**
DOM	2.328 (1.89)	-0.013 (0.066)	0.057 (0.016)**	0.199 (0.183)*	1.791 (2.762)
GRN	-3.892 (1.849)***	0.037 (0.045)	0.061 (0.015)***	-0.001 (0.083)	5.880 (1.39)***
MNI	2.067 (1.896)	0.440 (0.043)***	-0.0128 (0.003)***	-0.007 (0.009)	N/A
SKB	-8.736 (1.811)***	0.331 (0.071)***	0.097 (0.061)	0.579 (0.334)*	6.944 (5.158)
SLU	2.549 (1.625)	0.076 (0.045)	-0.005 (0.018)**	0.335 (0.089)**	-3.227 (1.023205)**

SVD	-2.133 (1.443)	0.090 (0.047)*	0.044 (0.061)	0.006 (0.212)	-1.249 (2.523)
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T-statistics marked ***, **, * denotes significance at 1, 5, 10 percent levels respectively.

4.0 Implications for Fiscal Policy and Public Sector Indebtedness

Based on this researcher's findings, no ECCU States would be able to finance losses induced by a severe natural disaster without additional external help. The poorest of these seven counties in terms of GDP (Montserrat), would not have financing difficulties mainly because they are colonized by Britain although their natural disaster risk and potential losses are quite large. On the other hand, the other islands - Antigua, Dominica, Grenada, St. Kitts and Nevis, St. Vincent and the Grenadines and St. Lucia would continue to experience financing difficulties because of their geographical location, economic exposure and their volatile revenue based.

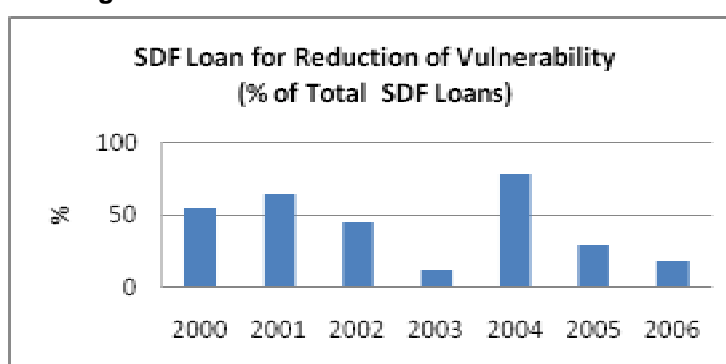
The economic costs of natural disasters and the level of public sector indebtedness associated with natural disaster expenditure can be expected to increase. The region should therefore take a proactive approach towards risk reduction and preparedness, instead of relying on costly reconstruction processes and post-disaster international assistance. This approach could be considerably useful for fostering fiscal sustainability since international assistance will continue to decrease because it places significant pressure on governments and donor spending. In recognizing pressures the World Bank reviewed its policy which is set out in "Laying the ground work for the new paradigm of national disaster management." This document emphasizes the efforts to reduced disaster losses and shift financing from reactive borrowing to more efficient use of cost sharing and risk transfer tools (W.B. 1999).

The World Bank and the Caribbean Development Bank (CDB) have emerged as primary sources of natural disaster funding during the period 1980-2008. The IMF/World Bank provides emergency assistance to member countries with urgent balance of payments financing needs in the wake of natural disasters. The assistance is granted when the IMF is satisfied that the member will cooperate with the Fund in finding solutions to its balance of payments difficulties. Loans usually have to be repaid within 3 to 5 years, this is a relatively short time frame.

In 1974, CDB disbursed its first disaster loan for the rehabilitation of houses damaged by an earthquake to Antigua and Barbuda. By 1997, the bank financed fourteen (14) loans for

disaster rehabilitation, amounting to some \$50.0 mn, to eight (8) of its borrowing member countries. The Special Development Fund is CDB's largest source of concessionary financing that provides soft loans and technical assistance grants to borrowing member countries. Fund under the SDF are disbursed under three (3) priority areas; Capability Enhancement, Reduction of Vulnerability and Good Governance. Natural disaster loans are disbursed under vulnerability reduction, in 2004 vulnerability reduction, accounted for 78% of the SDF programme, this represents the highest disbursement during 2004 (see figure 4.0.1).

