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Pooling Fiscal Risk in the ECCU: Quantifying Savings of a Regional Fund for Stabilization and Investment

by Alejandro Guerson

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Pooling Fiscal Risk in the ECCU: Quantitative Assessment of Savings with a Regional Stabilization Fund

Prepared by Alejandro Guerson

Authorized for distribution by Sònia Muñoz

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Abstract

This paper quantifies the savings obtained from risk pooling with a Regional Stabilization Fund (RSF) for the Eastern Caribbean Currency Union. A Monte Carlo experiment is used to estimate the size of a RSF conditional on probabilities of depletion under specific saving-withdrawal rules. Results indicate that regional risk pooling requires about half of the saving amount relative to the sum of individual-country savings. In addition to reducing the amount of saving requirements for stabilization, the RSF can improve welfare by reallocating government consumption savings during booms towards public investment during recessions, resulting in an increase of public investment in the range of 0.5-1.5 percent of GDP per year depending on the country, with positive growth dividends. Moreover, the RSF also reduces the dispersion of public debt outcomes in light of the cross-country cyclical synchronicity of output and revenue, thereby strengthening the stability of the regional currency board.

I. INTRODUCTION

Small island states in the Eastern Caribbean Currency Union (ECCU) exhibit significant volatility in output and government revenue. This volatility implies challenges to macroeconomic management and affect financial stability, fiscal discipline, external competitiveness and growth.[1] Output volatility also results from low output diversification related to smallness: comparative advantage in a relatively narrow spectrum of sectors (mainly tourism) subject to global growth swings and dependence on key commodity imports, including oil and manufactured goods for investment and consumption.
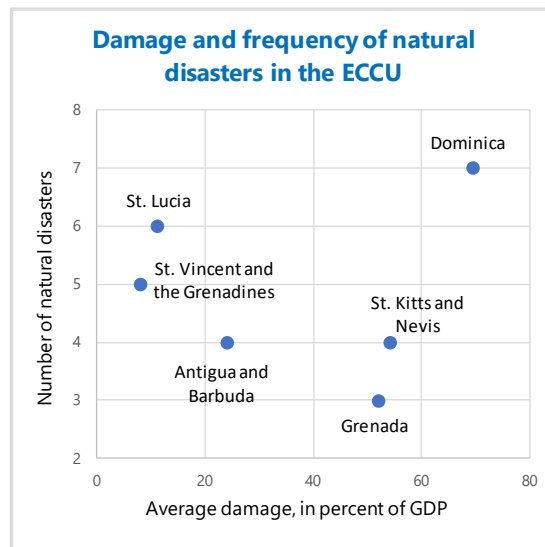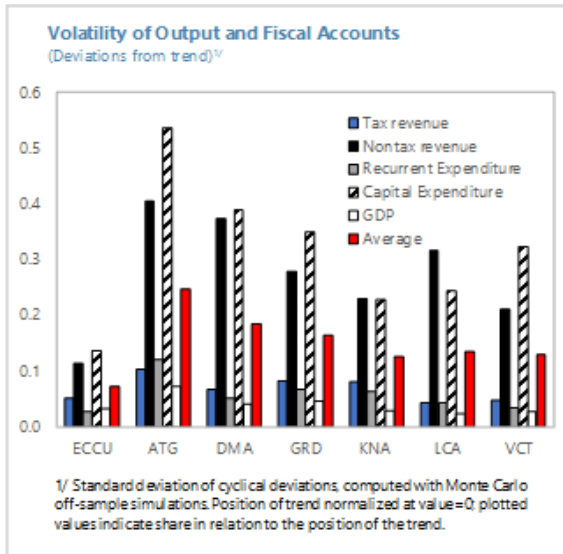
In addition, natural disasters (NDs), including tropical cyclones, earthquakes and volcanic eruptions, affect the region recurrently and impose significant losses of macroeconomic proportions, resulting in protracted increases in public debt (Acevedo, 2014).[2] In a sample of Caribbean countries, Cantelmo, Melina and Papageorgiou (2019) find that the welfare loss from natural disasters are equivalent to a permanent decline in consumption of 1.6 percent of GDP.

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[1] See Rasmussen 2004; Noy 2009; Cavallo and Noy 2011; Cavallo, Galiani, Noy and Pantano 2013.

[2] See for example Cummins and Mahul (2009) for a presentation of natural disaster insurance and general principles for public intervention.

In addition, government spending in ECCU countries has been procyclical, compounding the supply-driven sources of volatility above. The text chart shows that the cyclical component of output has a strong positive correlation in most ECCU countries.
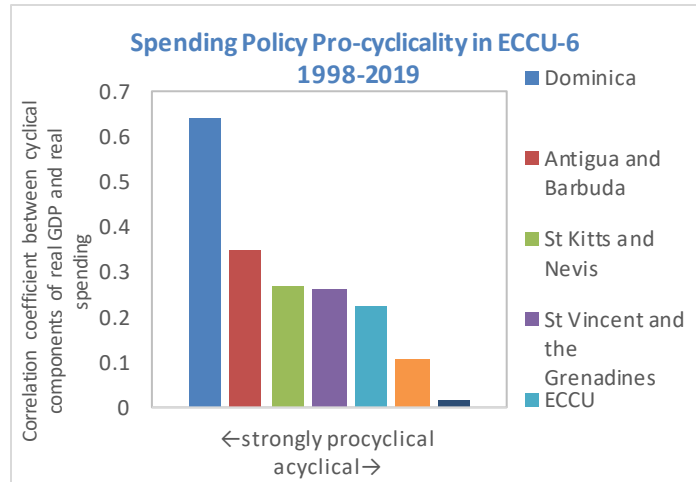
The need for self-insurance in the form of stabilization funds (SF) or a regional stabilization fund (RSF) is explained by financing constraints and political economy factors. ECCU countries are not integrated to global financial markets; the bulk of financing remains external in the form of official multilateral and bilateral loans. This implies difficulty to access financing during recessions with timing and amount commensurate with stabilization needs given administrative and processing frictions involved in project-based lending. Domestic financial markets remain significantly narrow.[3] Also, and critically, the vulnerability to potentially catastrophic NDs shocks imply need for immediate availability of financing for rehabilitation and reconstruction; available insurance instruments are insufficient and expensive.[4]

