



# EASTERN CARIBBEAN CURRENCY UNION

## SELECTED ISSUES

July 2022

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# EASTERN CARIBBEAN CURRENCY UNION

## SELECTED ISSUES

July 8, 2022

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## CONTENTS

<b>SCARRING EFFECTS OF THE PANDEMIC ON THE ECCU</b>	<b>3</b>
A. Introduction	3
B. Output Losses and Economic Structure	4
C. Fiscal Legacies from COVID	7
D. Conclusions	10
References	11
Data Description	12

### TABLES

1. Annual Real GDP Losses	5
2. Cumulative Real GDP Losses Between 2020–22, Health Component	6
3. Regression on Cumulative Real GDP Losses Between 2020–22, Education Component	7
4. Difference in Debt-to-GDP Projections Between January 2022 WEO and October 2019, Sectoral Composition of Output	9
5. Difference in Debt-to-GDP Projections Between January 2022 WEO and October 2019, Fiscal Variables	9
6. Difference in Debt-to-GDP Projections Between January 2022 WEO and October 2019, Other Economic Support Variables	10

**FISCAL RULES IN DISASTER-PRONE COUNTRIES: IMPLICATIONS FOR THE ECCU** \_ 14

A. Introduction	14
B. On the Incidence and Impact of Natural Disasters in the ECCU	15
C. Experience of Rule-Based Fiscal Responsibility Frameworks in the ECCU	18
D. Principles and Considerations for the Adoption of Fiscal Rules	20
E. Implications of Natural Disasters for Fiscal Rules in the ECCU	23
F. Conclusion	28
References	30

**BOXES**

1. Rule-Based Fiscal Responsibility Frameworks: The Experience in Grenada	20
2. Fiscal Rules in Small States	22

**FIGURES**

1. Deficit and Debt Paths: An Illustration for Grenada	24
2. Relative Performance of Fiscal Rules	27
3. Impulse Responses for Various Shocks: Grenada	29

**TABLE**

1. Summary of Fiscal Responsibility Frameworks Across the Members	19
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**ANNEXES**

I. Country Experiences with Fiscal Rules/FRFs and Disaster Resilience	32
II. Debt Fanchart and Operational Target Templates	36
III. Description of the Stochastic Simulation Methodology with GIMF	38

# SCARRING EFFECTS OF THE PANDEMIC ON THE ECCU<sup>1</sup>

## A. Introduction

**1. Large contractions in output could generate a protracted economic recovery.** When the economic damages to the factors of production originated by recessions, or more generally by a shock, preclude economies from recovering to their pre-shock trend, we say the shock generates scarring effects, also called hysteresis.

**2. The COVID-19 shock, temporary in principle, would likely have long-term economic repercussions.** The transmission channels, many still to be understood and discovered, have revealed the interaction of supply and demand factors.<sup>2</sup> The pandemic was peculiar in the sense that the fate of the virus itself produced a negative feedback loop on the behavior of consumers and producers alike, thus revealing the importance of beliefs and uncertainty, more generally, in affecting the transmission channels.<sup>3</sup> The economic effects would also differ across countries.

**3. This chapter adds to recent studies seeking to understand the potential long-term effects of COVID-19.**<sup>4</sup> Most of the studies report that the potential for medium-term scarring from the pandemic appears related to the interplay of four elements: (1) the future path of the pandemic and associated containment measures; (2) the heavier impact of the pandemic shock on high-contact sectors and its sectoral spillovers; (3) the capability of businesses and workers to adapt to a lower-contact working environment and lower-contact transactions; and (4) the effectiveness of the policy response to limit economic damage.

**4. Assessing the extent of the scarring effects is essential for the conduct of future economic policy in the ECCU.** A better understanding of the factors affecting the scarring effects and their fiscal implications could help inform the discussions on policies needed to overcome them, especially for economies with limited economic diversification and high vulnerability to frequent shocks and natural disasters such as the ECCU countries. In this context, this chapter seeks to shed some light on answering the following two sets of questions:

- How is the pandemic-related downturn different from previous downturns? How does the ECCU compare to other regions? Which economic features of ECCU countries are related to the output losses observed during the pandemic?
- What are the fiscal implications of the pandemic in terms of fiscal space and debt dynamics in ECCU countries?

<sup>1</sup> Prepared by Isabela Duarte, Roberto Garcia-Saltos, Salma Khalid, and Beatriz Nunes.

<sup>2</sup> See IMF (2021a) for a primer on the potential channels of transmission of COVID-19 and references there.

<sup>3</sup> See, for instance, Kozłowski and others (2020).

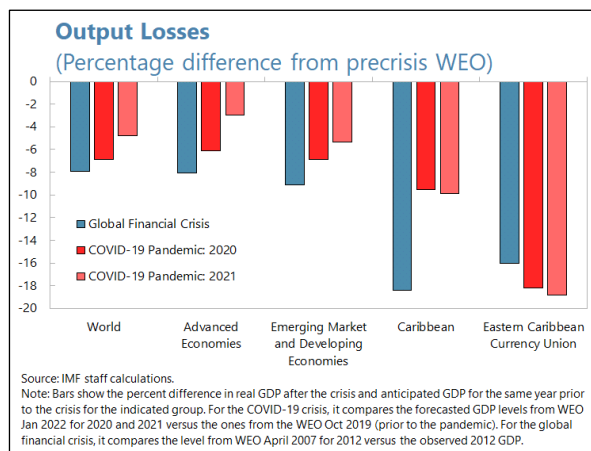
<sup>4</sup> See Tervala (2021), Cerra and others (2020), and Filipini and Levy-Yeyati (2022).

## B. Output Losses and Economic Structure

### 5. Output losses in the ECCU countries during the pandemic have been large.

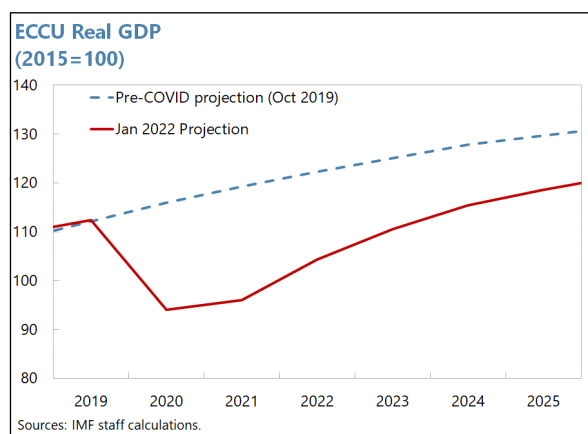
To contextualize the magnitude of the pandemic-related downturn, we used forecast revisions across WEO vintages before, during, and after a particular period to measure the extent of the unexpected losses. The comparison period used is 2008–12 because of the downturn

synchronization across economies and the global nature of the financial crisis, features that were prominent during 2020–21.<sup>5</sup> For the ECCU countries, the forecast revisions were sizeable, during both the global financial crisis (GFC) and the ongoing pandemic, but pandemic losses outstripped losses from the GFC in the first year of the pandemic and increased as the pandemic evolved in the subsequent year. In advanced and emerging market economies, the output revisions were more prominent in the GFC than in COVID-19, and the forecast revisions in advanced and emerging market economies in the second year of the pandemic were lower than in the first year, indicating an earlier recovery than in the ECCU region.<sup>6</sup>



### 6. The significant output contraction would generate scarring effects in the ECCU countries.

Using the January 2022 WEO forecast, real GDP for ECCU was estimated to reach the 2019 level only in 2024 and remain below its pre-pandemic projected path throughout the forecasting horizon. In advanced economies, such a pattern was not present.<sup>7</sup> A way to distinguish the nature of the output contraction during the pandemic across countries is to compute the correlation between the forecast revisions, what we call output losses, and initial conditions –



measured by the pre-pandemic levels of GDP per capita. Interestingly, during the first year of the pandemic, such correlation was positive, although small, showing a fast spread of the virus to more affluent countries, which affected beliefs and distorted investment opportunities.

<sup>5</sup> The analysis in this chapter ignores forecasts post January 2022 and does not consider the effects of the war in Ukraine.

<sup>6</sup> In general, the forecast revisions could be influenced by various factors, including the degree of forecasts' accuracy.

<sup>7</sup> See also IMF (2022).

## 7. The degree of scarring could vary with countries' economic structure and policy responses to the pandemic.

We conduct a simple regression analysis covering 115 countries of estimates of output losses during 2020–22. We analyze the relationship between output losses and variables relevant for the ECCU countries, such as the share of tourism in GDP, the degree of economic complexity embedded in countries' exports, and the extent of the lockdowns in response to the pandemic. We also control for the initial level of GDP per capita.

- We use the share of tourism in GDP and the percentage of the rural population to represent the extent of contact-intensive sectors. The tourism share is significant. Countries more reliant on tourism were more affected by the pandemic during 2020–22. The percentage of the rural population is significant but changes sign from negative in 2020 to positive in 2022, perhaps reflecting how the virus propagated initially to countries with large urban areas and then expanded to affect all countries and sectors.
- Similarly, economic complexity captured by a measure of the knowledge embedded in the products a country produces is significant in the regression of output losses. The interesting observation is its negative sign, which indicates that countries making more complex products were more resilient to the pandemic.
- As expected, the lockdown stringency variable is positive and significant.

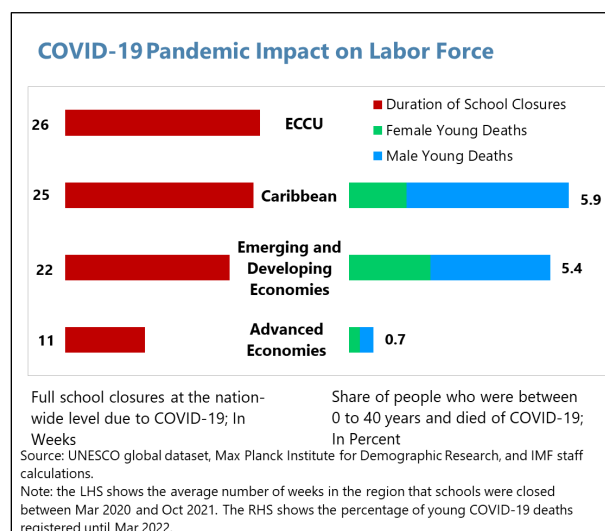
**Table 1. Annual Real GDP Losses**  
(In percentage points)

	2020	2021	2022
Log (GDP Per Capita)	-1.838 (1.443)	0.311 (0.780)	-0.0131 (0.844)
Rural Population	<b>-0.134**</b> (0.0573)	0.0429 (0.0312)	<b>0.0774**</b> (0.0344)
Lockdown Stringency Index	<b>0.209***</b> (0.0790)	<b>0.0834*</b> (0.0423)	0.0609 (0.0458)
Complexity Index	-0.874 (1.162)	<b>-1.536**</b> (0.622)	<b>-1.519**</b> (0.667)
Tourism Share of GDP	<b>0.530*</b> (0.299)	<b>0.423**</b> (0.163)	<b>0.389**</b> (0.175)
Constant	18.57 (14.20)	-1.417 (7.665)	1.088 (8.284)
Observations	117	116	114
R-squared	0.156	0.218	0.274

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the variables GDP Per Capita, Rural Population and Tourism Share of GDP represent the levels pre-pandemic. Real GDP losses were calculated using differences in several WEO vintages of real GDP projections between January 2022 and October 2019.  
Sources: IMF staff calculations, World Travel & Tourism Council, Harvard's Growth Lab, and World Bank staff estimates.

## 8. For the ECCU, the long-term effects from the pandemic could be significant.

The pandemic impact on the quality of human capital induced by school closures and young death has the potential to bring the biggest negative long-term consequences as those variables have been affected more in ECCU countries than in other regions of the world (see chart).<sup>8</sup> The regression results presented in Tables 2 and 3 show the response of cumulative output losses up to 2022 to explanatory variables representing human capital, either the share of young people (0 to 40 years old) that died from COVID-19 or the number of weeks of full school closures. Both variables are significant on most of the specifications, after controlling by the population median age, the pre-pandemic share of expenditure in health or education, the lockdown stringency, and others.



**Table 2. Cumulative Real GDP Losses Between 2020–22, Health Component**  
 (In percentage points)

Log (GDP Per Capita)	-0.323 (0.678)	-0.458 (0.845)	-0.961 (0.852)
Young Deaths	<b>0.345*</b> (0.177)	<b>0.392*</b> (0.211)	0.290 (0.209)
Share of Expenditure in Health		-0.0185 (0.127)	-0.0446 (0.123)
Population Median Age		0.0455 (0.0999)	0.0843 (0.0986)
Lockdown Stringency Index			<b>0.142**</b> (0.0586)
Constant	8.080 (7.189)	7.930 (7.443)	3.940 (7.416)
Observations	67	66	65
R-squared	0.138	0.139	0.218

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the variables GDP per capita, Expenditure in Health and median age of the population represent the levels pre-pandemic. Cumulative real GDP losses were calculated using the difference in two WEO vintages of real GDP projections, January 2022, and October 2019. ECCU countries are not included in this regression.

Sources: IMF staff calculations, World Bank staff estimates, Max Planck Institute for Demographic Research, World Health Organization Global Health Expenditure database, and University of Oxford.

<sup>8</sup> See IMF (2022) for simulations about long-lasting impacts on the labor force for the G20 countries.

