

Vulnerability, Debt and Growth in the Caribbean

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Motivation

The macroeconomic and fiscal framework of the Caribbean countries is characterized by three main stylized facts:

- 1 **High public debt-to-GDP** ratios--among the largest worldwide;
- 2 **Limited fiscal space**, due to rigid expenditures and the fixed costs of being small).
- 3 a **strong dependence on external factors**,

Given the vulnerability to external conditions, fiscal consolidation strategies and debt sustainability analysis should carefully take into account the role of shocks, particularly feedback effects.

Our paper attempts to do just that. We consider that a DSA informs us on impact of alternative policy choices for the future, rather than predicting an outcome. DSA as '**educated guess**'

What is the definition of 'vulnerability'?

- Commonwealth Secretariat: 'for small countries it is structural in nature and not derived from policy choices';
- Shocks from trading partners or commodity prices have a disproportionate impact: 'double whammy'.
- Not fully-insured for natural disasters.
- With essentially fixed exchange rate and pro-cyclical fiscal response, minimal policy buffers are available.
- Consistent with high uncertainty and investment models.

Economic Vulnerability Index in the Caribbean



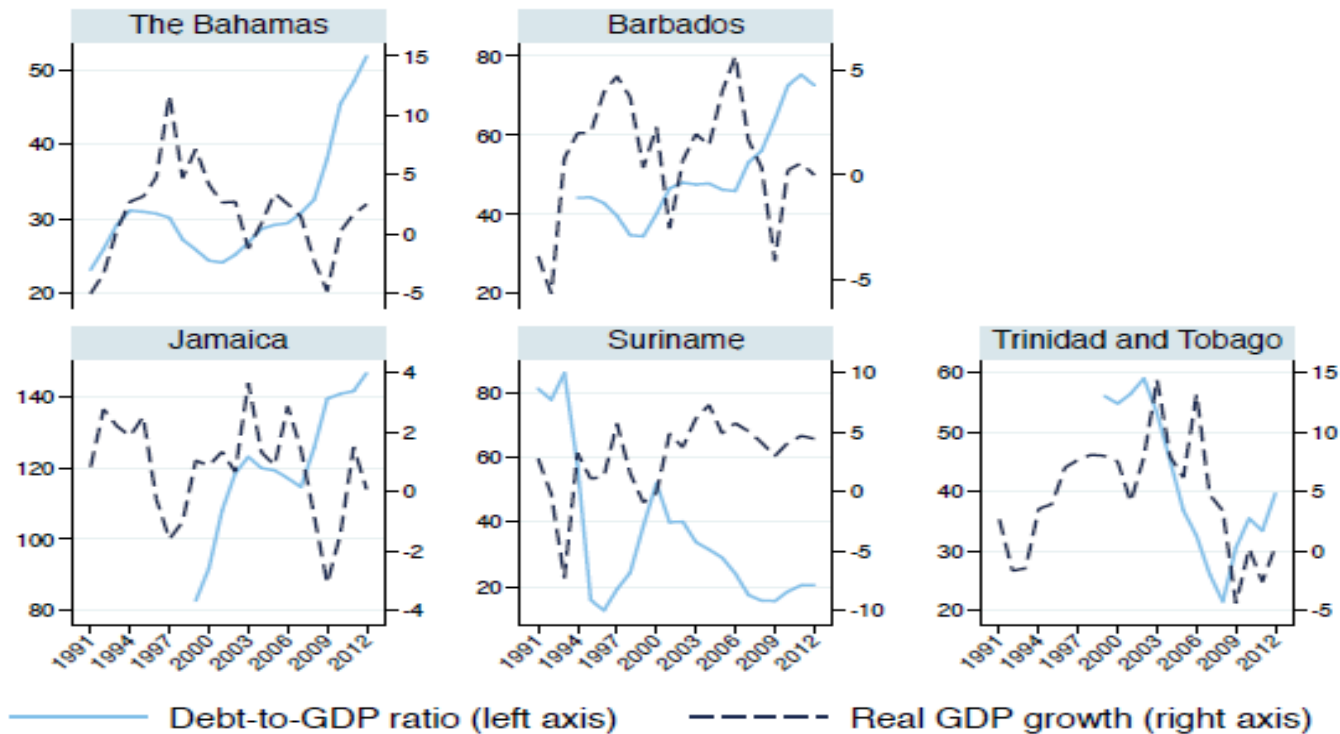
Notes: Source: DESA, United Nations, Geneva. The Economic Vulnerability Index (EVI) is a composite index consisting of seven indicators: population size; remoteness; exports concentration; the share of agriculture, forestry and fisheries in gross domestic product; homelessness owing to natural disasters; instability of agricultural production; and instability of exports of goods and services. For more details, see Guillaumont (2011). The red line is the average EVI for Low-Income Countries.