This paper quantifies the saving flows and size of establishing a RSF in the ECCU. The paper estimates the size of a RSF required for government consumption and investment stabilization for empirically plausible saving-investment rules. Savings of a RSF vis-à-vis individual countries' SF are estimated by comparing the estimated size of the RSF with resource pooling to the sum of individual country SFs, for given saving-investment flows. The simulations assume that a share of the government consumption pro-cyclical increase during economic booms is saved in the RSF, and the saving is used to finance public investment during recessions when, as shown empirically in this paper, public investment typically declines. The RSF therefore serves its main purpose of cyclical stabilization, while also contributing to increase public investment and growth.

Regional saving funds have been quantified and simulated by Dos Reis (2004a, 2004b, 2005) for the ECCU, Central America, and the African CFA-Fran -zone. However, the simulations in those studies focus on revenue and output asymmetries only, abstracting from the cyclical behavior of output and government spending for stabilization and the over-the-cycle reallocation of government consumption towards investment. The simulations in this paper present a more granular fiscal analysis distinguishing the cyclical behavior of tax and non-tax

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[3] The regional Securities Market has limited depth, and bonds issued regionally are seldom traded both locally and internationally, reducing demand.

[4] The Caribbean Catastrophic Regional Insurance Facility (CCRIF) has been a valuable instrument to finance disaster recovery, but extensive coverage is costly due to high reinsurance cost in international markets, resulting in under-insurance.

revenue, and also government consumption and investment. These distinctions are important for the quantitative results of the RSF and the specific objectives sought of both economic stabilization and increase in public investment. Non-tax revenue has become prominent in most ECCU countries with the increase in Citizenship-by-Investment (CBI) programs that provide substantial revenue and, without careful cyclical management, can exacerbate output volatility and competitiveness challenges (Xin Xu, El-Ashram and Gold, 2015). Distinction between government consumption and investment allows simulation of saving-investment rules that enable the simulation of cyclical stabilization and spending allocation rules over the cycle. Finally, the simulation framework in this paper integrates the RSF saving-investment flows with probabilistic regional and national public debt simulations, thereby measuring the benefits of the proposal also in terms of debt dynamics and dispersion. The later is important considering the regional currency board arrangement that relies on fiscal sustainability of the membership for its sustainability.

The rest of the paper proceeds in three sections. Section II presents the methodology. Section III shows a plausible calibration of the framework. Section IV displays the results, establishing the procyclical government expenditure pattern upon which the benefits of the RSF proposal rests, and then computing the size and saving amounts of regional resource pooling by comparing the needs for each country individually vis-à-vis the regional aggregate. Section V concludes and offers considerations for implementation.

II. METHODOLOGY

The first step is to estimate an empirical model for each country to capture the joint cyclical variations of output and government revenue and expenditure. To this end, an unrestricted Vector Auto-regression Model (VAR) is estimated for each country with specification

$$X_t = \gamma_0 + \sum_{k=1}^{p} \gamma_k X_{t-k} + \epsilon_t.$$

where Y_t is a vector of endogenous variables including the cyclical components of GDP; government tax revenue; non-tax revenue; current primary expenditures; and capital expenditures; $p\text{-}1$ is the number of distributed lags, for data sample spanning 1990-2019. The endogenous variables are expressed as a share of each indicators' trend [5],

$$\hat{x}_{it} = x_{it}/x_{it}^{trend}; \hat{x}_{it} \in X_t.$$

$\epsilon_t \sim N(0, \Omega)$ is the vector of residuals, with variance-covariance matrix Ω characterizing the joint statistical properties of the contemporaneous disturbances of the endogenous variables. γ_k is the vector of coefficients.

The second step is to run a Monte-Carlo experiment. This involves generating a large number of simulations using the estimated model above. The simulations use a sequence of random vectors $\hat{\epsilon}_{t+1}, \dots, \hat{\epsilon}_T$ such that $\forall \tau \in [t+1, T], \epsilon_\tau = W v_\tau$, where $v_\tau \sim N(0,1)$, and W is such

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[5] The cyclical components of GDP are estimated using the Hodrick-Prescott filter on 1990-2018 annual data. All variables expressed in real terms using the GDP deflator.

that $\Omega = W'W$ where W is the Choleski factorization of Ω. The estimated VAR is then used to generate 1000 forecasts X_τ for each country with the randomly-generated shocks $\epsilon_\tau, \tau = t + 1, \dots, T$.[6] The simulations consist of vector sequences of the five endogenous variables in the model, each affected by simulated random shocks of statistical distribution as estimated sequences of vector residuals. In this way, the simulations mimic historical volatility, persistence, and co-movement in the sample data. The results are then used to compute probability density functions for each of the five endogenous variables in each year projected.