**Table 3. Regression on Cumulative Real GDP Losses Between 2020–22, Education Component**  
(In percentage points)

Log (GDP Per Capita)	-0.451 (0.353)	-0.349 (0.388)	<b>-0.709*</b> (0.375)	<b>-0.738**</b> (0.367)
Weeks of full school closures	<b>0.116***</b> (0.0286)	<b>0.143***</b> (0.0285)	<b>0.0892***</b> (0.0324)	<b>0.0799**</b> (0.0319)
Share of Expenditure in Education		-0.0387 (0.0907)	0.0108 (0.0828)	0.0352 (0.0815)
Lockdown Stringency Index			<b>0.105**</b> (0.0430)	<b>0.120***</b> (0.0425)
Weeks of full school closures_ECCU				<b>0.381**</b> (0.152)
Constant	9.652*** (3.448)	8.348* (4.232)	5.926 (3.930)	5.125 (3.856)
Observations	171	126	120	120
R-squared	0.102	0.183	0.240	0.280

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the variables GDP per capita and Expenditure in Education represent the levels pre-pandemic. Cumulative real GDP losses were calculated using the difference in two WEO vintages of real GDP projections, January 2022, and October 2019. ECCU countries are included in this regression.

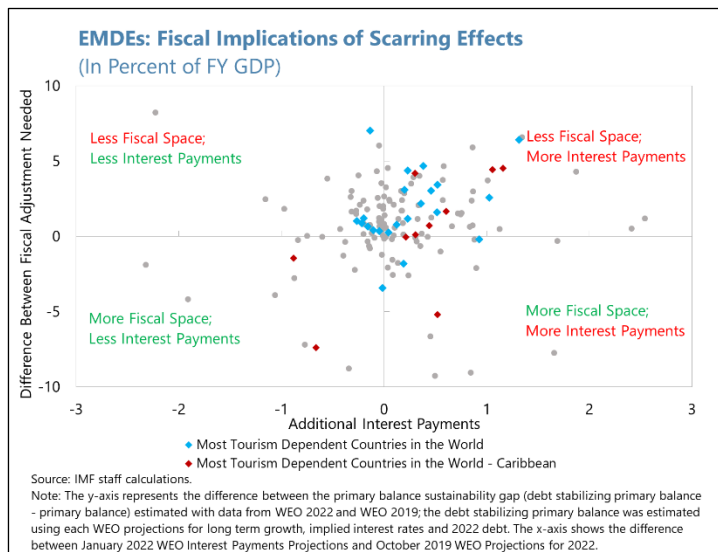
Sources: IMF staff calculations, World Bank staff estimates, University of Oxford, and UNESCO global dataset.

## C. Fiscal Legacies from COVID

**9. Fiscal positions deteriorated significantly in the aftermath of the pandemic.** Sharp curtailment of economic activity at the onset of the COVID-19 pandemic eroded public sector tax receipts and weakened the tax base. Meanwhile, spending needs rose to accommodate larger health budgets for pandemic containment and enhanced social assistance programs for household and business support during lockdowns. The economic shock was amplified in tourism-dependent economies as pandemic-related health concerns and mobility restrictions halted cross-border travel. The erosion of fiscal flows accelerated debt accumulation, exacerbating debt-to-GDP ratios that were already elevated from significant output losses.

**10. Governments deviated further from their long-run fiscal targets and carried larger debt service burdens.**

While we do not find a significant difference between post-pandemic and pre-pandemic estimates of the long run debt stabilizing primary balance, fiscal deterioration in the near term has increased the gap between the current primary balance and the debt stabilizing primary balance for many countries. This implies more fiscal effort to return to the debt-stabilizing trajectory and limited fiscal space to cushion the





impact of additional shocks. The larger debt burden relative to output also translates into more revenue share being allocated towards interest payments on debt. Moreover, as financial conditions tighten, the cost of rolling over commercial debt is expected to rise further. This is the case for most tourism-dependent countries in the Caribbean, which are seeing a reduction in the space available for fiscally sustainable spending in public goods of high societal value such as investment in climate resilient infrastructure, targeted social spending, and the buildup of fiscal buffers against natural disasters.

**11. The pandemic brought tourism-dependent economies further away from their pre-pandemic debt trajectories.** Cumulative output losses from COVID are a strong predictor of the worsening of debt as a percent of GDP. However, even after accounting for output losses, countries that lie in the top quartile of tourism contribution to GDP have higher debt accumulation than countries that are not as dependent on tourism (Table 4). Consequently, tourism-dependent economies are experiencing a dual shock of larger output losses exacerbating their debt-to-GDP ratios, and more debt accumulation that is not directly attributable to output losses.

**12. Debt accumulation during the pandemic is positively correlated with credit access.** This is because higher initial debt levels pre-COVID correlate with higher debt accumulation, and higher average borrowing costs pre-COVID (measured as average nominal interest rate on debt) are correlated with lower debt accumulation during the pandemic period (Table 4). Hence, only countries with pre-existing access to financing streams could avail themselves of the favorable global liquidity conditions that existed at the height of the pandemic. In this regard, we find that while the average cost of borrowing is not lower in the most tourism-dependent countries relative to the rest of the sample, they did enter the pandemic with already higher levels of debt, which may have also contributed to their deteriorating debt dynamics during the pandemic.

**13. Higher pandemic spending is correlated with higher debt accumulation, for all countries in the sample (Table 5).** However, the most tourism-dependent economies had higher average levels of fiscal expenditures to combat the pandemic, as a percent of GDP, resulting in greater overall debt accumulation.<sup>9</sup> Using alternate indices of economic support,<sup>10</sup> which combine domestic government measures and foreign aid measures, on an annual basis, we find that the disparity between debt accumulation because of fiscal support between tourism-dependent economies and other economies is largest in 2020, at the height of the pandemic, persisting into 2021 as tourism-dependent economies continue to suffer from repeated pandemic waves and re-emergence of travel restrictions, and weakening in 2022 as tourism revival strengthened (Table 6). Hence, the link between economic support and debt accumulation appears stronger in tourism-dependent economies, not only in terms of the direct correlation between the provision of economic support and debt accumulation but also because the level of economic support is more significant. To the extent that tourism-dependent countries are small, open economies with greater

<sup>9</sup> See Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic.

<sup>10</sup> Such as the Oxford University Economic Support Index.

import dependence, this larger debt accumulation may also be partially attributable to smaller fiscal multipliers and greater leakages to imports and international goods.

**Table 4. Difference in Debt-to-GDP Projections Between January 2022 WEO and October 2019, Sectoral Composition of Output**

(In percentage points)

Log (GDP Per Capita)	-0.285 (1.229)	0.0628 (1.209)	0.0608 (1.197)	0.596 (0.864)
Lockdown Stringency Index	0.0709 (0.0907)	0.0247 (0.0906)	0.0338 (0.0895)	
Complexity Index	1.121 (1.322)	1.653 (1.310)	1.594 (1.290)	
Tourism Share of GDP	<b>0.796**</b> (0.346)	0.505 (0.358)		
Cumulative Output Losses 2020-22		<b>0.598**</b> (0.243)	<b>0.578**</b> (0.236)	<b>0.595***</b> (0.222)
I(Top Quartile of Tourism GDP=1)			<b>5.445**</b> (2.628)	<b>4.854*</b> (2.592)
Log (Debt in 2019)				<b>3.033*</b> (1.564)
Log (Average Nominal Interest Rate on Debt)				<b>-1.897*</b> (1.143)
Constant	4.951 (10.26)	0.388 (10.19)	1.490 (10.09)	-8.263 (10.67)
Observations	112	112	112	112
R-squared	0.070	0.121	0.139	0.175

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the variables GDP per capita, median age of the population and tourism share of GDP represent the levels pre-pandemic.

Sources: IMF staff calculations, World Travel & Tourism Council, Harvard's Growth Lab, University of Oxford, and World Bank staff estimates.

**Table 5. Difference in Debt-to-GDP Projections Between January 2022 WEO and October 2019, Fiscal Variables**

(In percentage points)

Log (GDP Per Capita)	0.384 (1.297)	-0.311 (0.930)	-0.555 (0.876)	-0.531 (0.856)
I(Top Quartile of Tourism GDP=1)	-27.11 (24.55)	1.476 (3.633)	1.772 (3.877)	2.232 (3.418)
Log (Covid Cases as percent of population)	0.357 (0.758)			
Top Quartile of Tourism * Log (Covid Cases)	2.753 (2.113)			
Cumulative Output Losses 2020-22	<b>0.580**</b> (0.223)	<b>0.567**</b> (0.217)	<b>0.759***</b> (0.214)	<b>0.795***</b> (0.213)
Log (Debt in 2019)	2.575 (1.597)	1.569 (1.606)	1.564 (1.526)	1.255 (1.516)
Fiscal Spending on Covid – above/below the line (percent of GDP)		<b>0.249**</b> (0.111)		
Top Quartile of Tourism * Fiscal Spending above/below		0.270 (0.221)		
Fiscal Spending on Covid – above the line			<b>0.770***</b> (0.221)	
Top Quartile of Tourism * Fiscal Spending above			0.225 (0.417)	
Fiscal Spending on Covid – Non-health				<b>0.909***</b> (0.249)
Top Quartile of Tourism * Fiscal Spending Non-health				0.266 (0.441)
Fiscal Spending on Covid – Health				
Top Quartile of Tourism * Fiscal Spending Health				
Constant	-10.56 (10.46)	1.508 (11.19)	0.922 (10.29)	1.950 (10.18)
Observations	112	112	112	112
R-squared	0.171	0.233	0.274	0.289

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the variables GDP per capita, median age of the population and tourism share of GDP represent the levels pre-pandemic.

Sources: IMF staff calculations, World Travel & Tourism Council, Harvard's Growth Lab, University of Oxford, and World Bank staff estimates.

**Table 6. Difference in Debt-to-GDP Projections Between January 2022 WEO and October 2019, Other Economic Support Variables**  
(In percentage points)

Log (GDP Per Capita)	0.859 (0.918)	0.735 (0.904)	0.834 (0.871)
I(Top Quartile of Tourism GDP=1)	<b>-72.93**</b> (33.62)	-30.66 (20.27)	2.002 (3.179)
Log (Economic Support Index 2020)	-0.239 (0.772)		
Top Quartile of Tourism * Log(Economic Support 2020)	<b>18.13**</b> (7.819)		
Cumulative Output Losses 2020-22	<b>0.593***</b> (0.224)	<b>0.586**</b> (0.228)	<b>0.586**</b> (0.226)
Log (Debt in 2019)	2.609 (1.576)	2.559 (1.615)	2.734* (1.591)
Log (Economic Support Index 2021)		0.108 (0.640)	
Top Quartile of Tourism * Log(Economic Support 2021)		<b>8.496*</b> (4.839)	
Log (Economic Support Index 2022)			0.0310 (0.333)
Top Quartile of Tourism * Log(Economic Support 2022)			1.406 (0.852)
Constant	-10.53 (10.31)	-10.44 (10.52)	-11.72 (10.47)
Observations	109	109	109
R-squared	0.193	0.176	0.176

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the variables GDP per capita, median age of the population and tourism share of GDP represent the levels pre-pandemic.

Sources: IMF staff calculations, World Travel & Tourism Council, Harvard's Growth Lab, University of Oxford, and World Bank staff estimates.

## D. Conclusions

**14. The pandemic has inflicted large output losses in the ECCU that would generate scarring effects.** Countries with significant importance of high-contact sectors, such as tourism, or limited fiscal space to mitigate the pandemic, like the ECCU, are expected to suffer the most. After controlling for restrictions on mobility and other variables, our empirical results show that high tourism exposure and low economic diversification are correlated with the output losses during 2020–22 in the ECCU, measured as downward revisions to growth forecasts. Most ECCU countries now have a smaller fiscal space, and some need to allocate a larger share of revenues into interest payments. This suggests that the governments' ability to invest in projects with a higher fiscal multiplier, such as infrastructure, will be reduced in the coming years. In other words, the impact of the pandemic on the fiscal accounts will also affect long-term growth and can be another potential source of hysteresis in the region. The impact of the pandemic on the quality of human capital, induced by school closures and young deaths, has the potential to have the largest negative long-term consequences.

**15. ECCU countries need to balance difficult tradeoffs to mitigate scarring effects of the pandemic, other recent shocks, and limited fiscal policy space.** In the short term, the priorities are to continue health spending to cope with the pandemic and use effective social transfers to cope with rising living costs. In the medium term, moving from income support and job retention measures to adopting active labor market policies would facilitate the reallocation of workers and resources to their most productive uses and help foster productivity growth.

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## Data Description

**GDP Losses:** Comparison between real GDP projections from January 2022 WEO and October 2019.  
Source: IMF staff estimations.

**Rural Population:** Share of total population residing in rural areas.  
Source: World Bank staff estimates based on the United Nations Population Division's World Urbanization Prospects.

**Lockdown Stringency Index:** Average of the Lockdown Stringency Index in 2020 and 2021.  
Source: University of Oxford and IMF staff calculations.

**Complexity Index:** Measures the complexity of the products that the country successfully exports; we normalized the index between 0 and 4.5.  
Source: Harvard's Growth Lab.

**Tourism Share of GDP:** Travel and tourism total contribution to GDP.  
Source: World Travel & Tourism Council.

**Young Deaths:** People who were between 0 and 40 years old and died from COVID-19 until March 2022 (percent of total deaths from COVID-19).  
Source: Max Planck Institute for Demographic Research and IMF staff calculations.