Vulnerability to external shocks: other channels and additional evidence

- One driver for slower growth in the Caribbean is the projected decline in real commodity prices, implying a drop in the terms of trade and, therefore, a negative shock to income.
- The dependence on mining exports, exogenous shocks were the roots of volatile output growth, fiscal revenue volatility, and high inflation episodes in Suriname during the 1990s (Fritz-Krockow et al. 2009).
- International tourism receipts accounted for 31% (28%) of GDP in Barbados (Bahamas) over the last 15 years, but they are highly volatile.
- Adverse shocks are associated with increasing debt to GDP ratios, worsening high debt-low growth trap (Acevedo 2013).

The trends: GDP growth and public debt in selected Caribbean countries



Notes: Elaboration on WEO database, April 2013.



Debt & growth: correlation, causality and non-linearities

Large public debts are also associated with:

- Higher borrowing costs, especially in times of crisis and global uncertainty, crowding out public investment and expenditures (Jaramillo & Weber 2012);
- A bias towards short-term investment, reducing productivity and human capital accumulation;
- capital flight, worsening the current account and triggering financial crises.

As a result, in emerging and developing economies, more indebted countries **tend to growth slower** (Pattillo et al. 2011; Calderon & Fuentes 2012; Greenidge et al. 2012; Presbitero 2012).

However, the debate on public debt and growth is still ongoing:

1. The **direction of causality is not clear** (Panizza & Presbitero 2013);
2. There is **no robust evidence of threshold effects** (Eberhardt & Presbitero 2013).



IDB Country
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Caribbean

How to include the macroeconomic effects of shocks into the DSA?

To take into account the high volatility of tourist arrivals and commodities price shocks on debt sustainability, we apply an extension of the Fan Chart approach. It is possible that vulnerability to external conditions could jointly increase debt and reduce growth.

The vulnerability to exogenous shocks is not simply modeled by using external ad hoc forecasts, but it is endogenous to the model, since the primary balance becomes stochastic.

Results show a significant increase in the variability of medium-run debt projections compared to the baseline. The DSA endogenizes the effect of shocks on the government.

The Deterministic Approach...

- In the **deterministic approach**: the law of motion of debt (d) depends on the primary surplus ps , interest rates on domestic r_d and foreign r_f debt, exchange rate (e), and GDP growth rate (γ_t):

$$d_t = \left[\alpha \frac{(1 + r_t^d)}{(1 + \gamma_t)} + (1 - \alpha) \frac{(1 + r_t^f)(1 + \Delta e)}{(1 + \gamma_t)} \right] d_{t-1} - ps_t \quad (1)$$

Issues:

- The required fiscal adjustment does not depend on the policy mix: being everything exogenous, no difference in equilibrium condition of a reduction in government expenditures or an increase in taxes.
- Model does not provide any indication of the effect of the fiscal adjustment on aggregate consumption/GDP.
- Variables are assumed to stay close to their historical trends: exogenous shocks can only be modeled along defined fiscal balance path given values of r and g .

The fan chart approach

..is a probabilistic way to assess debt sustainability under a combination of several likely macroeconomic shocks.

- a **stochastic approach**: the coefficients and the variance-covariance matrix from a VAR(p):

$$Y_t = \mu_0 + \sum_{k=1}^p \mu_k Y_{t-k} + \xi_t \quad \text{where} \quad Y_t = (r_t, \gamma_t, ps_t, \pi_t, e_t) \quad \xi \sim N(0, \Omega) \quad (2)$$

The FC aims at estimating a probabilistic distribution of the debt-to-GDP ratio based on the joint distribution of shocks, as provided by a VAR econometric model of the country economy (but could be a set of external forecasts on risk inputs).

The Fan Chart **augmented** model (Andrian and Reyes-Tagle 2011):

- incorporates additional variables (tourism, commodity revenues) to take into account their key role; and assesses the effect of the volatility (shocks) of those variables on the probabilistic debt path.