The simulations in deviations from trend are then transformed as a percent of GDP. To that end, a deterministic trend is projected for each variable assuming each and all trends grow at the same constant rate starting from the end point of the estimated trend in the sample period, that is

$$x_{it+l} = \hat{x}_{it+l} x_{it+l}^{trend} \quad \text{with} \quad x_{it+l}^{trend} = x_{it}(1 + g)^{l-t}; l = 0, \dots, T;$$

where g is the potential growth rate assumption. After all endogenous variables are expressed in real-term levels, they can be calculated in percent of GDP by dividing each of the fiscal indicator projections by the GDP projection in each of the vector simulations. In order to ensure revenue and expenditure indicators as a percent of GDP are consistent with the data, the starting points of the trend projections are set at constant prices of the last year of the sample, 2019.[7]

The third step is to specify the saving and investment flows vis-à-vis the SF. Savings S_t in year t are assumed to take the form of a share of current primary expenditures *above* trend, that is $S_t = \varphi [G_t - G_t^{trend}]$ if $G_t - G_t^{trend} > 0$, $S_t = 0$ otherwise, where G_t is current primary expenditure computed in the simulations. Specified in this way, governments are assumed to reduce the extent of pro-cyclical public consumption (expenditure booms are positivelly correlated with output and revenue booms in the data and thus in the simulations). Public investment I_t in year t is assumed to take the form of a share of government investment *below* trend, that is $I_t = \sigma [X_t - X_t^{trend}]$ if $X_t - X_t^{trend} < 0$, $I_t = 0$ otherwise, where X_t is government investment budget execution. Saving in the stabilization fund is therefore used to finance public investment above the level that would have been predicted in the simulation. This results in stabilization of government consumption and smoothing of public investment, and also in an increase in public investment over-the-cycle. The stabilization fund stock, denoted SF_t, evolves according to $SF_{t+1} = (1 + i_t) SF_t + (S_t - I_t)$, where i_t is the interest rate on savings from year t to $t+1$.[8]

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[6] Notice that the results are not sensitive to the ordering of the variables in the VAR, as the stochastic simulation results are shaped per the variance-covariance matrix of reduced-form errors Ω, which is unique.

[7] It is therefore implicitly assumed that the deflators of GDP and the remaining fiscal variables change at the same rate in the projections.

[8] The simulations assume that is the SF is depleted, investment financing flows to the budget are constrained by the amount of remaining resources in the SF.

The simulations are then used to calculate public debt dynamics in each random simulation with the debt accumulation identity

$$D_{t+l+1} = (1 + i_{t+l+1})D_{t+l} - PB_{t+l} + (S_t - I_t); \ D_{t+l} > 0; \ l = 0, \dots, T \ ;$$

where D_{t+l+l} is the stock of public debt in year $t+l+1$, and PB_t is the primary balance in the revenue and primary expenditure simulations. The implicit interest rate i_t is calculated as the ratio of interest expenditures in year t divided by public debt stock in $t-1$. Notice this results in stochastic debt simulations that take into account saving and investment flows vis-à-vis the SF.

The solution is obtained by finding the SF expected withdrawal for investment that equates the saving flows to enure the sustainability of the SF. This is done by solving for the share of government ivestment $\sigma \in [0,1]$ that meets the transversality condition $E_t[SF_{T+N} / Y_{T+N}] = SF_T / Y_T$, where E_t is the expectations operator, Y is GDP, T is the last year of the sample, data and N is the number of years for which the SF is to remain with positive saving. The transversality requires the SF to remain stable in expected terms, thereby ensuring the SF sustainability without inefficient perpetual acummulation of resources (if σ is set "low" then more public investment could have been afforded with the available resources in the SF), or a declining trajectory in expected (if σ is set "high" then too much public investment is allowed relative to saving flows, which ends up depleting the SF). Also, N needs to be set large enough to cover complete boom-bust cycles in the simulations. The solution for σ is pinned down by setting a SF probability of depletion π at a terminal time horizon $T+N$. (φ, π, N) are therefore parametric government choices that governments would set according to risk aversion preferences, as measured in terms of the probability of SF depletion.

The size of the RSF is calculated following the procedure above with aggregated output, revenue and expenditure data of all countries. Aggregation can result in revenue and expenditure cycles that are less pronounced than the sum of the individual countries' cycles—equality would require perfect correlation of cyclical deviations accrosss countries, an unlikelly possibility.[9] Notice that the RSF would suffice to allow each country to benefit from the same saving-investment flows than having individual SFs by virtue of implicit cross-country financing flows.

The simulation framework also allows specification of structural fiscal consolidation, important to govern the expected trajectory of public debt. To this end, the projected trends used in the simulations of revenue and expenditures can be shifted up or down at any simulated year to internalize permanent fiscal policy innovations. In this way, public debt simulations can be calibrated to ensure fiscal sustainability. This is important to provide incentives for participation—countries are unlikely to be willing to participate in a RSF with

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[9] Notice that this need not be the case mathematically, but it turns out to be true in the simulations. For example, a country with no cyclical fluctuations and therefore no need for a SF would not benefit from risk pooling with a volatile partner. On the opposite end, countries with perfectly opposing cycles would benefit the most, mathematically requiring a zero-balance SF: the saving of one member would exactly match the withdrawal of its counterpart member resulting in net-zero transfers.

pooled resources if other members confront fiscal sustainability challenges which can compromise their ability to contribute their share of saving.