**Share of Expenditure in Health:** Estimates of 2018 health expenditures including healthcare goods and services as a share of GDP.  
Source: World Health Organization Global Health Expenditure database.

**Population Median Age:** Estimate for 2019.  
Source: Our World in Data.

**Weeks of Full School Closures:** Number of weeks that schools were closed at a national level due to COVID-19 between March 2020 and October 2021.  
Source: UNESCO global dataset.

**Share of Expenditure in Education:** 2018 general government expenditure on education expressed as a percentage of GDP.  
Source: UNESCO Institute for Statistics and World Bank.

**Debt to GDP:** Comparison between debt-to-GDP projections from January 2022 WEO and October 2019.  
Source: IMF staff estimates.

**Average Nominal Interest Rate on Debt:** Calculated as the ratio of gross interest expenditures in year t to stock of debt in year t-1.

Source: IMF staff estimates.

**Fiscal Spending on COVID:** Includes different types of fiscal support (for example, above-the-line and below-the line measures, and contingent liabilities) that have different implications for public finances in the near term and beyond.

Source: IMF's Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic.

**Economic Support Index 2021 and 2022:** Index for economic support measures undertaken by a government including income support, debt/contract relief, other economic stimulus spending and COVID-19 related foreign aid.

Source: University OF Oxford, COVID-19 Government Response Tracker.

# FISCAL RULES IN DISASTER-PRONE COUNTRIES: IMPLICATIONS FOR THE ECCU<sup>1</sup>

*This paper reviews the ECCU's experience with rule-based fiscal responsibility frameworks (FRFs) and considers how fiscal frameworks and fiscal policy could be enhanced to explicitly account for the presence of sizeable natural disasters (NDs). The experience of countries similar to the ECCU shows that successful fiscal rules typically combine debt and operational targets and have stronger enforceability frameworks, confirming the general principle of simple, flexible and enforceable rules. In terms of fiscal rule design, debt ceilings, commonly used as a medium-term fiscal anchor, should be set lower to internalize the impact of ND shocks, unless disaster mitigating buffers are readily available. The choice of operational target depends on country characteristics, including crucially the exposure to NDs, because those characteristics modulate the ability of different rules to trade-off between counter-cyclicality and the speed of debt convergence to target. Ultimately, each country needs to take these considerations into account when designing new or amended FRFs.*

## A. Introduction

**1. ECCU fiscal frameworks have been loosely guided by the regional debt ceiling.** In 1998, the ECCB Monetary Council set a public debt ceiling of 60 percent of GDP and an overall deficit target of 3 percent of GDP to be reached by 2020 for all member countries. The deficit target was abandoned in 2006 and the 2020 deadline for the public debt target was delayed to 2030 in 2015. These modifications reflect continued difficulties in meeting the targets, often against a background of a challenging economic context sometimes due to natural disasters. Moreover, these targets are always suggestive, are not underpinned by national legislation, and lack enforcement mechanisms. Prior to the onset of the pandemic only three ECCU member states—Grenada (in 2015), St. Vincent and the Grenadines (in 2020), and Anguilla (also a territory of the United Kingdom, in 2013)—had legislated Fiscal Responsibility Frameworks/Acts that embed fiscal rules.

**2. The pandemic brought a temporary suspension of fiscal rules and a further extension of the ECCU debt ceiling date to 2035.** ECCU countries were severely impacted by the pandemic, with GDP estimated to have contracted over 15 percent in 2020 due to the collapse of tourism and containment measures to prevent the spread of the virus. The decline in activity together with pandemic-related expenditures contributed to a significant widening of the fiscal deficit and public debt, with the latter estimated to have risen by around 20 percentage points to 85 percent of GDP in 2020. In response to the pandemic, Grenada and St. Vincent and the Grenadines triggered the escape clause under their fiscal rules in 2020-22 and the ECCB Monetary Council in February 2021 decided to extend the debt target by five years. Amid a weak recovery and elevated levels of public debt, ECCU countries are seeking to ensure fiscal sustainability with some seeking to reinstate their

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fiscal rules, while others, such as Antigua and Barbuda and Dominica, approving Fiscal Responsibility Frameworks (FRFs).

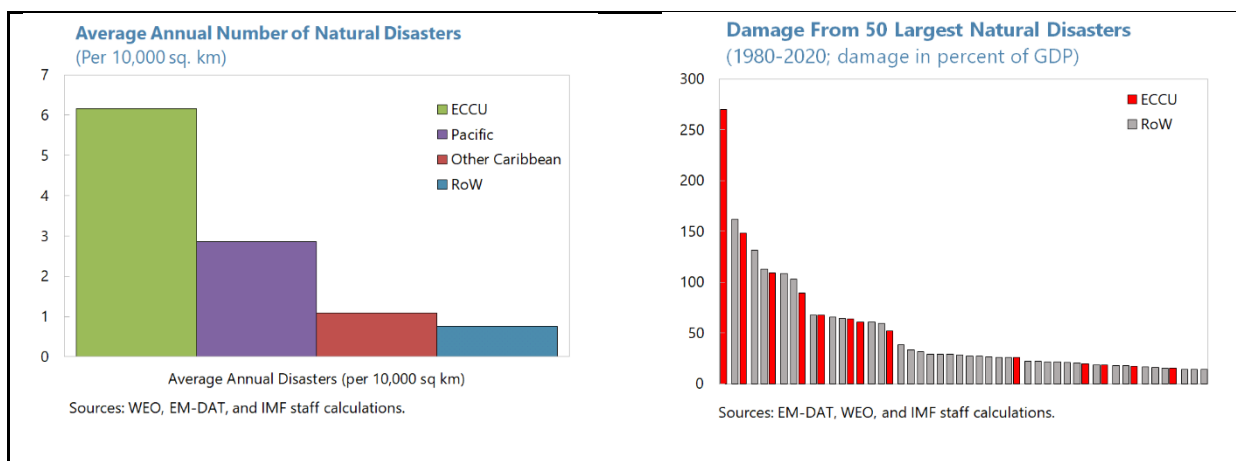
**3. This paper considers how country-specific fiscal rules could help achieve the regional debt target, while navigating regional challenges particularly the large exposure to NDs.** Past work (IMF 2017a, 2019a) has argued for the usefulness of fiscal rules, favoring operationalization through a budget balance target net of Citizenship-by-Investment (CBI) revenues, and for fiscal frameworks to take natural disasters into account. While IMF staff has done extensive work on fiscal rules, less analysis has been undertaken for small states, particularly developing island states subject to macrocritical NDs. This paper aims to fill these gaps and potentially contribute beyond the region. It does so by first highlighting the key characteristics of ECCU economies such as their exposure to natural disasters and their experience with rule-based FRFs. It then outlines a set of principles for the successful implementation of fiscal rules. Finally, the paper uses the cases of Grenada and St. Vincent and the Grenadines to illustrate the implications of the presence of natural disasters for fiscal rules using two broad modelling approaches.

**4. NDs call for lower debt ceilings and for building fiscal space ahead of natural disasters.** The general principles of fiscal rules (Eyraud and others, 2018) also apply to countries with NDs. Fiscal rules should be simple (avoiding too many operational targets), flexible (with appropriately defined escape clauses and clarity of plans to enable the return to targets after triggering), and enforceable (inscribing the framework in law and designating an independent fiscal council to oversee the framework). Given the asymmetric nature of NDs' impact on output, the analysis points to setting fiscal policy more conservatively than without NDs to partially accommodate them, both in terms of medium-term debt ceiling and operational targets. The analysis also evaluates the choice of operational targets. As demonstrated in Andrieu and others (2015), there exists a trade-off between counter-cyclicality and speed of the debt convergence to targets in expenditure and primary balance rules, with the former typically achieving a lower GDP volatility but at the expense of a higher debt-to-GDP ratio and a slower transition to the debt target following shocks. For small economies with high exposure to natural disasters and elevated initial level of debt, primary balance rules could be preferable to expenditure rules. Additionally, when comparing different fiscal policy instruments within primary balance rules, those with the smallest multiplier tend to have better trade-offs.

## **B. On the Incidence and Impact of Natural Disasters in the ECCU**

**5. The ECCU is one of the world's most vulnerable regions to natural disasters.** From 1980 to 2020, the ECCU experienced 1.6 natural disasters per year on average and damages of 13 percent of GDP per disaster. Controlling for land area, the likelihood of a natural disaster for ECCU countries is twice that of disaster-prone Pacific islands and 5.6 times more than other Caribbean countries. Moreover, once a natural disaster hits, ECCU countries also tend to experience more damage. Around a quarter of the 50 most destructive country-specific natural disasters from 1980 to 2020 hit an ECCU country. Climate change is likely to further increase the frequency and intensity of these events, even if they are already above historical levels (WMO, 2021).

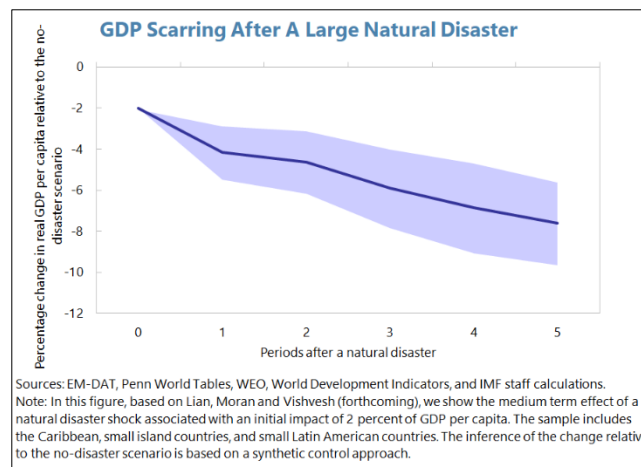




## 6. Studies on ECCU countries found sizeable GDP effects from climate shocks.

Acevedo (2014), using information on 12 Caribbean countries between 1970 and 2009, found that severe storms had an immediate negative impact of 1 percentage point on GDP growth, while severe floods had an immediate negative impact of 3 percentage points. Rasmussen (2004) used 12 events affecting ECCU countries between 1970–2002 to find that real GDP declined by about 2.2 percentage points in the year a

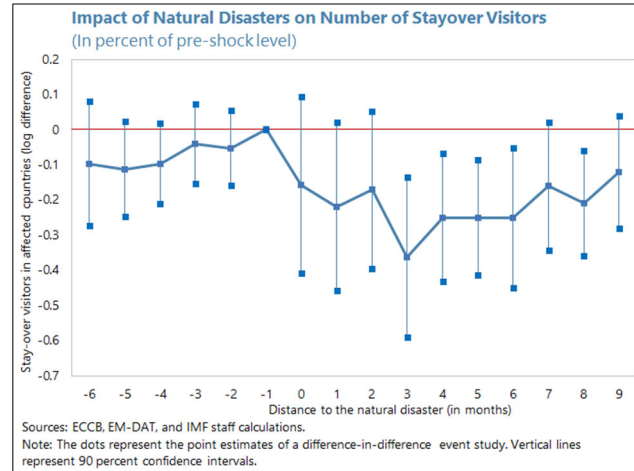
natural disaster struck. Two recent papers studying the region—IMF (2021), using a DSGE model, and Lian, Moran, and Vishvesh (forthcoming), using empirical methods—find that severe natural disasters involve both short-term effects and medium-term scarring on real output per capita. Lian, Moran, and Vishvesh find that a disaster with an economic damage of 30 percent of GDP causes output to fall below its counter-factual trend by 8 percent five years after the shock.



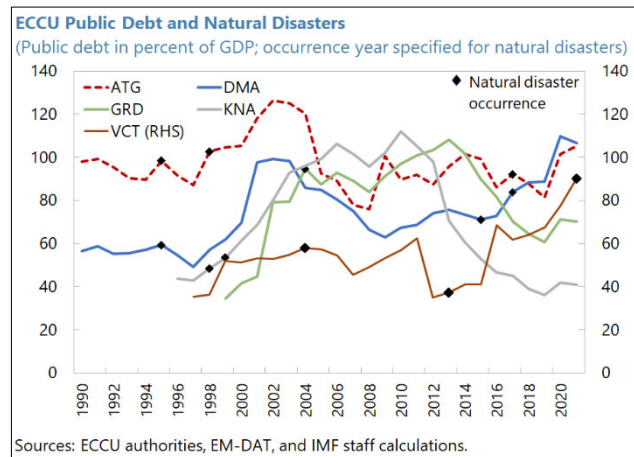
**7. The ECCU's reliance on tourism and agriculture exacerbate the effect of natural disasters.** Between 2010 and 2019, tourism accounted from 21.8 percent of GDP (Grenada) to 57.5 percent of GDP (Antigua and Barbuda). The number of visitors to the region is highly dependent on economic conditions in source countries (Sun and Samuel, 2011, and Salinas, Vargas and Parlak, 2021) and global shocks.<sup>2</sup> The dependency on tourism reinforces the vulnerability to

<sup>2</sup> For instance, the 12-month moving average of stayover visitors took almost 2 years to return to pre-crisis level following the 9/11 shock, 7 years following the Global Financial Crisis, and it is still 74 percent lower than pre-crisis level following the COVID-19 shock.