Augmented fan chart approach: the role of tourism

Government's revenues rely heavily on tourism and so they depend on its volatility and shocks.

- The starting point is the debt equation (1), where primary surplus is defined as:

$$PS_t = REV_t - EXP_t \quad (3)$$

The projections of PS are based on the estimation of:

$$\ln(REV_t) = \beta_0 + \beta_1 \ln(REV_{t-1}) + \beta_2 \ln(GDP_t) + \beta_3 \ln(VISITORS_t) \quad (4)$$

$$\ln(EXP_t) = \gamma_0 + \gamma_1 \ln(EXP_{t-1}) + \gamma_2 \ln(GDP_t) \quad (5)$$

GDP and *VISITORS* are related by a VAR(1) system. This is the augmented model.

- We look at debt dynamics in two scenarios: the baseline model, where equation (4) is replaced by (6), and compare with the augmented model:

$$\ln(REV_t) = \beta_0 + \beta_1 \ln(REV_{t-1}) + \beta_2 \ln(GDP_t) \quad (6)$$

Debt sustainability: the role of tourism in Barbados

- Cycle volatility of GDP, government revenues, and visitors



The diagram reports the cyclical component of the three variables, measured in logs and in real terms. To each series has been applied the Hodrick and Prescott filter (bandwidth: 6.25).

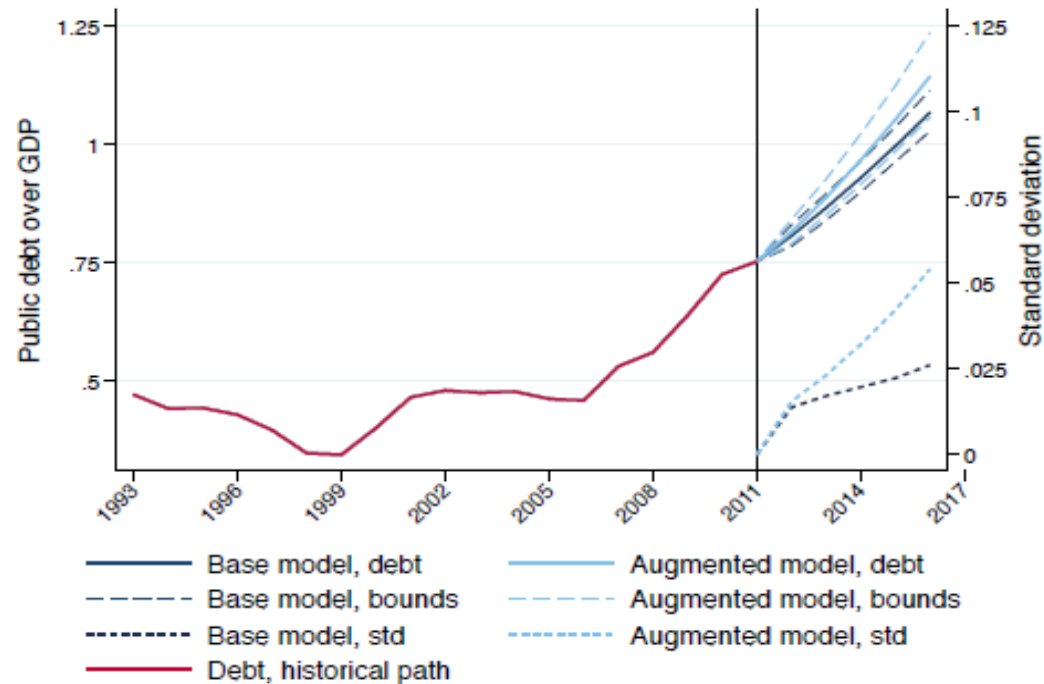
What is the elasticity of revenues to tourism arrivals in Barbados?

	Dependent variable:		
	EXP_t eq (5)	REV_t eq (6)	REV_t eq (4)
Constant	-0.807*** (0.166)	-0.418*** (0.134)	-5.985*** (2.245)
REV_{t-1}		0.605*** (0.119)	0.536*** (0.113)
GDP_t	1.543*** (0.313)	0.755*** (0.238)	0.292 (0.287)
$VISITORS_t$			0.417** (0.168)
EXP_{t-1}	0.240 (0.151)		

Notes: Estimation on the period 1981-2011. IMF WEO and National Authorities data. * significant at 10%; ** significant at 5%; *** significant at 1%. The coefficients are elasticities.