III. CALIBRATION

The next step is to choose parameter values for the framework above. The parameters in the illustrative simulations are set as shown in the text table below. Potential output growth has been set according to the long-term projected growth rates in the International Monetary Fund World Economic Outlook (WEO) database.[10] The interest rate on public debt for each country has been set as the ratio of the governments' interest expenditure to the previous year's debt stock. The amount of fiscal consolidation is calculated as the cumulative improvements in primary balances as per projected revenue and primary expenditure in the WEO database over the medium term (5 year horizon). This reflects a combination of fiscal measures as well as projected changes in investment plans as per identified government financing, and also in non-tax revenue.

The following parameters moving down the table govern inflows and outlows from the SFs. The share of expenditure above trend that is saved (φ) has been set exogenously at a value of 1 for illustrative purposes—all revenue above trend is saved. This choice implies country-specific amount of saving (S) *inflows* into the SF according to the depth and length of revenue cycles in each country, which are shown in the table in percent of GDP on average accrosss simulations, per year. This determines a total amount of resources that will go into the SF over time. Given this, the share of investment spending below trend financed by SF *outflows* to the budget (σ) is solved for endogenously such that the SF is sustainable in expected terms, as set by the transversality condition. This results in an amount of investment (I) in percent of GDP on average across all simulations, per year. Finally, the bottom row in the table displays the probability of depletion of the SF/RSF for the parameter choices above.

Parameter Calibration in Simulations								
Parameter	Description	Antigua and Barbuda	Dominica	Grenada	St. Kitts and Nevis	St. Lucia	St. Vincent and the Grenadines	ECCU
g	GDP potential growth, percent	2.777	1.642	3.051	2.642	1.847	1.869	2.294
i	Implicit interest rate on public debt, percent	3.176	2.333	3.037	2.363	5.250	3.183	3.615
PB	Cumulative fiscal consolidation, percent of GDP	-1.760	0.468	-0.888	-5.979	0.724	0.569	-0.330
φ	Share of expenditure above trend saved	1.000	1.000	1.000	1.000	1.000	1.000	1.000
S	Inflows into the Fund from the budget, percent of GDP	0.909	0.558	0.412	0.562	0.308	0.273	0.208
σ	Share of government investment below trend financed with SF	1.273	0.276	0.434	1.353	0.650	0.488	0.404
I	Outflows of the Fund to the budget parameters, percent of GDP	0.545	0.540	0.344	0.408	0.263	0.236	0.099
	Avg. annual probability of SF depletion	0.009	0.010	0.050	0.032	0.049	0.051	0.001

Interestingly, the last column, which captures the results for the aggregated revenue and spending of all six sovereign ECCU countries, already advances some of the results. For $\varphi = 1$, the RSF requires less *net inflows* because cyclical revenue asymetries imply some countries are contributing positive savings while others may be withdrawing funds for investment during recessions. Given the cyclical asymetries across countries, the RSF also disburses relatively lower *net outflows* to the countries, yet it has a significantly lower probability of depletion than any of the individual countries' SFs. This observation preempts

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[10] The data reflects 2019 WEO data to avoid the effect of the Covid-19 pandemic that had a large impact on tourism-dependent ECCU economies, thereby more likely to capture long-term or structural parameters.

the results of the next section about the net savings in terms of size of a RSF vis-à-vis the needs of ECCU countries individually.

The figures below illustrate the workings of the simulation framework. The left chart shows inflow savings and outflow investments vis-à-vis the SFs in each simulated year for a random off-sample simulation. Positive values of the bars indicate net-positive saving flows from the governments to the RSF in years of regional economic booms (defined in regional terms as per the aggregated regional output) and negative values indicate net financing flows to the government budgets in years of regional recessions. The line shows the evolution of the stock of resources remaining in the RSF, which increases in years of boom and declines in years of recession. The right chart illustrates the change in aggregate net regional investment with and without the RSF and shows how investment increases in the years with net-positive budget financing flows for the same random simulation. The appendix shows random off-sample simulations for each individual country, illustrating the workings of the framework of national level SFs.
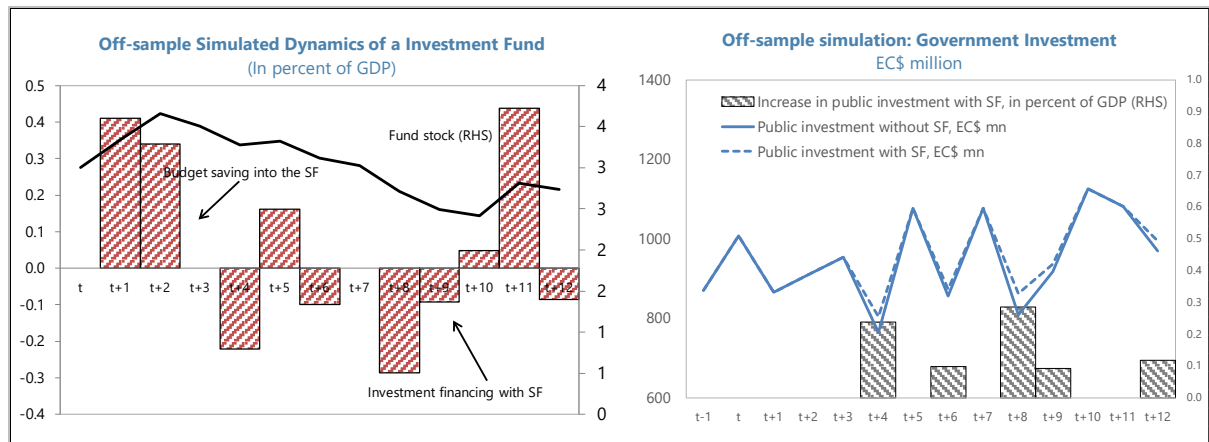
IV. RESULTS