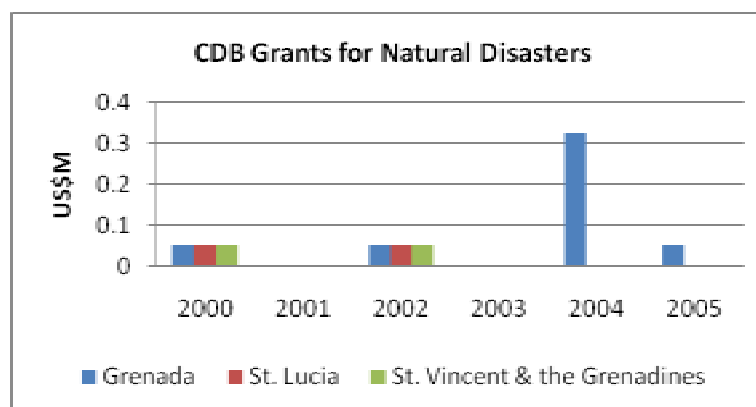
Figure 4.0.1



Source: Caribbean Development Bank

During 2004, an emergency response loan totaling EC\$2,157,000 was approved for Grenada immediately following hurricane Ivan. In 2004 SDF grant financing by the CDB for Grenada represented 30 percent of total SDF grant. (see figure 4.0.2) In addition, a total of US\$12.7 million was committed to Jamaica and Grenada to assist those governments in meeting their fiscal obligations, in order to sustain an economic recovery programme, subsequent to the damage and destruction wrought by hurricane Ivan.

4.0.2



Figure

Source: Caribbean Development Bank

In 2004 one of the most devastating natural disasters “hurricane Ivan” hit the region inflicting significant damage to Grenada. In 2005, Dominica suffered from a severe earthquake. Emergency response loans and grants approved by the CDB during 2005 for the purpose of natural disasters total US\$0.8 million, mitigation loan approved during that year for St. Lucia total US\$0.24m

Over the period 2002-2006 the SDF committed 51.1% of resources or US\$79.7 m to the reduction of vulnerability of deprived groups to economic volatility, natural disasters and other risks that impact on income and well-being. The main areas of focus included immediate response and disaster management.

5.0 Policy Recommendations

Rebuilding can take many years, amplifying fiscal sustainability and causing States productive sectors to become virtually unproductive. In the ECCU States the budgetary impact of extreme weather events (natural disasters and hazards) seems to have had a limited magnitude in terms of GDP but the impact on the sustainability of public finances in the long term is relatively significant. This implies that these events have negative implications for government’s budgetary expenditure.

Given that these countries have to cope, governments need to recognise and prepare for these random shocks. The following measures can be very useful. Early warning systems can be used to effectively reduce the impact on fiscal policy. Furthermore, since financial and insurance markets are underdeveloped and limited in these States, governments could enhance the emergence of these by providing necessary infrastructure and enforcing the building of institutional standards. In addition, governments faced with considerable operational or financial constraints could opt for private sector participation. Fostering cooperation between the public and private sector can essentially ease financial constraints faced by governments.

Prevention measures also include keeping debt levels low. It is therefore crucial that governments plan ahead, as debt and debt service payments may have significant long-term impacts upon the economy. Countries need to analyse systematically the scale of shocks which would make debt “unsustainable” and build them into programmes contingency measures. Thus they should integrate analysis of shocks fully into the proposed long-term debt sustainability framework, thus tailoring the grant allocation and borrowing formulas to absorb borrowing to its vulnerability to shocks. Countries can also establish fiscal contingency reserves, these can be more useful than accumulating foreign exchange reserves, because they would make prevention plans focus on the fiscal impact of shocks.