Which then yields the augmented fan chart

Baseline and model augmented with total visitors in Barbados



Notes: The Fan Chart reports the central path of the debt-to-GDP ratio and the 5th and 95th percentile of the simulated distributions under the baseline and the augmented models. The dotted lines represent the standard deviation of the projections.

Augmented fan Chart Approach: the role of commodity shocks

Government's revenues rely heavily on minerals and therefore inherit their volatility and shocks.

- The starting point is the debt equation (1), where primary surplus is Modified as follows:

$$PS_t = NONMIN REV_t + MIN REV_t - EXP_t \quad (7)$$

$$\ln(NONMIN REV_t) = \beta_0 + \beta_1 \ln(NONMIN REV_{t-1}) + \beta_2 \ln(GDP_t) \quad (8)$$

$$\ln(MIN REV_t) = \beta_3 + \beta_4 \ln(MIN REV_{t-1}) + \beta_5 \ln(OIL) \quad (9)$$

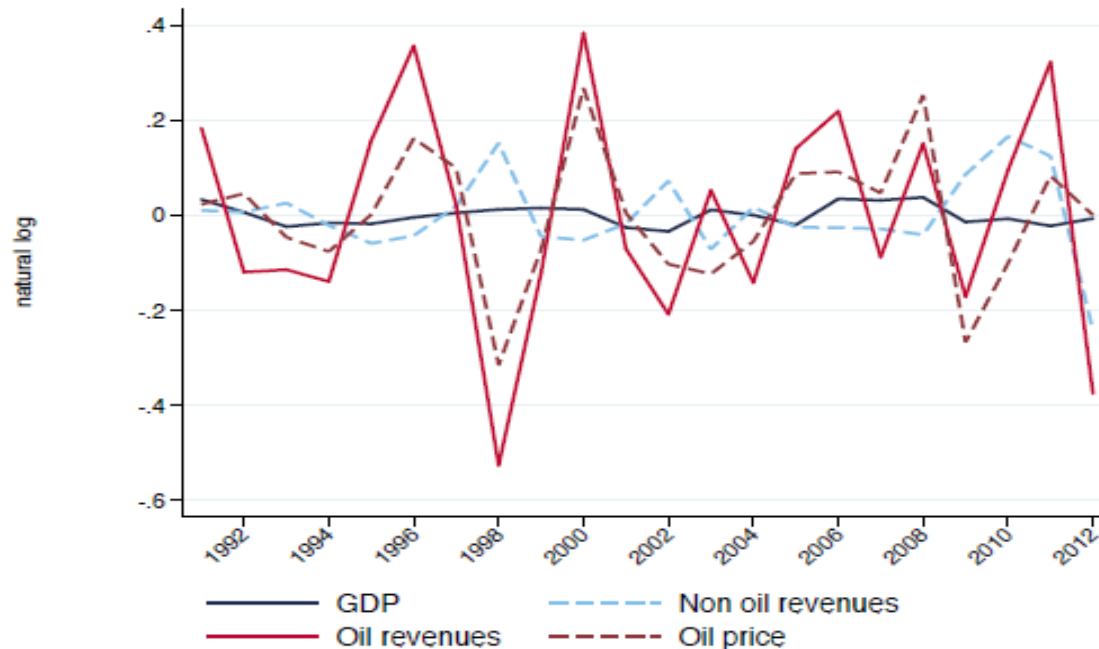
$$\ln(EXP_t) = \gamma_0 + \gamma_1 \ln(EXP_{t-1}) + \gamma_2 \ln(GDP_t) \quad (10)$$

GDP and *OIL* are related by a VAR(1) system. The baseline model is just equations (8) and (9) replaced by:

$$\ln(REV_t) = \beta_6 + \beta_7 \ln(REV_{t-1}) + \beta_8 \ln(GDP_t) \quad (11)$$

What is the role of revenues in Trinidad and Tobago?

Cycle volatility of GDP, oil and non-oil government revenues, and oil prices



The diagram reports the cyclical component of the four variables, measured in logs and in real terms. To each series has been applied the Hodrick and Prescott filter (bandwidth: 6.25).