The results are presented in two subsections. The first subsection shows that government consumption and investment spending has been pro-cyclical. This is necessary to justify the specific saving-investment rules proposed in the framework which, as explained above, have been chosen specifically to address this typically considered sub-optimal pattern in cyclical terms. The second subsection displays the workings of the simulation framework for the aggregated ECCU, including an off-sample simulation arbitrarily chosen for illustration purposes, and then summary charts that showcase (i) the probabilistic results of SF depletion for alternative saving shares, and (ii) implied public debt fan charts.

A. Pro-cyclicality of Government Spending

Establishing empirically the procyclicality of government expenditure is important because it justifies the welfare-enhancing claim of the specific RSF in this paper. First, it implies there is room to smooth spending intertemporally, contributing to reduce macroeconomic volatility and helping address the build-up of competitiveness pressure during economic booms,

particularly important in the ECCU considering it has a currency board. Second, it enables the intertemporal spending reallocation from consumption to investment explained above. Although the latest need not be optimal on a welfare perspective as it depends on preferences, ECCU governments are seeking options to finance public investment and high public debt levels in most countries imply a binding constraint. The specific proposal can therefore operate as an efficient way to create fiscal space for investment by way of a de-facto saving investment rule that earns its credibility on its regional nature: pooled resources imply incentives for cross-country pier monitoring of compliance with agreed saving-investment rules in the RSF.

Impulse-response functions analysis using the estimated fiscal VAR models indicate significant government spending procyclicality. The results show that government consumption, as measured by current primary spending, and public investment increase when output and revenue are high. The figure below shows impulse-response functions (IRFs) from the VAR estimates in previous sections for the regional aggregation of output, revenue, and expenditure. This pattern is suboptimal on an intertemporal perspective according to standard economic theory. Under risk aversion, the region could achieve higher welfare with smoother intertemporal or counter-cyclical public spending.[11]

Current spending procyclicality also crowds-out public investment over-the-cycle. For example, financial and political economy constraints can result in downward rigidity of government consumption, de-facto reducing space for investment in low states of the cycle—i.e. under political resistance or insufficient or delayed access to financing.

An implication of the regional level procyclical spending result is that the country cycles are also positively correlated, showing a significant degree of synchronization. This captures the fact that ECCU countries have similarities in their economic structures that imply exposure to common external shocks, including dependence on tourism exports, reliance on oil importation for transport and electricity generation, significant external remittance flows from a small group of countries (mainly the United States, Canada the United Kingdom, and other Caribbean countries), and exposure to global monetary and financial conditions that drive interest rates and exchange rates of major currencies, affecting the competitiveness of the Eastern Caribbean dollar which is pegged to the US dollar.

The next subsection shows that despite the cyclical synchronicity of output and government spending, cross-country asymmetries remain strong enough to provide significant savings.

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[11] Alichi et.al. (2019) show small island states positive revenue and spending fiscal multipliers in general equilibrium calibration for small states.

Procyclicality of Public Expenditure in the ECCU 1/

Response of Government Consumption to Output

Response of Capital Expenditure to Output

Response of Government Consumption to Revenue

Response of Capital Expenditure to Revenue

Response of Government Consumption to Tax

Response of Capital Expenditure to Tax Revenue

Response of Government Consumption to non-Tax Revenue

Response of Capital Expenditure to non-Tax Revenue

1/ Estimation based on a VAR model including the cyclical component of total regional output, tax revenue, non-tax revenue, government consumption (recurrent spending excluding interest), and government investment. Cyclical deviations calculated with the Hoddrick-Prescott filter, then normalized as a share of each data series' trend.

B. Regional Saving of Risk Pooling

The left figure below shows the results in terms of required size of a RSF based on the simulation framework and calibration above. The calculations showcase different levels of RSF as a percent of the regional GDP for alternative probabilities of depletion, for net inflow-outflow saving and investment flows of about ½ percent of GDP each year—but often larger at the individual country level according to the cyclical asymmetries. For

example, the RSF could be set so that country contributions imply an average level as low as 2 percent of the regional GDP. However, such relatively low level RSF would imply a high probability of depletion of 10 percent. On the other end of the spectrum, reducing the probability of RSF depletion to 0.001 would require a level of 4.5 percent of the regional GDP.