Even with dramatic improvements in projections and preventive measures and policy adopted, shocks will still occur and ECCU States will remain vulnerable. Therefore, it is clear that policies intended to reduce disaster impacts among countries must take account both what countries can, themselves, do to reduce their vulnerability and of those broader actions that are required by the external institutions (eg. multilateral and bilateral). Multilateral and Bilateral Banks can help ECCU States to manage their Volatility by enhancing these State’s access to international insurance and hedging instruments, both existing and new, increasing access to finances, reducing the level of conditionality imposed on borrowings, revisiting structural adjustment programmes and considering debt sustainability analysis (DSA’s). DSA’s must be tailored for these States, ensuring that they specifically consider the impact of shocks and volatility imposed by unforeseen circumstances such as natural hazards and disasters.

The abovementioned measures can mitigate the effects of natural disasters and hazards shocks as long as they contribute to reducing the procyclicality of fiscal policy.

6.0 Conclusion

As demonstrated in this paper, the risk of natural disasters in the ECCU poses a sizable threat to GDP growth, balance of trade, the public deficit and indebtedness. A number of ECCU States will reach the limit of their ability to finance such unexpected shocks due to low domestic savings, low donor support, small tax base and a limited ability to borrow at favorable conditions. Governments, in the absence of risk financing options will have to access external

capital to fund post-disaster obligations that include providing relief to the poor and those in need, rebuilding infrastructure and rehabilitating the economy.

The issue of increasing foreign borrowing to finance post disaster reconstruction raises important policy issues. Like heavily indebted developing countries, ECCU countries depend on external public borrowings to sustain their socio-economic development programmes. The severity of natural disaster feeds directly into the fiscal accounts and balance of payments causing governments to make major adjustment to their macroeconomic policies. It is the aim of this study to highlight this issue by examining environmental vulnerability and presents the implications of natural disasters indebtedness on fiscal sustainability. The objective of the study was attained by focusing firstly on the main effects of natural hazards – humanitarian effect, depressed economic growth, fiscal effect and the balance of payment effect. The second task was to estimate the impact of financing recovery. This was done by using a procyclical model to estimate the impact.

This study found that when a government is submerged by a sudden need to finance unexpected events they automatically increase public expenditure, leading to larger fiscal deficits. An increase in the public deficit (a flow) would add to the public debt. Reallocation of expenditure is one of the most common ways to cope with the urgent need. This solution provides a rapid source of funding while keeping domestic credit and money supply under control. However, it still diverts funds and thus hampers development. For some countries, aid flows and public debt acquisition may be the only option. However, increased indebtedness is government's last resort. With the influx of capital flow, fiscal policy behaves in a pro-cyclical manner. This policy decision places significant stress on the economy. High exposure to shock augmented by pro-cyclicality augments economic volatility. Higher macroeconomic volatility is closely associated with vulnerabilities. Natural disasters will tend to exacerbate fiscal imbalances since macro policy tend to respond in a pro-cyclical manner. This intensifies the severity of the shock.

For the key findings, the study found that environmental vulnerability leads to fiscal and financial vulnerability since following a natural disaster economic output falls, budget deficit increases and the current account deficits widens. If the shock is large, coping may require

large and costly current account, exchange rate and procyclical fiscal adjustments which, may significantly amplify the effects of the shock. ECCU States have limited ability to obtain financing in adverse times. In the aftermath of crises, they are required to reallocate budgetary resources, increase fiscal deficit, acquire new borrowing, aids and grants or use insurance mechanisms to cope with the urgent need of a post-disaster situation

The qualitative results suggest that fiscal policies react strongly to adverse shocks. The empirical results of the procyclical model indicate that there is procyclicality in government spending across ECCU countries. Thus, this study has provided evidence that natural disasters can pressure policy makers to adopt fiscal policies that are procyclical. These results suggest that there have been misjudgments of fiscal sustainability since environmental shocks and specifically natural disasters caused government to run procyclical policies. These policy decisions have caused natural disasters expenditure to induce systematic bias in determining fiscal sustainability in ECCU states. Therefore appropriate policies must be instituted to accommodate or rectify the fiscal stress created by natural disasters.