NDs. The risk of NDs and worse weather conditions reduce the number of tourists by more than 50 percent during the hurricane season,<sup>3</sup> and visitors decline significantly following a ND even eight months after the event. Agriculture is another important channel for natural disasters to affect ECCU economies. For Dominica, Grenada, and St. Vincent and the Grenadines, the primary sector accounts for more than 5 percent of GDP on average. Large natural disasters affect agricultural output, directly, through the destruction of crops and equipment, and indirectly, through the destruction of infrastructure that is crucial for distributing and processing agricultural output. The income loss for workers in the sector, mostly self-employed, translates into rising needs for social protection and government transfers.<sup>4</sup> The vulnerability of agriculture to natural disasters can also lead to scarring due to lengthy gestation periods.<sup>5</sup>



**8. The fiscal position typically deteriorates significantly in ECCU countries following natural disasters despite offsetting support from the international community.** Following NDs, the primary balance worsened by an average of 5.5 percentage points of GDP and public debt rose by 7 percentage points of GDP in ECCU economies since 1989.<sup>6</sup> Such deterioration occurs despite additional external grants of about 1 percent of GDP.



<sup>3</sup> According to ECCB data, from 2014 to 2019 the ECCU region welcomed, on average, 49,811 tourists per month during the hurricane season (June–November) and 114,185 tourists per month during the rest of the year.

<sup>4</sup> Damages in Dominica’s agriculture sector amounted to 31 percent of GDP (IMF Country Report No. 18/265) following Hurricane Maria and 9.4 percent of GDP following Tropical Storm Erika (IMF Country Report No. 15/316).

<sup>5</sup> Following Hurricane Ivan, 95 percent of Grenada’s nutmeg trees—a key export—were destroyed, and it was estimated pre-disaster capacity would return after 10 years (IMF Country Report No. 04/405).

<sup>6</sup> Rasmussen (2004) found similar effects in the ECCU during 1970–2002, with the median public debt-to-GDP ratio increasing by a cumulative 6.5 percentage points over a three-year period following large natural disasters.

## C. Experience of Rule-Based Fiscal Responsibility Frameworks in the ECCU

**9. Fiscal frameworks in the ECCU were initially guided by the regional deficit and debt targets.** In 1998, the ECCB Monetary Council provided guidance to ECCU countries to achieve a public debt ceiling of 60 percent of GDP countries and an overall deficit target of 3 percent of GDP by 2020. However, these targets were only suggestive and not legally binding, with many countries having difficulties in meeting them. The deficit target was subsequently abandoned, and the debt target was postponed twice. Currently the ECCU debt-to-GDP ceiling stands at 60 percent to be achieved by 2035.

**10. In response, some countries have enacted FRFs to strengthen public finances management, but under different legal basis.** The FRFs of Anguilla (2013), Grenada (2015), and Dominica (2021) were passed by their respective parliaments, while those of St. Vincent and the Grenadines (2020) and Antigua and Barbuda (2021) are set under a parliament resolution and Cabinet approval, respectively. Except for Anguilla and Grenada, implementation of the FRFs has yet to start. Moreover, the FRF has been suspended in Grenada and St. Vincent and the Grenadines since the onset of the pandemic.

**11. In all cases, the FRFs are anchored on a medium-term debt target with relatively similar operational targets, except for Anguilla (Table 1).** All FRFs except Anguilla set a public gross debt ceiling in percent of GDP, typically consistent with the ECCU's ceiling (Antigua and Barbuda and St. Vincent and the Grenadines at 70 and 60 percent of GDP by 2030 respectively, Grenada's at 55 percent of GDP by 2025, and Dominica's at 60 percent of GDP by 2035). Anguilla, on the other hand, aims for a ceiling on net debt of 80 percent of recurrent revenues. In most cases, a primary balance rule is the main operational target, supported by other rules on spending, including public wages. Anguilla's operational targets are set on debt service relative to recurrent revenue and liquid assets relative to recurrent spending.

**12. Extraordinary events (i.e., natural disaster, health crisis, recession, or financial crisis) can trigger the suspension of the targets in most ECCU countries.** These events need to be certified by competent authorities, including by the ECCB in the case of a financial crisis (Dominica, Grenada, and St. Vincent and the Grenadines). Remedial plans need to be developed in all cases for public finances to return to the FRFs' targets.

**13. The FRFs in all countries require the establishment of an oversight committee.** In most cases, though, the committees lack independence as they are appointed by Cabinet (Antigua and Barbuda, Dominica, and St. Vincent and the Grenadines). Operationalization of the oversight committee is pending in Antigua and Barbuda, and Dominica.

Table 1. ECCU: Summary of Fiscal Responsibility Frameworks Across the Members

Member Country or Territory	Legal Status of Rule Introduction Date/ Implementation Date	Medium-Term Debt Anchor	Operational Targets	Escape Clauses and Triggers	Government Level Coverage (CG, NFPS)	Compliance Oversight	Independent Oversight Committee
Anguilla	Fiscal Responsibility Act, enacted by Anguilla's Legislature on October 25, 2013 and effective 2014.	* Net debt below 80 percent of recurrent revenue; * Net debt below 90 percent of recurrent revenue by 2015.	1. Debt service below 10 percent of recurrent revenue; 2. Liquid assets at a minimum of 25 percent of recurrent expenditure (90 days).	Yes. Triggers:  Extraordinary events that threaten macroeconomic stability.	Public sector (i.e., central government, statutory authorities, and government companies)	UK government	Yes.  UK government.
Antigua and Barbuda	Fiscal Resilience Guidelines and Medium-Term Fiscal Strategy approved by Cabinet on January 20, 2021, but not published and lacking parliamentary approval.	Below 70 percent of GDP by 2030	1. Primary surplus between 0.5 and 1 percent of GDP by 2023; 2. Overall deficit of less than 1.5 percent of GDP by 2024; 3. Tax-to-GDP ratio of at least 18 percent by 2023 and 20 percent over the medium-term; 4. Wage bill not exceeding 9 percent of GDP by 2025.	Yes. Triggers: a) Natural disaster is declared; b) A public health epidemic or pandemic is declared; c) Real GDP contracts by 2 percent or more in a fiscal year or cumulatively by 3 percent or greater over two consecutive years; d) A financial crisis with fiscal costs has occurred or is imminent.	Central government	Yes.  a) Parliament; b) To-be-established Fiscal Resilience Oversight Committee (FROC).	No.  FROC still to be appointed by Cabinet.
Dominica	Fiscal Responsibility Framework (FRF), enacted by Parliament on November 30, 2021.	60 percent of GDP by 2035	1. Primary balance has to reach a surplus of 2 percent of GDP by 2026 and to remain above that level thereafter, when the debt to GDP ratio is above 60 percent; 2. When the cumulative difference between the actual primary balance and the target is greater than 2 percent of GDP, a corrective action needs to be taken to reduce the difference to zero within 3 years, with at least one third of the adjustment made in the first year.	Yes. Triggers: a) Natural disaster, epidemic, civil unrest or war; b) Real GDP contracts by 2 percent in a year or cumulatively by equal or greater than 3 percent over two consecutive fiscal years; c) The ECCB has certified that a financial crisis has occurred; or d) The prime Minister determines that implementation of the fiscal rules, targets or corrective measures would be unduly harmful to public finances or macroeconomic or financial stability.	Non-Financial Public Sector	Yes. Fiscal Responsibility Committee (FRC), to be established by March 31, 2025.	No.  FRC, appointed by the Minister and approved by the Cabinet.
Grenada	Fiscal Responsibility Act, enacted by Parliament on August 25, 2015 and implemented since 2016, with escape clause triggered for 2020-22.	Expected to reach 55 percent of GDP by 2025	1. Primary balance exceeding 3.5 percent of GDP; 2. Public expenditure growth lower than 2 percent in real term (excl. grant-financed capital expenditure); 3. Wages lower than 9 percent of GDP;  Parameters to be recalibrated when the public debt falls below 55 percent of GDP.	Yes. Triggers: a) Natural disasters, pandemic, or war; b) Real GDP contracts by 2 percent in a year or by 3 percent cumulatively over two consecutive years; c) Financial crisis certified by the ECCB, or fiscal cost related to capital injection exceeding 4 percent of GDP.	NFPS	Yes.  a) Parliament; b) Fiscal Responsibility Oversight Committee (FROC), operational since August 2017.	Yes.  Nominated by the parliament in consultation with the Director of Audit, and appointed by the Governor General.
St. Vincent and the Grenadines	A parliamentary resolution (i.e., not enacted into a "Law"), approved in January 2020. Not yet operationalized.	60 percent of GDP by 2030	1. Primary balance rule: primary deficit of on average of 1.2 percent of GDP annually for 2021-2023; and primary surplus of 2.7 percent of GDP from 2024 onwards; 2. Expenditure rule: (i) current spending growth does not exceed nominal GDP growth; (ii) wage bill does not exceed 12.5% of GDP from 2022.	Yes. Triggers: a) Natural disaster is declared; b) A public health epidemic or pandemic is declared; c) Real GDP contracts by 2 percent or more in a year or cumulatively by 3 percent or greater over two consecutive years; d) A financial crisis certified by the ECCB and with fiscal costs has occurred or is imminent.	Central government	Yes.  Fiscal Responsibility Mechanism (i.e., Fiscal Council), established on September 23, 2021.	No.  Members appointed by Cabinet.

Note: The medium-term debt anchor of all countries is consistent with the ECCU's debt target of reaching 60 percent of GDP by 2035.  
Sources: Country authorities and IMF staff.

### Box 1. Rule-Based Fiscal Responsibility Frameworks: The Experience in Grenada

*The experience of Grenada in adopting and implementing its country-level fiscal rules proved to be enforceable and flexible, although suffered from overlapping operational rules.*

**Grenada’s enforceable fiscal rules led to a significant reduction in debt.** Fiscal rules, enshrined in the Fiscal Responsibility Act (FRA) 2015, were successfully established as the cornerstone of Grenada’s fiscal policy framework during the 2014 IMF ECF-supported program (see Table 1 for more details). The fiscal framework had strong political buy-in and frontloaded an ambitious reform agenda. Crucially the FRA has strong enforceability via the Fiscal Responsibility Oversight Committee, instrumental in the sharp reduction of public debt from 105 percent of GDP in 2013 to 84 percent in 2016. Grenada continued prudent fiscal management with public debt falling to below 60 percent of GDP in 2019.

**The FRF also provided flexibility during the pandemic.** Grenada suspended its fiscal rules during 2020–22, consistent with the FRA’s escape clause. This enabled counter-cyclical measures to support key sectors and vulnerable households. Mostly reflecting a sharp contraction in GDP, public debt rose to 71.4 percent of GDP in 2020, before falling back to a projected 69 percent in 2022.

**The operational rules were hampered by overlaps.** Grenada’s FRF puts a ceiling on the growth rate of real expenditure as well as a floor on the primary balance. Before the pandemic, compliance with the expenditure rule was typically achieved by restricting public investment, given that the growth rate of real expenditure was typically the binding constraint. As a result, the primary balance ended up well above its set floor for several years.

**The FRA allows core parameters to be recalibrated over time once public debt falls below 55 percent of GDP, consistent with debt stabilization and an updated estimate of potential output growth.**

However, the sharp rise in public debt during the pandemic implies a delay in the timing of recalibrating core parameters based on the current FRA.

## D. Principles and Considerations for the Adoption of Fiscal Rules

### General Principles

**14. Well-designed FRFs should strike a balance between being simple, flexible, and enforceable (Eyraud and others, 2018).** A key objective of FRFs is to provide credible commitments to fiscal discipline and correcting deficit bias, without jeopardizing stabilization and redistribution goals of fiscal policy. While FRFs can be effective for creating fiscal discipline, they need to be well-designed and tailored to countries’ characteristics to avoid costs (Eyraud and others, *ibid*). First, some rules can be procyclical thereby not contributing to smoothing output volatility. Second, fiscal rules may lead myopic policymakers to shift towards short-term visible but unproductive spending at the expense of high-quality spending with longer-term benefits. Third, rules may encourage creative accounting or the use of off-budget operations to achieve fiscal targets (Milesi-Ferretti, 2003). Certain FRF design principles can minimize these costs (Box 2 shows that many of these principles are being adopted by countries), including:

- **Enshrining FRFs into law supports transparency and enforceability.** FRF laws should define the principles of fiscal sustainability, create a legal framework where fiscal rules are formulated and applied, and map out the procedural and accountability requirements of the various actors. They should facilitate making policy commitments more binding, acceptable and better

understood by the public, avoiding political interference and discretion while increasing the costs of non-compliance.