The RSF also reduces the dispersion of public debt outcomes, strengthening the sustainability of the regional currency board arrangement and thereby contributing to regional financial stability. The right chart in the figure below shows the evolution of the regional public debt aggregate including the flows vis-à-vis the RSF. By enabling implicit cross-country financing, the RSF reduces the dispersion of aggregated government debt outcomes: individual countries would need to issue more public debt to sustain the expenditure flows enabled by the RSF. In light of the cyclical synchronicity of output and revenue across countries shown in the earlier subsection, countries would be issuing debt simultaneously most of the time, increasing the dispersion of the debt outcome. The appendix shows the same results for each individual country, showcasing the working of the simulation framework for national SFs.
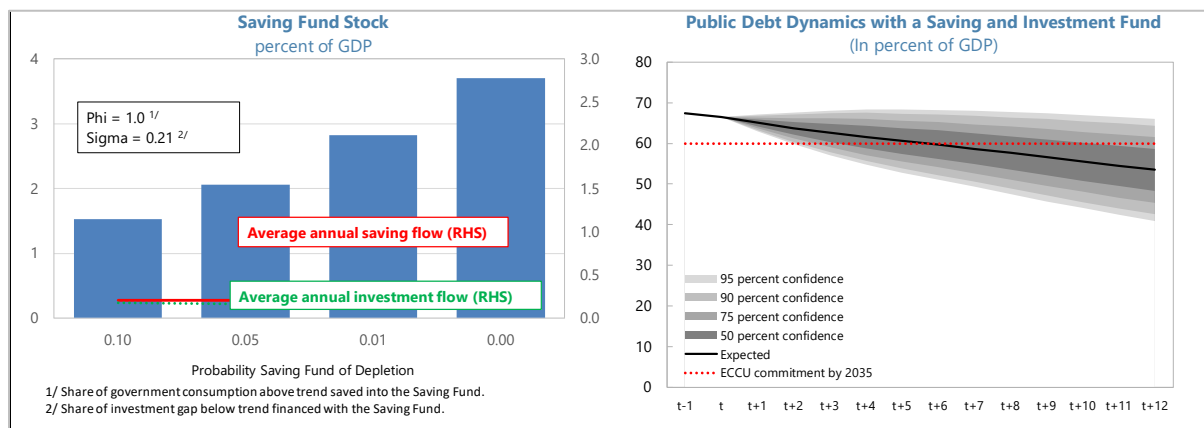
The simulation results indicate that a RSF enables significant savings from risk pooling: the size of a RSF is about ½ of the size of the sum of individual countries' SFs, for the same amounts of saving and withdrawal flows (text table). This is explained by cyclical cross-country asymmetries, as determined by differences in timing and exposure to shocks (including natural disasters), economic structure (i.e. size of tourism and agriculture sectors), and CBI program revenue size and volatility. For example, for a probability of SF depletion at 1 percent and share of "excess consumption" saving of 1, the estimated RSF is about 5 percent of regional GDP, while the sum of individual countries' SF adds to near 10 percent (text table). [12]

All countries benefit from risk pooling under the specified saving-investment rules. This is concluded from the observation that the size of estimated saving funds for the individual

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[12] The contributions of the individual countries to the regional SF are calculated based on the shares of each country in the sum of the individual-country SFs—thus accounting for cross-country differences in size and cyclical volatility as measured by depth and length of output and fiscal cycles.

countries is in all cases larger than the allotted shares under the regional pooling, as shown in the text table. Notice that the smaller RSF remains sufficient for the same level of saving-investment flows each of the countries would have on an individual basis, because of the implicit cross-country transfers as a result of the cyclical asymmetries explained above.

Size Requirement of Regional and Individual Country Stabilization Funds
(in percent of regional GDP)

| | Prob. Depletion = 0.1 | | Prob. Depletion = 0.05 | | Prob. Depletion = 0.01 | | Prob. Depletion = 0.001 | |
	Country 1	Regional 1/	Country 1	Regional 1/	Country 1	Regional 1/	Country 1	Regional 1/
Antigua and Barbuda	1.79	0.90	2.69	1.33	4.75	2.29	6.83	3.12
Dominica	0.34	0.17	0.49	0.24	0.71	0.34	0.90	0.41
Grenada	0.39	0.20	0.56	0.28	0.93	0.45	1.35	0.62
St. Kitts and Nevis	0.46	0.23	0.66	0.33	1.09	0.53	1.55	0.71
St. Lucia	0.59	0.30	0.90	0.44	1.55	0.75	2.13	0.97
St. Vincent and the Grenadines	0.23	0.11	0.32	0.16	0.52	0.25	0.71	0.32
ECCU	**3.79**	**1.90**	**5.63**	**2.78**	**9.55**	**4.61**	**13.46**	**6.15**

Source: ECCB data, WEO, and IMF staff calculations.
1/ Stochastic simulations for targeted probabilities of Stabilization Fund depletion.

The assumed reallocation from government consumption to capital spending over the cycle results in a significant increase in public investment. For example, under a RSF with depletion probability of 0.01, ECCU countries would increase public investment in the range of 0.5–1.5 percent of GDP per year on average (text chart). Aside from the direct investment stimulus, a sizable boost to output growth can also be expected from crowding-in of private investment and employment, which is not accounted for in the simulations.

Increase in Public Investment with a Regional Saving Fund
(Annual average in percent of GDP)

Source: ECCB data, WEO, and IMF staff calculations.
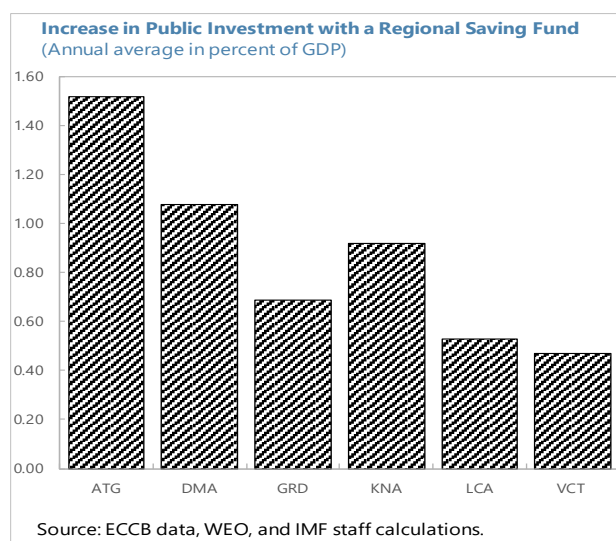
V. CONCLUDING REMARKS