Governments must design fiscal management policies to resist the stress caused by the occurrence of disasters. Freeman et al. (2003) consider ways to create the necessary fiscal strategies deal with catastrophic risk. Among various alternatives, Freeman advocates treating natural disasters as a contingent liability for the national government and suggests that the government makes annual budgetary allocations to provide for natural disasters expenditure when needed. A second suggestion is for the government to take catastrophic insurance. The disaster insurance available for ECCU states is provided by the Caribbean Catastrophe Risk Insurance Facility (CCRIF), under the leadership of the World Bank (see World Bank, 2006). This facility acts as a financial intermediary between the participating countries and the international reinsurance market. It allows participating governments in the Caribbean region to purchase insurance that would provide them with immediate assistance after the occurrence of an earthquake or the passing of a hurricane. Payments from this scheme are based on the occurrence or intensity of certain natural phenomenon, as determined by a specialized agency such as the U.S. National Hurricane Center or the U.S. National Earthquake Information Center and not on the estimated cost of the damage suffered.

In conclusion, it is essential to mobilize domestic and foreign resources to ensure prudent macroeconomic management (inflation, reserves, deficit and indebtedness). Prudent macroeconomic management is necessary for a quick and consolidated recovery process.

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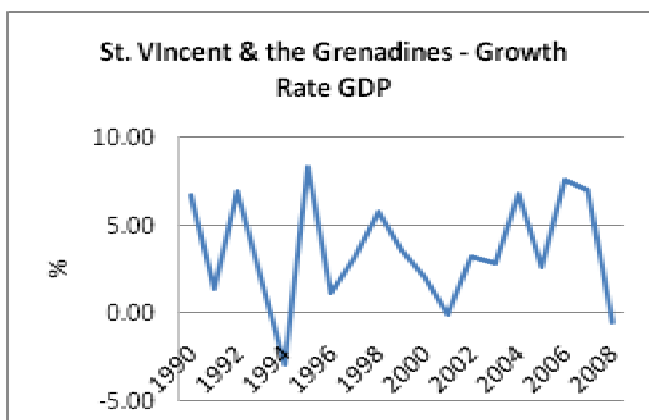
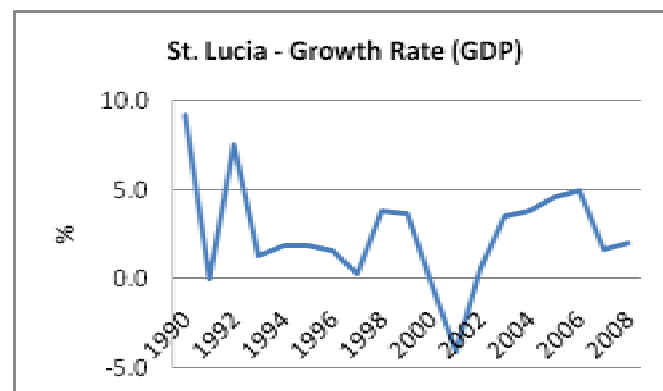
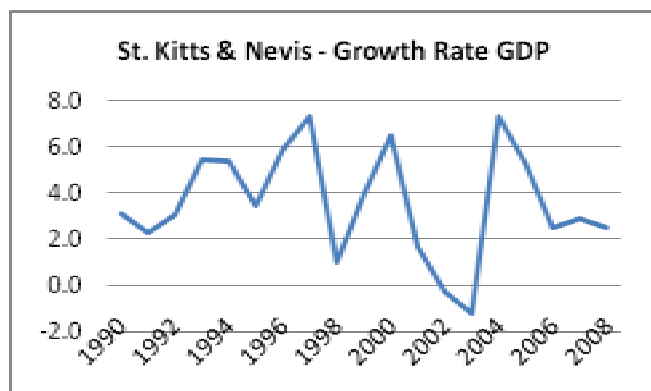
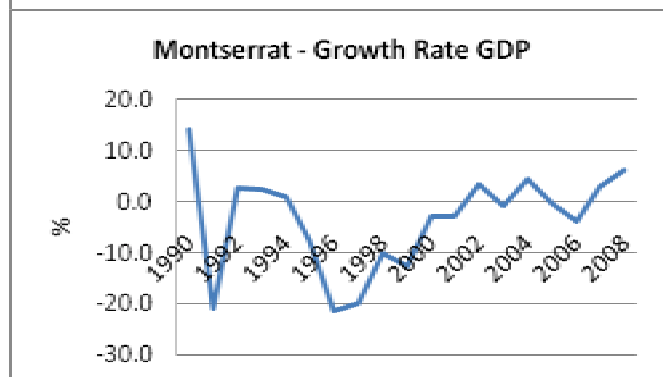
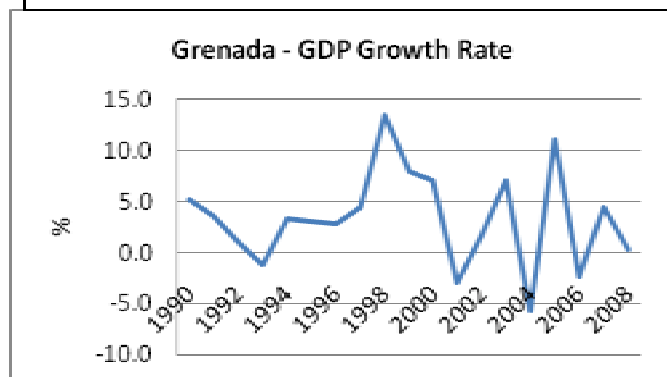
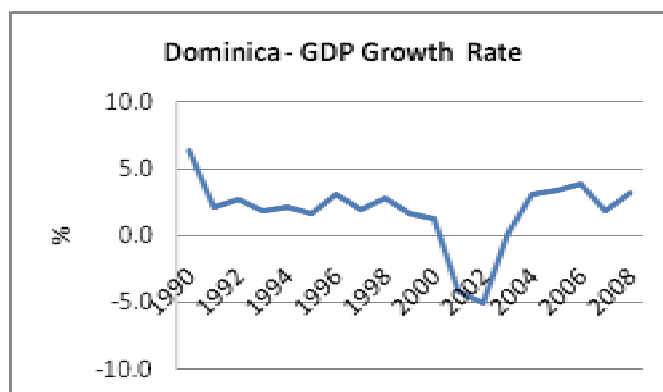
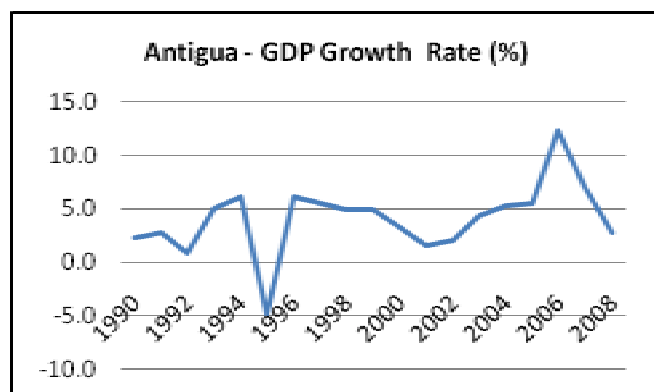
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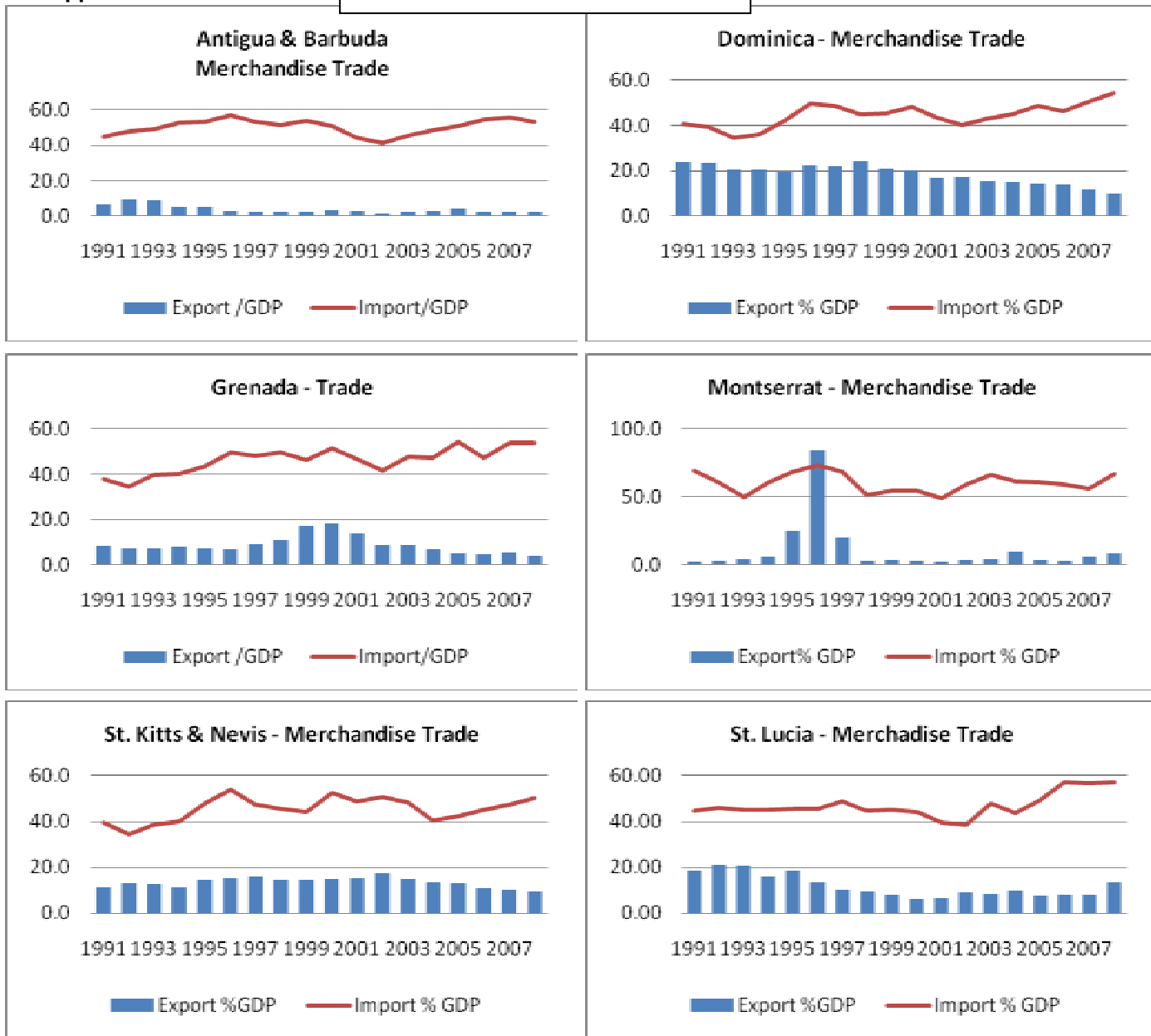
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Appendix A: ECCU Countries GDP Growth Rate 1990-2008



Appendix B: Merchandise Trade

Source: Eastern Caribbean Central Bank



Source: Various Statistical Offices and the Eastern Caribbean Central