- **The creation of independent institutions to monitor, report on, and recalibrate the fiscal rule can enhance transparency and enforceability.** Institutions need to have operational independence, technical capacity, and budget resources to undertake its remit, including the evaluation of fiscal projections and budget submissions to guarantee ex-ante fiscal rule consistency. They should also be accountable to the broader public and their political principal, with actions evaluated through peer reviews, regular public hearings, uncensored and timely public release of the council's reports, and ex-post assessments by a supreme auditing institution.
- **FRFs can benefit from strong public financial management (PFM) and credible medium-term fiscal plans to support enforceability.** Having a medium-term debt anchor and simple operational rules closely tied to the anchor are key building blocks of successful FRFs (IMF, 2018). Strong PFM to achieve sound fiscal operations and transparent communication of the fiscal strategy facilitate framework implementation. Detailed multi-year fiscal statements should be made and appropriate targets communicated. To achieve these, a strong framework for producing macro-fiscal projections and evaluating fiscal risks should be in place and be linked to the top-down aspects of budget preparation.
- **To improve compliance and credibility, FRFs should follow good practices in the design of operational rules, including broad coverage where possible, specifying instruments, and considering one-offs and contingency buffers (Eyraud and others, 2018).** While FRFs should encourage as broader coverage of the fiscal accounts as possible, they should be specified in terms of instruments that the government has direct control of and for which it is accountable. Ideally rules should avoid compositional changes away from high-quality spending and allowing for counter-cyclical fiscal policy. Moreover, targets and rule instruments need to be easily measurable in a timely and relatively uncontroversial manner for simplicity and better enforceability. Simplicity could be especially helpful for ECCU countries, where institutional capacity can make it difficult to have very sophisticated fiscal rules (e.g., rules that adjust for the business cycle given lack of timely data). Revenue windfalls, including CBI, and/or one-off expenditures should be excluded from the targets and instruments.
- **To deal with extreme events, a detailed escape clause that describes the circumstances for fiscal rules to be suspended can support flexibility.** While FRFs should be formulated to limit discretion, they should enable the government to respond to large macro-financial shocks or natural catastrophes allowing for automatic stabilizers that support the vulnerable during severe downturns. However, to limit discretion, FRFs should define: i) the nature and the size of the triggers under which fiscal rules can be suspended; ii) the authority to activate and monitor the escape clause; and iii) the mechanisms and timing for returning to the fiscal rule.

### Box 2. Fiscal Rules in Small States

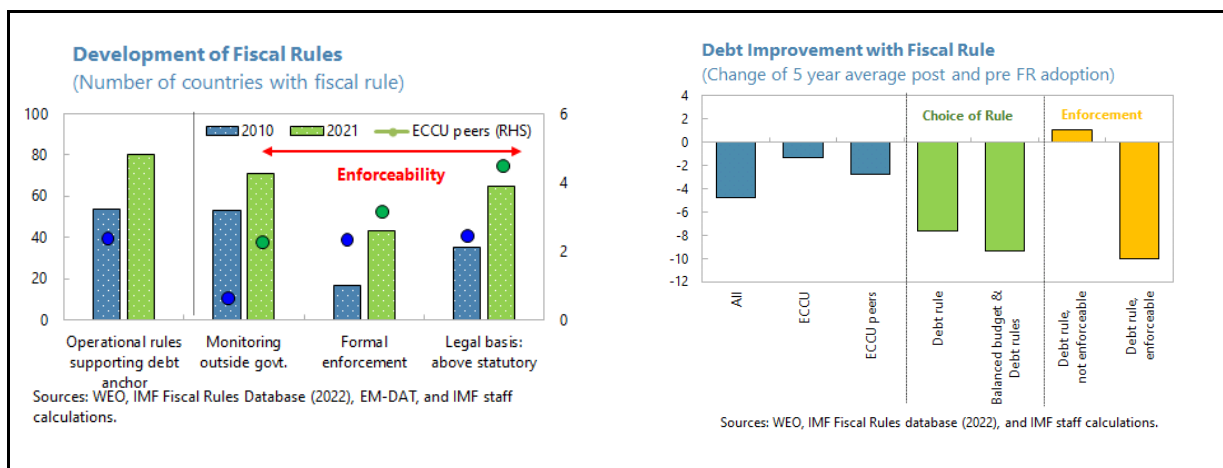
*Experience of countries with similar characteristics as the ECCU<sup>1</sup> suggests successful fiscal rules combine debt and operational targets and have stronger enforceability frameworks.*

**Rising adoption.** The number of countries with fiscal rules has doubled to over 105 countries over the past two decades, driven by emerging markets and developing economies (EMDEs), see Davoodi and others (2022). Small states have also followed this trend, albeit at a slower rate. Following early adopters—including ECCU countries and Cape Verde in 1998—more ECCU peers have adopted fiscal rules.<sup>2</sup> Over time, fiscal rules have become also more complex and have strengthened enforcement and oversight (see Figures below).

**Effectiveness.** The event study suggests that countries achieve greater benefit from fiscal rules when (i) debt and operational targets are combined; and (ii) the rules are enforceable.

**Combining debt and operational targets.** Among ECCU peers, Mauritius adopted a debt rule only, while all others adopted budget balance and other operational targets in addition to the debt rule. ECCU countries have recently introduced operational targets to support the debt rule at their national level fiscal rule (see Table 1).

**Strengthening enforceability.**<sup>3</sup> EMDEs notably improved their FRFs over the last decade through a stronger legal basis and enhanced enforcement mechanisms (Blanco and others, 2020; Davoodi and others, 2022). Among ECCU peers, Anguilla and Grenada have a fiscal rule both supported by formal enforcement mechanisms and approved by legislation. A few ECCU peers have legally backed fiscal rules but lack formal enforcement mechanisms (The Bahamas, Cabo Verde, and Maldives) and a strong legal basis (Antigua and Barbuda and St. Vincent and the Grenadines).



1/ These are defined as small open economies with high exposure to natural disasters and include 34 developing countries with population fewer than 1.5 million (IMF, 2017b).

2/ Maldives (2013), Mauritius (2008), Montenegro (2014), Timor-Leste (2005), and The Bahamas (2018). At the supranational level, WAEMU adopted FRFs in 2000, CEMAC in 2002 and EAMU in 2013; however, they do not share similar characteristics as ECCU-like countries.

3/ Rules are deemed enforceable if there are (i) a monitoring mechanism outside of the government (“fiscal council”); (ii) formal enforcement procedure; and (iii) strong legal basis, above statutory level.

## Considerations for Fiscal Rules and Interplay with Building Resilience to Natural Disasters

**15. Investing in structural (infrastructure) resilience, complemented with financial (insurance) resilience, would yield significant long-run benefits for the ECCU.** Resilient capital such as durable roads, bridges, and sea walls contains the damage and losses from natural disasters,



promotes private investment, and generates job opportunities. Fund staff estimates for ECCU countries indicate that resilient public investment can boost the level of GDP in the long run by 3–11 percent through an increase in employment and wages and a decline in outward migration, which is generally high in countries prone to natural disasters. Because building structural resilience takes time, a comprehensive layered insurance framework is also needed to ensure liquidity for relief and reconstruction while safeguarding public finances. In this context, Grenada and St. Vincent and the Grenadines enrolled in the World Bank’s Catastrophe Deferred Drawdown Option (CAT DDO) in 2020 and St. Vincent and the Grenadines received a disbursement in 2021. IMF staff simulations indicate that Caribbean countries would need an insurance coverage of 15–30 percent of GDP to cover 99 percent of the fiscal costs related to natural disasters, at an annual cost in the range of 0.5–2 percent of GDP.<sup>17</sup>

**16. Despite some progress in recent years, *ex-ante* (before a disaster hits) resilience building in the ECCU remains insufficient.** Upgrading infrastructure competes with other development needs, reflecting limited fiscal space and capacity constraints, and public and external sustainability challenges. Insurance coverage also remains low, reflecting the relatively low-income population and high administrative costs of small insurance sectors, non-insurability of many assets, high insurance premiums, and regulatory obstacles that limit coverage.

**17. Rule-based FRFs can help create fiscal space for resilience building to NDs and withstand shocks.** In the Caribbean, [Dominica](#) and [Grenada](#) have developed a Disaster Resilience Strategies (DRS) with IMF support,<sup>18</sup> and efforts are ongoing with their implementation and the preparation of updates to national adaptation/disaster plans (by Antigua and Barbuda, Grenada, St. Lucia, and St. Vincent and the Grenadines). In this context, fiscal rules help to contain current expenditure, creating necessary fiscal space specially for resilient public investment, the biggest portion of the cost of building resilience. Second, it can help to build credibility, lower interest rate costs, and attract international financing and grants, crucial for building resilience against NDs.

## E. Implications of Natural Disasters for Fiscal Rules in the ECCU

**18. The presence of NDs warrants setting a lower debt ceiling, unless buffers and other mitigating mechanisms are in place.** The IMF’s fiscal rule calibration toolkit (Eyraud and others 2018), extended to incorporate NDs and other climate-related considerations, was used to analyze the debt ceiling (see Gbohoui and Akanbi, forthcoming, summarized in Annex II).<sup>19</sup> Unlike more frequent macroeconomic shocks such as demand and inflation shocks, NDs represent often large

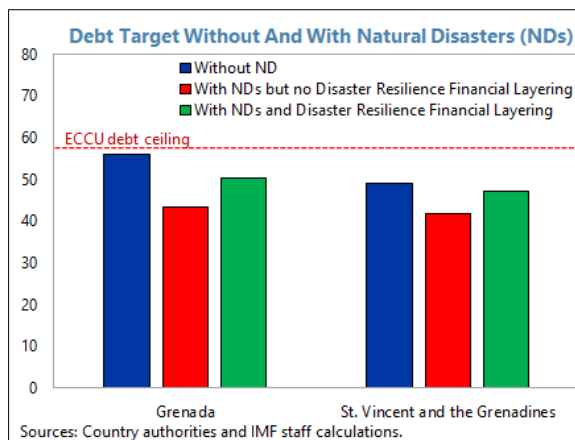
<sup>17</sup> See 2018 ECCU Regional Consultation Report (IMF Country Report No. 19/62) and Western Hemisphere Regional Economic Outlook (October 2021).

<sup>18</sup> The DRS internalizes the costs and returns of resilience building into sustainable macroeconomic frameworks consistent with debt sustainability to help catalyze financial support from bilateral donors, climate funds, and other sources.

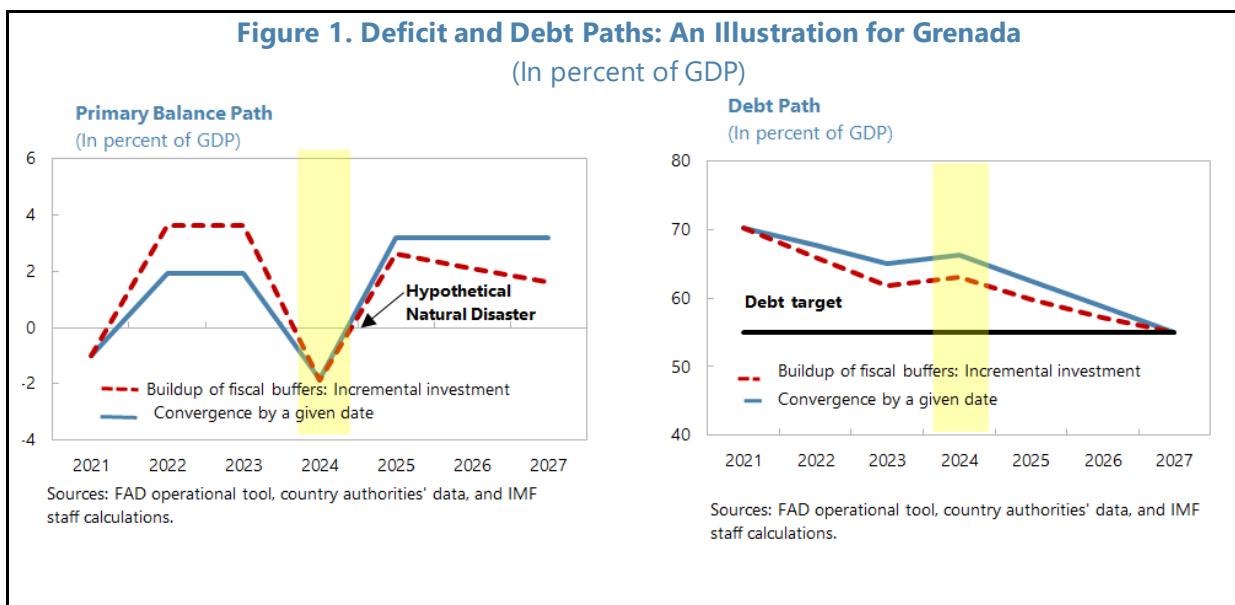
<sup>19</sup> A natural candidate for a country’s fiscal anchor is a ceiling on public debt-to-GDP. Such a ceiling corresponds to the prudent level of public debt that, under a wide range of scenarios, assures debt will not be excessively high and risk becoming unsustainable.



and asymmetric supply shocks that lower output, increase inflation, and deteriorate the fiscal and current account balances not only in response to lower output, but also due to the need to support vulnerable households and reconstruction spending. As a result, the prudent ceiling on public debt should be set lower, all else equal, the greater the exposure to NDs. The degree to which the debt ceiling should be set lower depends crucially on the extent of scarring or persistence of subdued growth due to NDs, their prevalence, and the size of financial buffers in place, including the government’s self-insurance, insurance policies, disaster clauses in debt securities, access to grants conditional on disasters, and private self-insurance.



**19. Natural disasters also suggest a conservative approach to setting operational targets, regardless of their choice.** Countries exposed to NDs have a greater need to create and preserve fiscal space, especially if debt is already elevated and exceeds the debt ceiling. ECCU countries have sought to establish operational targets calibrated to returning to their debt ceiling by a certain date or within a certain number of years (see Table 1). In doing so, countries would do best to target a more conservative operational target than the mechanical approach would suggest, because a ND is highly likely to occur within the relevant window (Figure 1). Setting operational targets conservatively accounts for the fact that debt rises following a ND due to both growth and tax revenues falling, while fiscal support is also typically needed in the recovery phase.