Stochastic simulations in this paper, accounting for cross-country cyclical asymmetries of output and government revenue and expenditure, indicate sizable welfare gains from public consumption stabilization and savings during economic booms for public investment during recessions. Regional pooling of resources in a RSF for cyclical stabilization, through counter-cyclical saving and investment, requires ½ the resources that would be needed by the sum of each country individual needs. The RSF can help contain pro-cyclical government consumption, thus reducing macroeconomic volatility, while providing additional fiscal space for investment during recessions. For plausible saving-investment rules vis-à-vis the RSF, the simulations in this paper indicate that ECCU countries could increase public

investment in the range of 0.5-1.5 percent of GDP per year. The latter implies significant net long-term output growth dividends and also efficiency gains in public investment execution by reducing pressures to undercut public investments during recessions, when government revenue is typically low. As shown in this paper, the latter is an empirical regularity in the ECCU, likely resulting from a combination of financing constraints (ECCU economies are not financially integrated to the rest of the world and access to financing is limited to official creditors and the domestic regional market) and downward rigidity of recurrent spending (mostly public wages and current transfers). In addition, by contributing to reduce the dispersion of public debt outcomes, given ECCU economies are affected by common shocks, the RSF can strengthen the sustainability of the regional currency board arrangement, contributing to regional financial stability.

Success of an RSF would require strong preconditions and a solid governance framework ensuring transparency and incentive compatibility. Countries willingness to participate would likely depend on the fiscal sustainability prospects of other countries, as needed to ensure availability of funds in bad times from the contributions of other members. A strong governance framework would likely be necessary to assess fiscal sustainability, and a transparent methodology for the assessment of cyclical revenue and spending positions, possibly with support of independent institutions. It would also require an accounting mechanism for the net-credit appropriation of the pooled funds by each member, and decisions on specific access rules—i.e. whether members would be allowed to become net-debtors of the RSF. Regional initiatives establishing minimum common standards for Fiscal Responsibility Frameworks and fiscal rules at the national level would be valuable supporting institutions.[13]

Over the long run, an RSF can play an important role as a commitment device for fiscal prudence in the ECCU. The governance framework of an RSF, if established in line with the transparency standards above, could provide incentives for cross-country peer monitoring of fiscal performance, as needed to enforce saving flows in good times and to determine eligibility for withdrawal in bad times.

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[13] Grenada has a fiscal rule entrenched in legislation; other ECCU countries have expressed commitment to adopt fiscal rules with signature of a Memorandum of understanding by all ministers of finance in their role as members of the Eastern Caribbean Central Bank Monetary Council.

REFERENCES

Acevedo, S. 2014. "Debt, Growth and Natural Disasters: A Caribbean Trilogy" *IMF Working Paper* 14/125.

Alichi, A., Shibata I., Tanyeri, K. 2019. "Fiscal Multipliers in Small States." IMF Working Paper 19/72.

Borensztein, E., Cavallo, E., and Jeanne, O., 2015. "The Welfare Effects from Macro-Insurance Against Natural Disasters." NBER working paper series No. 21674.

Cantelmo, A., Melina, G. and Papageorgiou, C., "Macroeconomic Outcomes in Disaster-Prone Countries. *International Monetary Fund working paper series No. 19/217.*

Cavallo, E. A., and Noy, I., 2011. "Natural Disasters and the Economy: A Survey." *International Review of Environmental and Resource Economics, 5: 63102.*

Cavallo, E., Galiani,S., Niy, I., and Pantano, J., 2013. "Catastrophic Natural Disasters and Economic Growth." *Review of Economics and Statistics*, 95(5): 1549{1561.

Cummins, J.D., and O. Mahul. 2009. *Catastrophe risk financing in developing countries: principles for public intervention*. World Bank Publications.

Dos Reis, L. 2004a. "A Fiscal Insurance Proposal for the Eastern Caribbean Currency Union" G24 Secretariat. https://www.g24.org/wp-content/uploads/2016/01/A-Fiscal-Insurance-Proposal.pdf.

Dos Reis, L. 2005 "A Fiscal Insurance Scheme for Central America" G24 Secretariat.

Dos Reis, L. 2004b. "A Fiscal Insurance against Exogenous Shocks for the CFA-franc Zone" G24 Secretariat. https://www.g24.org/wp-content/uploads/2016/01/Fiscal-Insurance-against-Exogenous-Shocks-in-the.pdf

El-Ashram, A., Gold, J. Xu, X., 2015. "Too Much of a Good Thing? Prudent Management of Inflows under Economic Citizenship Programs." *IMF Working Paper* 15/93.

Hsiang, S., and Jina, A., 2014. "The Causal Effect of Environmental Catastrophe on Long-run Economic Growth: Evidence from 6,700 Cyclones." *NBER working paper series* No. 20352.

Noy, Ilan. 2009. "The Macroeconomic Consequences of Disasters." *Journal of Development Economics*, 88(2): 221-231.