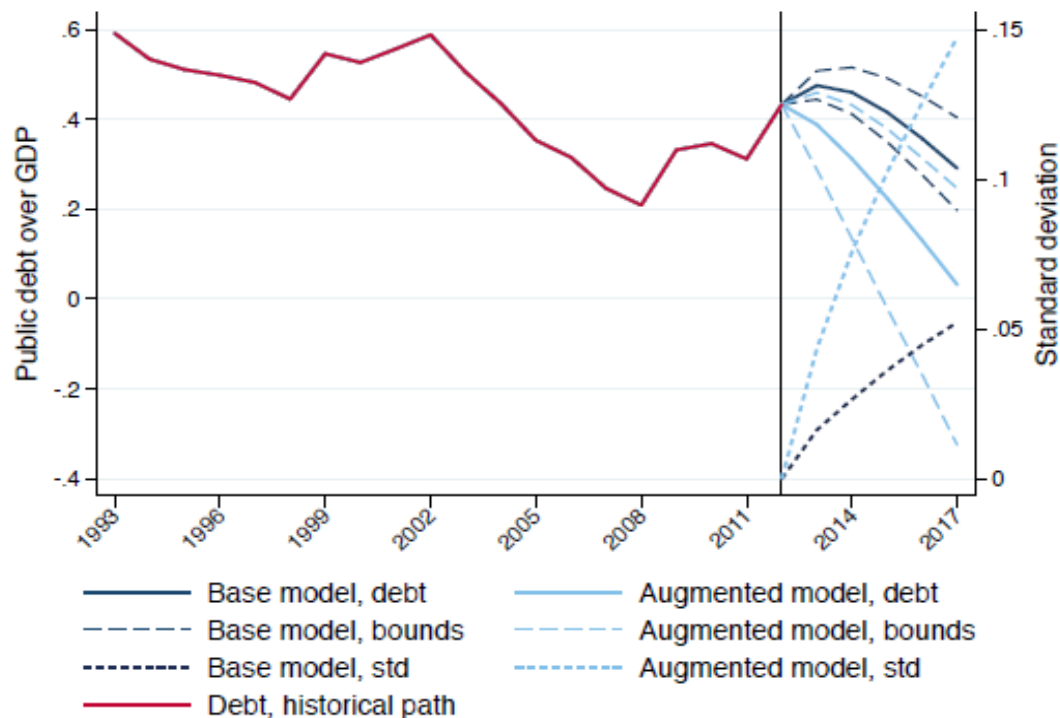
With a positive and significant elasticity of mineral revenue to oil prices in Trinidad and Tobago.

	Dependent variable:			
	EXP_t eq (10)	REV_t eq(11)	$NONMIN REV_t$ eq (8)	$MIN REV_t$ eq (9)
Constant	-1.057** (0.492)	-1.453*** (0.418)	-0.549 (0.317)	-2.967*** (0.598)
REV_{t-1}		0.384** (0.153)		
GDP_t	0.545** (0.216)	0.784*** (0.197)	0.487** (0.179)	
$NONMIN REV_{t-1}$			0.396* (0.207)	
$MIN REV_{t-1}$				0.057 (0.170)
$OIL PRICE_t$				1.100*** (0.202)
EXP_{t-1}	0.563*** (0.178)			

Notes: Estimation on the period 1991-2011. IMF WEO and National Authorities data. * significant at 10%; ** significant at 5%; *** significant at 1%. The coefficients are elasticities.

Which create important debt dynamics

Baseline and augmented model with mineral revenues and oil prices



Notes: The Fan Chart reports the central path of the debt-to-GDP ratio and the 5th and 95th percentile of the simulated distributions under the baseline and the augmented models. The dotted lines represent the standard deviation of the projections.

Conclusions

There is a much higher uncertainty about range of outcomes in Caribbean countries' DSA.

Vulnerability to shocks requires the creation of adequate buffers, as fiscal consolidation and debt reduction will increase the resilience to external shocks.

- The effect of fiscal consolidation depends on the size of fiscal multipliers: Multipliers may be small in developing, open and high-indebted countries (Ilzetzki et al. 2013; Kraay 2012; Guy & Belgrave 2012; Harrison et al. 2013).

- Three key issues about consolidations are:
 - The timing of the adjustment (it may be delayed during recessions).
 - The credibility and sustainability of the policy.
 - The choice between tax increase vs expenditure cuts and the identification of unproductive public expenditures.



Thank you