**20. The performance of fiscal rules is further examined by assessing their ability to mitigate output fluctuations and stabilize public debt.** Stochastic simulations are employed to evaluate different operational fiscal rules, following the methodology developed by Andrieu and Hunt (2020) and based on the historical distributions of annual demand, inflation and natural disaster shocks using the IMF's Global Integrated Monetary and Fiscal Model (GIMF) that incorporates ND-induced demand and inflation shocks (See Annex III).

**21. Both expenditure and primary balance rules, similar to those embodied in FRFs in the ECCU, are considered.** The first type of rule is a primary balance rule (PB) which seeks to achieve the primary deficit targets each period, consistent with PB rules in the ECCU.

$$Def_t = Def^* - \alpha Y_t - \beta(Debt_{t-1} - Debt^*) \quad (1)$$

where  $Def$  is the primary balance as a percent of GDP,  $Def^*$  is the associated primary deficit target consistent with the debt-to-GDP target ( $Debt^*$ ),  $Y$  is the output gap, and  $Debt$  is the debt-to-GDP ratio. Three types of PB rules are assumed: first a strict PB rule where primary deficit targets are met each period (setting  $\alpha = \beta = 0$ ); second, PB rules that also seek to stabilize output (setting  $\alpha \neq 0, \beta = 0$ ); and third, PB rules that also seek to stabilize output and public debt (setting  $\alpha \neq 0, \beta \neq 0$ ). To operationalize (1) two types of spending—government consumption (GC) and general transfers (GT)—are used.<sup>20</sup> The second type of rule is a nominal expenditure rule (EXP) with a debt break:

$$100 \log(EXP_t) = 100 \log(EXP^*) + \delta Y_t - \gamma(Debt_{t-1} - Debt^*) \quad (2)$$

where  $EXP$  denotes government consumption of goods and services and  $EXP^*$  is trend GC. This rule seeks to sustain government consumption of goods and services at its trend/target level but includes a debt target to ensure it is consistent with debt stabilization. The calibration of the coefficients  $\delta$  and  $\gamma$  is such that the public debt-to-GDP ratio *returns to its target level within 10 years following a shock* (see Annex III for more details on both rules).

**22. Simulations show that rules trade-off counter-cyclicality and speed of the debt convergence to targets (Figures 2 and 3).**

- The presence of NDs (compared to their absence) is associated with greater and more protracted departures of public debt<sup>21</sup> from its target and GDP volatility. Within PB rules, those that place some weight on output stabilization tend to have a lower volatility of GDP at the expense of slower debt convergence, whereas PB rules that allow for both output and debt stabilization tend to do worse in terms of output stabilization but achieve faster debt

<sup>20</sup> Other "adjusters," including across different types of taxes, were analyzed. These two expenditure items were chosen for illustration as they are the most realistic to be cut if performance is falling short of a fiscal target in the ECCU context, and also as an example of the principle that the best "adjustor" is one with lower multipliers.

<sup>21</sup> Proxied by the standard deviation of five-year average deviations of public debt from its target level.

convergence to target.<sup>22</sup> The intuition behind these results is that fiscal rules that put more premium on stabilizing debt require a more aggressive response of the fiscal instrument, affecting GDP.

- When comparing instrument use *within* a PB rule (GC vs GT), using general transfers typically results in better outcomes, both in terms of GDP and speed of debt convergence.<sup>23</sup> This is due to the larger multiplier associated with government consumption compared to general transfers. Expenditure rules (of the type represented by equation (2)) also face a similar trade-off with these rules associated with lower GDP volatility at the expense of slower debt convergence relative to PB rules that employ government consumption as its instrument. The intuition for this result is that the expenditure rule responds to shocks with a one period (year) delay, implying that the rule “sees through” the shock in the first period. This is crucial for the case of ND shocks which lower GDP: the “delay” in the policy response prevents the amplification impact of fiscal policy on GDP at the expense of higher debt and slower convergence of debt to its target. Indeed, the relative ranking of the various fiscal rules in terms of output volatility and speed of debt convergence is relatively unchanged in the absence of climate shocks, with the exception of the general transfers PB rule that allows a role for output stabilization which performs better in terms of GDP volatility compared to the expenditure rule.
- The lower prevalence and impact of ND shocks in St. Vincent and the Grenadines compared to Grenada explains why the PB rule with transfers outperforms the expenditure rule in some cases, even in the presence of natural disasters. Figure 3 provides more intuition for the results by plotting the impulse responses of the various shocks for a subset of fiscal rules.<sup>24</sup>

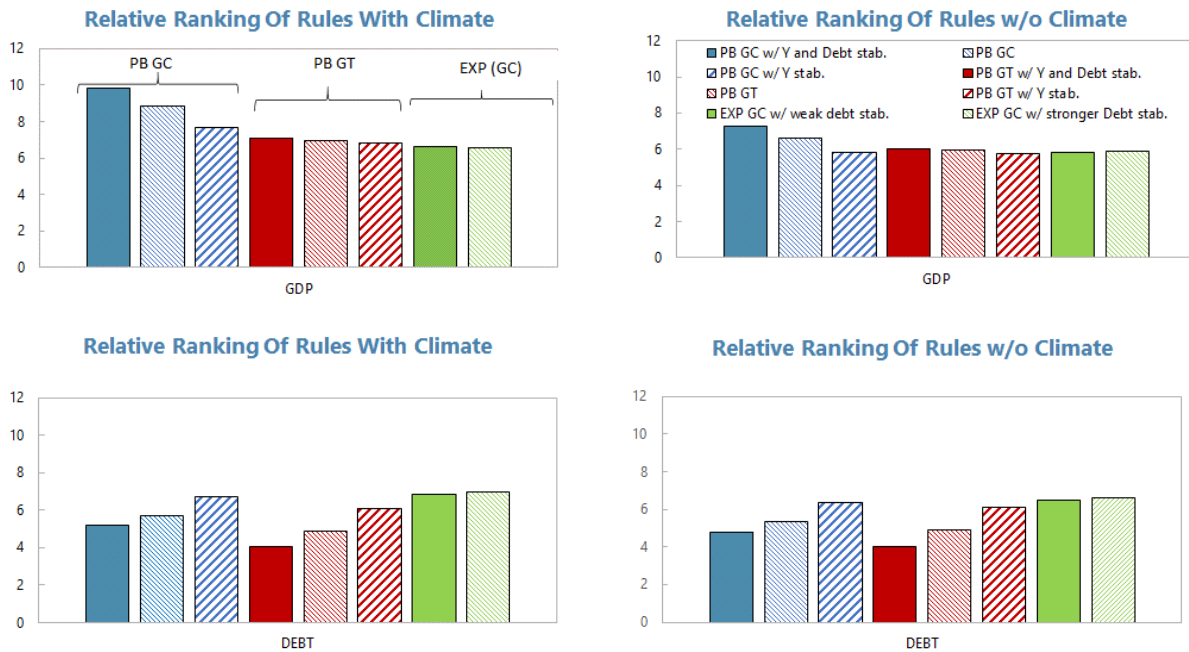
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<sup>22</sup> Strict primary deficit rules without a role for output or debt stabilization lie in between (see Figure 2).

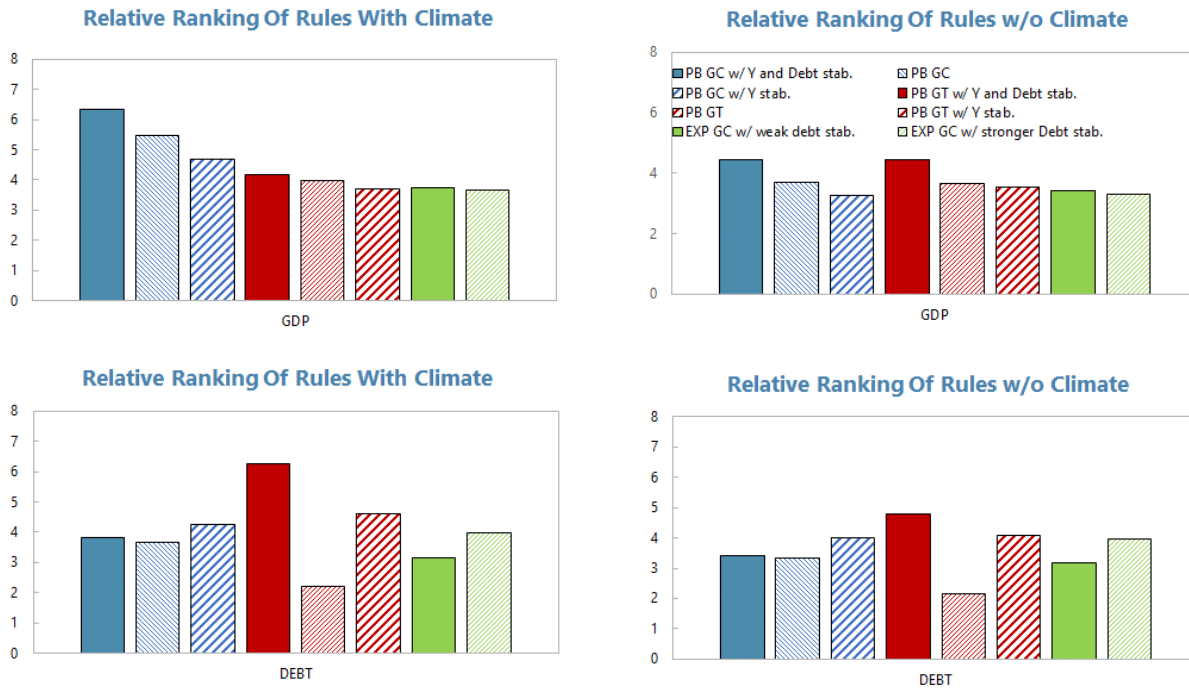
<sup>23</sup> These results are consistent with those obtained by Andrle and others (2015) for the Euro Area, which only considered demand shocks.

<sup>24</sup> Only the responses are shown for Grenada. The responses for St. Vincent and the Grenadines are qualitatively very similar to those of Grenada.

**Figure 2. Relative Performance of Fiscal Rules**  
(Standard deviation)  
**Grenada**



**St. Vincent and the Grenadines**



Source: IMF staff calculations.

Note: Absolute standard deviations such that lower numbers imply less volatility in GDP and debt-to-GDP ratio. More volatile debt conditional on a shock equates to larger and more protracted deviations of debt from target.

**23. Given the aforementioned tradeoffs, the best fiscal rule to implement will depend on the tolerance for output versus the speed of debt convergence.** While lower GDP volatility is highly desirable from a welfare perspective, the speed of debt convergence is also important, notably in cases where the level of debt is initially elevated and debt sustainability concerns are more pronounced. The model simulations assume that countries follow the fiscal rule and ensure the long-term sustainability of public debt. Moreover, households, firms and market participants also believe the government is intertemporally solvent in every period and that insolvency and default are not possible. The possibility of a debt default would likely have a negative impact on domestic yields, capital inflows and GDP. Hence, in cases where the level of debt is high, deploying a rule that mitigates debt deviations from target may thus be highly desirable.

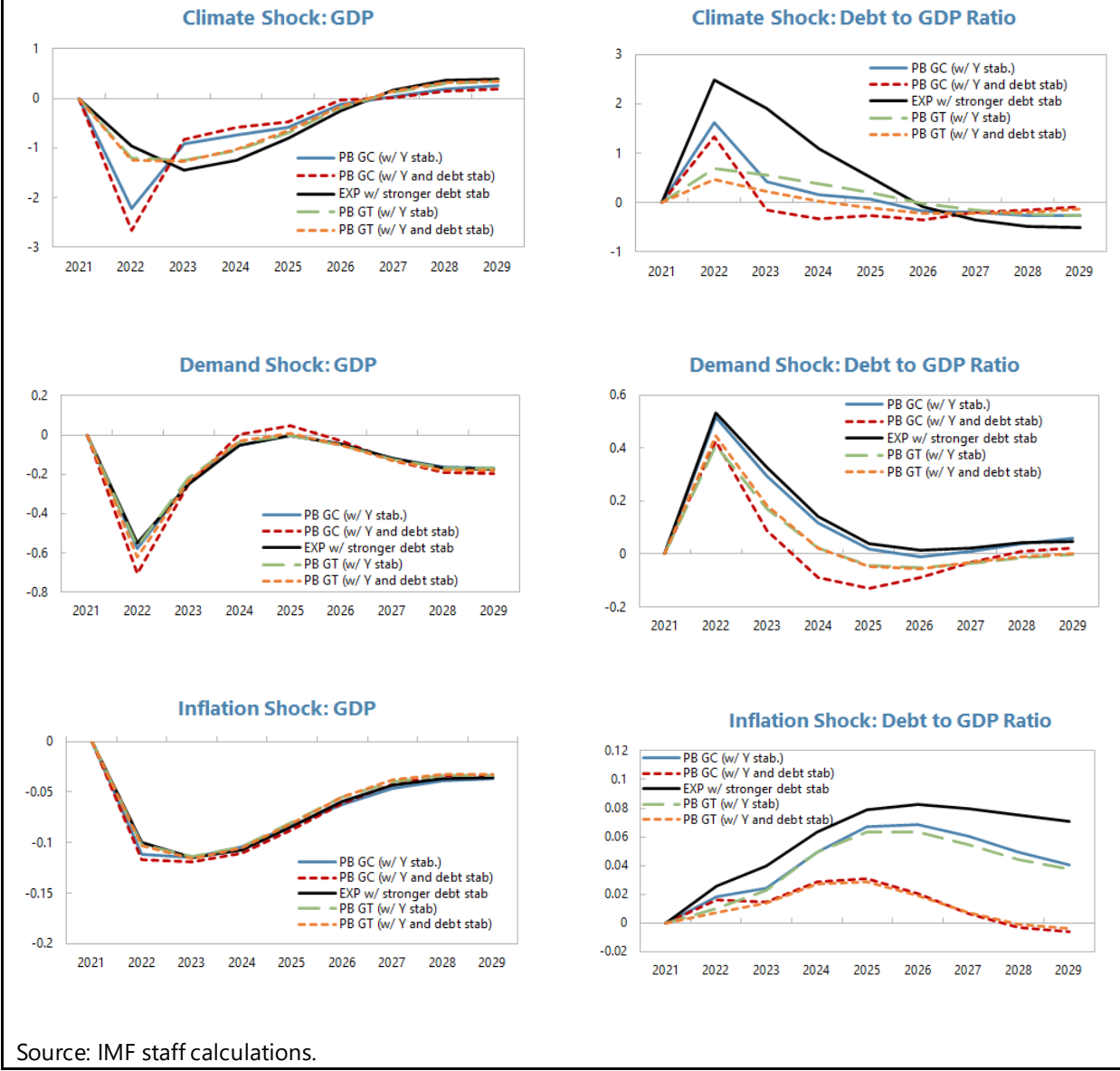
**24. Other non-modeled considerations are also important for the choice of operational targets, such as the incentives for revenue mobilization (IMF 2018).** Expenditure rules may incentivize the extension of tax expenditures and typically do not create appropriate incentives for mobilizing domestic revenue, which is a critical task for several ECCU countries.