Rasmussen, T. N. 2004. "Macroeconomic Implications of Natural Disasters in the Caribbean." *IMF Working Paper* 04/224.

APPENDIX: NATIONAL SAVING FUND SIMULATIONS

Antigua and Barbuda

Off-sample Simulated Dynamics of a Investment Fund
(In percent of GDP)

Budget saving into the SF

Fund stock (RHS)

Investment financing with SF

Off-sample simulation: Government Investment
EC$ million

- Increase in public investment with SF, in percent of GDP (RHS)
- Public investment without SF, EC$ mn
- Public investment with SF, EC$ mn

Saving Fund Stock
percent of GDP

Phi = 1.0 [1]
Sigma = 0.76 [2]

Average annual saving flow (RHS)

Average annual investment flow (RHS)

Probability Saving Fund of Depletion

1/ Share of government consumption above trend saved into the Saving Fund.
2/ Share of investment gap below trend financed with the Saving Fund.

Public Debt Dynamics with a Saving and Investment Fund
(In percent of GDP)

- 95 percent confidence
- 90 percent confidence
- 75 percent confidence
- 50 percent confidence
- Expected
- ECCU commitment by 2035

Dominica

Off-sample Simulated Dynamics of a Investment Fund
(In percent of GDP)

Budget saving into the SF

Fund stock (RHS)

Investment financing with SF

Off-sample simulation: Government Investment
(EC$ million)

- Increase in public investment with SF, in percent of GDP (RHS)
- Public investment without SF, EC$ mn
- Public investment with SF, EC$ mn

Saving Fund Stock
(In percent of GDP)

Phi = 1.0 [1]
Sigma = 0.54 [2]

Average annual saving flow (RHS)

Average annual investment flow (RHS)

Probability Saving Fund of Depletion

1/ Share of government consumption above trend saved into the Saving Fund.
2/ Share of investment gap below trend financed with the Saving Fund.

Public Debt Dynamics with a Saving and Investment Fund
(In percent of GDP)

- 95 percent confidence
- 90 percent confidence
- 75 percent confidence
- 50 percent confidence
- Expected
- ECCU commitment by 2035

Grenada

Off-sample Simulated Dynamics of a Investment Fund
(In percent of GDP)

Fund stock (RHS)

Budget saving into the SF

Investment financing with SF

Off-sample simulation: Government Investment
EC$ million

- ▨ Increase in public investment with SF, in percent of GDP (RHS)
- — Public investment without SF, EC$ mn
- --- Public investment with SF, EC$ mn

Saving Fund Stock
percent of GDP

Phi = 1.0 [1]
Sigma = 0.26 [2]

Average annual saving flow (RHS)

Average annual investment flow (RHS)

Probability Saving Fund of Depletion

1/ Share of government consumption above trend saved into the Saving Fund.
2/ Share of investment gap below trend financed with the Saving Fund.

Public Debt Dynamics with a Saving and Investment Fund
(In percent of GDP)

- 95 percent confidence
- 90 percent confidence
- 75 percent confidence
- 50 percent confidence
- — Expected
- ⋯ ECCU commitment by 2035

St. Kitts and Nevis

Off-sample Simulated Dynamics of a Investment Fund
(In percent of GDP)

Fund stock (RHS)

Budget saving into the SF

Investment financing with SF

Off-sample simulation: Government Investment
EC$ million

- ▨ Increase in public investment with SF, in percent of GDP (RHS)
- — Public investment without SF, EC$ mn
- --- Public investment with SF, EC$ mn

Saving Fund Stock
percent of GDP

Phi = 1.0 [1]
Sigma = 0.26 [2]

Average annual saving flow (RHS)

Average annual investment flow (RHS)

Probability Saving Fund of Depletion

1/ Share of government consumption above trend saved into the Saving Fund.
2/ Share of investment gap below trend financed with the Saving Fund.

Public Debt Dynamics with a Saving and Investment Fund
(In percent of GDP)

- 95 percent confidence
- 90 percent confidence
- 75 percent confidence
- 50 percent confidence
- — Expected
- ⋯ ECCU commitment by 2035

St. Lucia

Off-sample Simulated Dynamics of a Investment Fund
(In percent of GDP)

Off-sample simulation: Government Investment
EC$ million

Saving Fund Stock
percent of GDP

Phi = 1.0 [1]
Sigma = 0.65 [2]

Average annual saving flow (RHS)

Average annual investment flow (RHS)

Probability Saving Fund of Depletion

1/ Share of government consumption above trend saved into the Saving Fund.
2/ Share of investment gap below trend financed with the Saving Fund.

Public Debt Dynamics with a Saving and Investment Fund
(In percent of GDP)

95 percent confidence
90 percent confidence
75 percent confidence
50 percent confidence
Expected
ECCU commitment by 2035

St. Vincent and the Grenadines

Off-sample Simulated Dynamics of a Investment Fund
(In percent of GDP)

Off-sample simulation: Government Investment
EC$ million

Saving Fund Stock
percent of GDP

Phi = 1.0 [1]
Sigma = 0.24 [2]

Average annual saving flow (RHS)

Average annual investment flow (RHS)

Probability Saving Fund of Depletion

1/ Share of government consumption above trend saved into the Saving Fund.
2/ Share of investment gap below trend financed with the Saving Fund.

Public Debt Dynamics with a Saving and Investment Fund
(In percent of GDP)

95 percent confidence
90 percent confidence
75 percent confidence
50 percent confidence
Expected
ECCU commitment by 2035