## F. Conclusion

**25. Well-designed country-specific fiscal rules could help achieve the regional target and help navigate regional challenges such as a large exposure to NDs.** Fiscal rules can be an efficient mechanism to provide credible commitments to fiscal discipline and correct deficit bias, without jeopardizing stabilization and redistribution goals of fiscal policy. However, fiscal rules and FRFs need to be well-designed—striking a balance between simplicity, flexibility and enforceability—and tailored to countries’ characteristics to avoid potential costs. More specifically, the experience of countries similar to the ECCU shows that successful fiscal rules typically combine debt and operational targets and have stronger enforceability frameworks. Rule-based FRFs can also help create fiscal space for resilience building to NDs and withstand shocks.

**26. In terms of fiscal rule design, countries exposed to ND shocks should set fiscal policy more conservatively than countries not exposed to NDs to partially accommodate them, both in terms of medium-term debt ceiling and operational targets.** The presence of NDs warrants setting a lower debt ceiling, unless buffers and other mitigating mechanisms are in place. The degree to which the debt ceiling should be set lower depends crucially on the extent of scarring or persistence of subdued growth due to NDs, their prevalence, and the size of financial buffers in place. The choice of operational target depends on country characteristics, including crucially the exposure to NDs, because those characteristics modulate the ability of different rules to trade-off between counter-cyclicality and the speed of debt convergence to target. For small economies with high exposure to natural disasters and elevated initial level of debt, primary balance rules could be preferable to expenditure rules.

**Figure 3. Impulse Responses for Various Shocks: Grenada**



Source: IMF staff calculations.

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## Annex I. Country Experiences with Fiscal Rules/FRFs and Disaster Resilience

*This annex summarizes the country experiences of Antigua and Barbuda, Dominica, Grenada, and St. Vincent and the Grenadines with the implementation of their Fiscal Responsibility Frameworks (FRFs). Anguilla, which adopted a FRF in 2013, is presented in the table while Monserrat, St. Lucia, and St. Kitts and Nevis are excluded as they are yet to introduce FRFs. The annex also presents disaster resilience and other financing/insurance strategies to address natural disasters.*

### **Antigua and Barbuda**

**1. Prior to the pandemic, the authorities had embarked on fiscal consolidation efforts in the context of a weakening fiscal stance despite strong growth.** Declining domestic revenues led to cash flow pressures, accumulation of arrears, and wider fiscal deficits as public debt rose despite debt write-offs. To restore fiscal sustainability and build buffers against natural disasters, the authorities took various measures in 2019 including a windfall income tax, increasing the sales tax rate (ABST) on hotels, and extending the ABST to tour operators. Further reforms were envisaged in 2020, comprising the expansion of the property tax and ABST bases, reducing concessions and exemptions, and introducing a tourism guest levy to fund the Climate Resilience and Development Fund (CRDF). However, as the pandemic pushed the economy into a deep recession, fiscal plans were postponed, and public debt rose to 102 percent of GDP in 2020.

**2. In January 2021, Cabinet approved a rule-based fiscal framework underpinned by a Medium-Term Fiscal Strategy (MTFS) and Fiscal Resilience Guidelines (FRG) to entrench fiscal discipline and restore debt sustainability.** It seeks to strengthen financial management, fiscal resilience, stability and sustainability, create fiscal space to deliver better services, reduce public debt, provide resources for needed infrastructure, and mitigate the impact of natural disasters and other external shocks (e.g., pandemic). The MTFS and FRG set quantitative fiscal targets for the primary balance, spending growth, tax collections, and public debt (Table 1). Implementation of the MTFS is under way, including fiscal reform efforts. Nonetheless, the legal and institutional framework is not embedded in legislation. The framework also lacks an independent appointment of an oversight committee, and the timing for its selection and operationalization is yet to be defined.

### **Dominica**

**3. Dominica had one of the highest debt levels in the ECCU prior to the pandemic.** Public debt increased from 70 percent of GDP in 2015 to 94 percent of GDP in 2019 post-tropical storm Erika and Hurricane Maria. While still recovering from back-to-back natural disasters, the pandemic hit the economy hard. In 2020, the authorities requested a Rapid Credit Facility (RCF) and committed to a fiscal consolidation plan to put public debt on a sustainable downward path. The fiscal measures to increase revenue mobilization and improve spending efficiency were estimated to improve the fiscal stance over the medium term by 5 percent of GDP.

**4. On November 2021, Dominica’s parliament approved a rules-based Fiscal Responsibility Framework (FRF).** The FRF seeks to enhance long-term resilience, stability and sustainability of public finances through entrenched fiscal discipline by guiding and anchoring fiscal policy in the budget process. The fiscal rule is anchored on a public debt-to-GDP ratio of 60 percent by 2035 to be met by operational targets on the primary fiscal balance (Table 1). The fiscal rules and targets exclude grant-financed capital expenditures and include escape clauses for natural disasters and pandemics.

**5. Dominica is also making efforts to strengthen its fiscal institutions through structural reforms.** In addition to the Fiscal Responsibility Act, ongoing reforms include a new Public Procurement and Disposal of Public Property Act and a framework to monitor state-owned enterprises, important to identify contingent liabilities and fiscal planning.

### ***Grenada***

**6. Grenada was the first sovereign country in the ECCU to adopt a rule-based fiscal responsibility framework (FRF).** Due to severe external shocks (e.g., Hurricanes Ivan and Emily), public debt rose from below 42 percent of GDP in 2000 to over 100 percent of GDP by 2010. The urgent need to restore macroeconomic stability and support the economic recovery from the 2009 recession led to the enactment of the Fiscal Responsibility Act of 2015 (FRA). The FRA was initially calibrated to lower the debt-to-GDP ratio to 55 percent by 2025. Shortly after passage of the FRA, a fiscal council was tasked with monitoring the implementation of the FRA (Table 1).

**7. The framework—underpinned by a home-grown fiscal consolidation strategy and supported by an IMF Extended Credit Facility (ECF 2014–16)—was successfully implemented.** Fiscal discipline, structural reforms, access to concessional financing, and debt restructuring helped to restore macroeconomic stability and put public debt on a sustainable trajectory—to 84 percent of GDP by 2016 and below 60 percent of GDP by 2019. Prior to the pandemic, it was estimated that Grenada would reach the FRA’s debt target by 2021—four years ahead of the target, reflecting adherence to the FRF.

**8. The COVID-19 pandemic and weak recovery led to the suspension of the fiscal rule, reinforcing discussions about the need to strengthen the FRF.** In response to the pandemic shock and its lingering effects, the escape clause was triggered in 2020–22 to support the economic recovery and protect the vulnerable population. The authorities plan to return to the FRA in 2023. Key areas for future review can include enhancing the communication strategy about medium-term fiscal targets and making fiscal rules more flexible and compatible with the recovery from the pandemic while making progress towards resilience building.

***St. Vincent and the Grenadines***

**9. The authorities adopted a Fiscal Responsibility Framework (FRF) at the onset of the pandemic.** The authorities had previously introduced fiscal consolidation measures and set up a Contingencies Fund to ensure fiscal and debt sustainability. Complementing their efforts, the Fiscal Responsibility Resolution was approved by parliament in January 2020. The FRF, which remains to be entrenched in primary legislation, includes primary balance and spending operational targets to achieve the public debt-to-GDP ratio to 60 percent by 2030 (Table 1). A fiscal council (Fiscal Responsibility Mechanism) was also established to oversee compliance with the FRF.

**10. The pandemic and the 2021 volcanic eruption have delayed the implementation of the fiscal rule.** In line with the escape clauses stipulated in the FRF, the authorities delayed the implementation of the FRF due to the COVID-19 pandemic in 2020. In 2021, the government released fiscal policy measures immediately to respond to the economic and social crisis from the eruption of La Soufrière Volcano that further delayed the implementation of the FRF and worsened the fiscal position.

**11. The government plans to implement the FRF, but the plan lacks a time frame and modality for its operationalization.** Relative to pre-pandemic, debt level has risen to 89.2 percent of GDP in 2021 from 68.1 percent in 2019. Against this background and to strike an appropriate balance between supporting the recovery and ensuring debt sustainability, a revision and update of the FRF's fiscal rule target and its implementation timeframe and modalities appears necessary. Nevertheless, there is no detailed plan announced yet, though the Cabinet appointed five Fiscal Council members in September 2021.

***ECCU Countries Implementing Disaster Resilience Strategies***

**12. Dominica** plans to implement a comprehensive insurance strategy with a risk layering framework. Insurance layers' coverage will be decided to efficiently address risk and damage for an incremental range of disaster intensities, targeting coverage of 99 percent of estimated fiscal costs related to natural disasters. The framework comprises three layers:

- Layer 1: Small and medium disasters. The first layer will be used to cover losses from small and medium but more frequent natural disasters. This layer will include a savings fund for self-insurance, financed by CBI revenues for start-up cost, and annual budget contributions to make it sustainable.
- Layer 2: Large disasters. This will be covered with high access under the Caribbean Catastrophe Risk Insurance Facility (CCRIF).
- Layer 3: Extreme disasters. A third insurance layer with issuance of Catastrophe (CAT) bonds could also be considered, albeit at a cost exceeding expected payouts. This option would

require regional issuance pooling considering the high administration cost to enable market demand; it is therefore considered a strategy to be developed in the medium term.

**13. Grenada** adopted a National Disaster Risk Financing Strategy (DRFS), to strengthen financial resilience by building complementarity between several risk retention and risk transfer instruments that provide adequate access to financial resources in the event of a disaster, with a risk layering framework that covers incremental risk and damage for a range of disaster intensities. The layered buffers include risk retention mechanisms, particularly self-insurance in the form of a contingency fund, risk transfer mechanisms such as CCRIF, the World Bank's CAT-DDO, the hurricane clause for debt service, and private sector insurance mechanisms.

### ***How Other ECCU Countries are Building Resilience***

**14. St. Vincent and the Grenadines** has made various efforts to strengthen its preparedness and capacity to respond to disasters. The government introduced three layers of instruments to improve financial resilience and alleviate fiscal pressure: (1) Contingent Fund created in 2017 as a self-insurance Fund to cover emergency relief in the event of a natural disaster; (2) enrollment in regional risk-sharing facilities, CCRIF; (3) enrollment in contingent credit lines, the World Bank's CAT-DDO. Additionally, to improve structural resilience, the country introduced the National Climate Change Policy (2019) to lay out an institutional framework. While it received some financing from the Green Climate Fund (GCF), limited funding is available to fully support the added responsibilities and measures to adapt to climate change.

**15. Antigua and Barbuda** has made policy and institutional changes to enhance resilience to natural disasters and climate change. To limit the financial impact of natural disasters, Antigua and Barbuda participates in the CCRIF. Additionally, a Sustainable Island Resource Framework (SIRF) Fund was introduced in 2019 to serve as the primary channel for environmental, climate mitigation and adaptation funding from international sources such as the GCF and from domestic sources. Given the SIRF Fund's limited size to deal with major hurricanes, a Climate Resilience and Development Fund (CRDF) was planned for introduction in the first half of 2020 to help build fiscal buffers to absorb the costs of such shocks, but the pandemic delayed its establishment. Financing for the CRDF would come mainly from domestic sources, including from the Tourism Guest Levy that went into effect in October 2021.

## Annex II. Debt Fanchart and Operational Target Templates

*This annex summarizes the toolkit of Gbohoui and Akanbi (forthcoming). This toolkit builds upon the toolkit of Eyraud and others (2018) to account for natural disaster shocks, mitigating mechanisms, and climate investment. The template was first piloted for Grenada and St. Vincent and the Grenadines.*

### Debt Fanchart Template

**1. Debt anchor.** The original toolkit calibrates the debt anchor using a three-step procedure: (1) constructing paths for key macroeconomic variables subject to shocks drawn from their historical distribution, (2) projecting medium-term debt trajectories consistent with each simulated path using the debt dynamic equation and a fiscal reaction function, and (3) identifying the debt anchor such that debt would not exceed a certain higher limit with high probability over the medium term.

- **Accounting for natural disaster risks.** Natural disasters pose a severe downside risk to growth, suggesting a need to consider an asymmetric growth distribution (i.e., thicker left tail). The revised toolkit models natural disaster risks parametrically. The overall growth shock,  $Y_t = Y_t^* - \mathbb{1}_{D_t=1} Z_t$  at time  $t$  combines “normal” growth shocks,  $Y_t^*$ , with a second component, where  $\mathbb{1}$  is the indicator function,  $D_t$  is drawn from a Bernoulli distribution whose parameter,  $p$ , is the probability of the occurrence of a natural disaster and  $Z_t$  is drawn from a Pareto distribution, whose parameters are calibrated to match the average marginal growth effects of natural disaster shocks, and the skewness of growth shocks distribution.<sup>1</sup> Given the difficulty to fully match the overall growth distribution in practice, one option is to adopt a two-step approach as done for the ECCU country cases. First, the natural disaster shocks are differentiated according to small and large shocks, with the former already captured in “normal” growth shocks. Second, one calibrates the Pareto distribution using large natural disasters.

**2. Climate shocks are calibrated to be larger and more frequent in Grenada than in St. Vincent and the Grenadines in line with observed data.** Natural disaster shocks are modeled parametrically as a combination of a binomial distribution, to capture the frequency of natural disasters, and a Pareto distribution, to capture the growth impact conditional on the materialization of a disaster. The Pareto distribution is estimated from all tropical storms or floods in the EM-DAT dataset for ECCU countries which incurred damages larger than 2 percent of GDP during 1980-2019. To map damages to GDP growth space, the rule of thumb provided in Lian, Moran, and Vishvesh (forthcoming) was used.

**3. Incorporating mitigating measures of natural disaster shocks.** Maintaining a sufficiently low debt to account for natural disasters may not be feasible. In practice, countries use a combination of other risk transfer or sharing instruments—such as climate or natural disaster funds (as in St. Vincent and the Grenadines), regional insurance (ECCU), catastrophe bonds (Barbados and

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<sup>1</sup> The Pareto distribution is one of the most common asymmetric distributions used in the literature. Its cumulative distribution function is:  $F(x) = 0$  if  $x < \gamma$ , and  $F(x) = 1 - \left(\frac{\gamma}{x}\right)^\alpha$  otherwise where  $\gamma$  and  $\alpha$  are the scale and shape parameters.

Grenada), or the Catastrophe Containment and Relief Trust and the Catastrophe Deferred Drawdown Option-Cat DDO—to cover immediate needs and longer-term post-disaster development. The toolkit integrates these mitigating channels in reduced form. An amount in percent of GDP is disbursed in equal annual installments if at least one natural disaster occurs over the forecast horizon. The impact on debt accumulation in each year is then reduced by the disbursed amount, limiting debt increases which in turn alleviates the need to set a lower debt anchor.

## Calibrating the Operational (Deficit) Rules

4. **Setting an operational target consistent with the debt anchor.** The template is based on the debt dynamic equation and determines the deficit paths that allow debt to converge from the current level to the anchor level. It requires inputs on key macroeconomic parameters such as growth, interest rates, and the current levels of deficit and debt.
5. **Introducing natural disaster shocks.** The revised toolkit allows an occurrence of severe natural disasters in the transition period, with the flexibility to set the timing and severity of the shock. Following a natural disaster shock, the country activates the escape clause within the rules-based fiscal framework to provide fiscal support. Without other arrangements, it would imply more abrupt fiscal adjustment, which could prove economically and politically unviable. The size of additional fiscal efforts would depend on the distance of the deficits relative to the rule limits as well as the remaining horizon to reach the debt anchor. The revised toolkit offers the possibility to extend the horizon to reach the debt anchor to accommodate a more gradual fiscal adjustment.
6. **Incorporating mitigation mechanisms.** Besides extending the horizon, the country that just experienced a natural disaster often has other mitigating mechanisms, as discussed above. The revised toolkit allows for user-defined external resources. This allows more modest deficit and debt paths given the availability of mitigating measures.
7. **Incorporating climate investment.** The profile of climate investment would affect the calibration of the deficit rules.<sup>2</sup> The template allows for a front-loaded phase of investment<sup>3</sup> which then implies an adjustment in subsequent periods to achieve the same debt anchor. Debt declines more modestly during the investment phase but then falls faster when budget balances are maintained at higher levels.

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<sup>2</sup> The toolkit is not limited to climate investment and can adapt to any medium-term and long-term public investment purposes.

<sup>3</sup> The toolkit also allows to model an anticipated investment in the future, either as an increment per year or as a constant annual outlay. Interested readers could refer to Gbohoui and Akanbi (forthcoming) for further explanations. The users have the flexibility to set the initial investment period and the convergence horizon.

## Annex III. Description of the Stochastic Simulation Methodology with GIMF

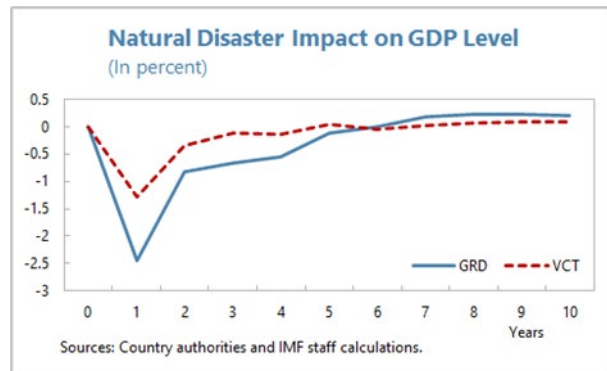
1. **The GIMF model<sup>1</sup> is used to analyze the stochastic properties of the key macroeconomic variables.** To obtain the macro variables' distributions, the model is run with many alternative future paths of the economic shocks drawn from their statistical distribution.
2. **The distribution of economic shocks is estimated using the data and the GIMF model.** As a model input, the economic shocks drive the behavior of model variables. But this can be reversed. The goal is to answer the following question: for observed paths of output, inflation, and other model variables, what were the shocks that generated those paths? To estimate the selected economic shocks, the model is "inverted." This can be a hard problem to solve, in general. The problem becomes much simpler by choosing the number of economic shocks equal to a number of the observed variables to condition on. Then the shocks can be easily estimated using both a linear and a non-linear model and—crucially—there is no need to specify an a priori parametric statistical distribution of the shocks.
3. **The estimated economic shocks fed back to the model replicate the historical data.** There are  $N$  shocks for  $K$  countries, over  $T$  periods, cast into a  $[N \times K \times T]$  matrix. To estimate the shocks' non-parametric and unknown joint distribution, the kernel density must be estimated first. Subsequently, this distribution is used for sampling. The procedure boils down to a block-bootstrap with jitter. The  $[N \times K \times T]$  matrix of shocks is the key object for the sampling. Each counterfactual simulation draws a  $[N \times K \times p]$  block from the full shock matrix to maintain the cross-sectional and time dependence of the estimated economic shocks and adds a draw from the multivariate kernel function used in the estimate (multivariate Gaussian kernel is used). This added "jitter" makes each observation unique and avoids sample impoverishment.
4. **For special events, like climate shocks and natural disasters, the shocks can be estimated jointly with the other shocks if the events are observed, and the impulse-response functions generating these events are well identified (observability condition).** Joint estimation of all shocks would help to identify better the more common macroeconomic demand and supply shocks. Since natural disasters and climate events are rare and the past may not be representative of the future, the sampling distribution for these shocks need not be drawn from the estimated empirical distribution. Other fat-tailed distributions can be selected, reflecting the analysts' knowledge of the phenomena, reflecting the body of knowledge about climate change and the behavior of complex ecosystems.

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<sup>1</sup> See Kumhof and others (2010), Anderson and others (2013), and Carton and others (2017) for more information about the model. The model allows for various nominal and real rigidities as well as assuming an overlapping generations structure with hand-to-mouth consumers. This structure allows for an active role for fiscal policy, with a rich fiscal structure in the model. Monetary policy is typically guided by a Taylor rule, and for the case of the ECCU, it is assumed to be guided by a fixed exchange rate.



**5. Specifically, climate shocks are calibrated to match observed data on climate events.** The impact (intensity) of each climate shock is calibrated to match CCRIF and EM-DAT estimates of damages associated with climate events. These damages are expressed as percent of GDP and assumed to correspond to public and private capital damages. The frequency of each shock is also extracted from recorded events in the EM-DAT database. Historically, climate events have been more frequent and intense in Grenada than in St. Vincent and the Grenadines.



**6. Compared to a pre-specified parametric distribution, like a multivariate Gaussian, for example, the benefits of the sampling scheme used is that it adapts to the data** and allows for asymmetries, fat tails, and complex forms of data interdependence possibly not explained by the model. Due to its adaptive nature, any possible model misspecification becomes reflected in the estimated shocks. After all, the shocks and the model must jointly replicate the historical data, and this makes the distribution of future outcomes very realistic.

**7. As in Andrieu and others (2015), expenditure and primary balance rules are considered.** Both rules are similar to those embodied in FRFs in the ECCU, are considered. The first type of rule is a primary balance rule (PB) of the type:

$$Def_t = Def^* - \alpha Y_t - \beta(Debt_{t-1} - Debt^*) \quad (III.1)$$

where  $Def$  is the primary balance as a percent of GDP,  $Def^*$  is the associated primary deficit target consistent with the debt to GDP target ( $Debt^*$ ),  $Y$  is the output gap and  $Debt$  is the debt-to-GDP ratio. To operationalize (1) two types of spending—government consumption (GC) and general transfers (GT)—are used. The second type of rule is a nominal expenditure rule (EXP) with a debt break:

$$100 \log(EXP_t) = 100 \log(EXP^*) + \delta Y_t - \gamma(Debt_{t-1} - Debt^*) \quad (III.2)$$

where  $EXP$  denotes government consumption of goods and services and  $EXP^*$  is trend GC. The calibration of the coefficients  $\delta$  and  $\gamma$  is such that the public debt-to-GDP ratio *returns to its target level within 10 years following a shock*. Table 1 presents the various fiscal rules' parameters.



Annex III Table 1. Fiscal Rule Parameterizations

Fiscal rule	Parameterization	
Rule (1)		
CG Primary balance rule	$\alpha=0$	$\beta =0$
CG Primary balance rule w/ output stabilization	$\alpha=0.25$	$\beta =0$
CG Primary balance rule w/ output stabilization and debt correction	$\alpha=0.25$	$\beta =0.5$
CT Primary balance rule	$\alpha=0$	$\beta =0$
CT Primary balance rule w/ output stabilization	$\alpha=0.25$	$\beta =0$
CT Primary balance rule w/ output stabilization and debt correction	$\alpha=0.25$	$\beta =0.5$
Rule (2)		
CG expenditure rule with small debt correction	$\delta=0$	$\gamma=0.5$
CG expenditure rule with larger debt correction	$\delta=0$	$\gamma=1$

Source: IMF staff estimates.

- The rest of the model is calibrated for the blocks so that the steady state matches their average stylized facts (such as the shares of consumption and investment in GDP).** Both Grenada and St. Vincent and the Grenadines represent around 0.001 percent of global GDP, with the rest of the ECCU representing around 0.007, the United States around 24 percent and the rest of the world around 75.9 percent of global GDP. Table 2 presents the calibration of some essential ratios to GDP, which point to some differences between Grenada and St. Vincent and the Grenadines.<sup>2</sup> Crucially, Grenada is a more open economy than St. Vincent and the Grenadines<sup>3</sup> but has a smaller public sector, with lower expenditures on consumption goods, investment and transfers and lower revenues. Despite being less open, St. Vincent and the Grenadines obtains more revenues from imports than Grenada.<sup>4</sup>

<sup>2</sup> The calibration is based on the average ratios (except government debt) prior to the pandemic.

<sup>3</sup> Openness is key in the results that follow, as fiscal multipliers are smaller in more open economies.

<sup>4</sup> On the production side, absent data, it is assumed that the labor share is 60 percent for both countries. GIMF does have a rich supply structure with intermediate and final good producers and tradeable/non-tradeable sectors. However, it does not have a sectoral structure (e.g., agriculture, tourism, etc.).

Annex III Table 2. Calibration of Some of the Key Ratios

Steady-State shares (in percent of GDP)	GRD	VCT
National Accounts		
Private consumption	63.3	60.8
Investment	23.4	19.8
Public Spending	16.6	21.9
Consumption	12.9	17.1
Investment	3.7	4.8
Exports	52.6	44
Imports	55.9	46.5
Fiscal Accounts		
Total Revenues	24.8	34.4
Consumption tax	8.5	8.5
Labor tax	2.1	4
Corporate tax	1.8	3
Tariffs	7.8	16.2
Government Spending	24.5	34
Public consumption	12.9	17.1
Public investment	3.7	4.8
Transfers	7.9	12.1

Source: IMF staff estimates.