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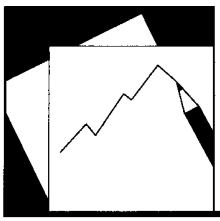

IMF Working Paper

The Eastern Caribbean Currency Union: Would a Fiscal Insurance Mechanism Mitigate National Income Shocks?

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Abstract

This paper studies the nature of the shocks affecting the Eastern Caribbean Currency Union (ECCU), and examines whether a hypothetical Eastern Caribbean fiscal insurance mechanism could insure member countries of the union against asymmetric national income shocks. The empirical results suggest that a one dollar reduction in an ECCU member country's per capita personal income could trigger, through reduced income taxes and increased transfers, flows equivalent to about 7 percent of the initial income shock. Each member of the currency union could benefit as well, although the extent of shock mitigation differs across individual countries.

JEL Classification Numbers: E62, F53, H20, O23

Keywords: Fiscal insurance mechanism; income shocks; income tax revenue; transfers; Eastern Caribbean Currency Union

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I. INTRODUCTION

The Eastern Caribbean Currency Union (ECCU) is comprised of eight member countries that share a common currency, monetary policy, and exchange rate system.[2] [3] The common currency, the Eastern Caribbean dollar (EC$), has been pegged to the United States dollar (US$) at the rate of EC$2.7 per US$ since July 1976. The common central bank, the Eastern Caribbean Central Bank (ECCB), has operated as a quasi-currency board, maintaining foreign exchange backing of its currency and demand liabilities of close to 100 percent. The common monetary policy implies that each member cannot use its own independent monetary policy, and in particular the exchange rate, as an instrument to mitigate asymmetric shocks.

Shocks can be classified as symmetric or asymmetric, and permanent or temporary. While symmetric shocks can be mitigated by a common monetary policy, asymmetric shocks cannot. For this reason, determining the nature of shocks is important when deciding upon the mitigation policies to be adopted. If a monetary union faces an asymmetric permanent shock, the optimal response is to keep external accounts in balance and reduce aggregate demand. However, if the shock affecting a monetary union is asymmetric and temporary, the optimal response is to maintain the level of the aggregate demand and finance the external gap either through external debt or foreign reserves. If an asymmetric shock is not identified as either permanent or temporary, then an incorrect economic policy response could be implemented, with an unnecessary contraction of aggregate demand when the shock is temporary instead of permanent, or the unnecessary acquisition of new external debt or reduction of foreign reserves when the shock is permanent instead of temporary.

The economic union literature suggests that it is the task of the monetary authority to absorb symmetric shocks, while it is the task of each member's fiscal policy to provide insurance against asymmetric shocks. However, each member's fiscal policy could be ineffective in smoothing cyclical fluctuations, because of a lack of fiscal space and/or limited access to credit sources. The creation of a fiscal insurance mechanism—which collects taxes from the members in a cyclical upswing to assist those members in a cyclical downswing—could help to ensure the stability of the economic union. However, why could a fiscal insurance mechanism be a better solution than national fiscal policy to stabilize output? A given country's fiscal policy could attempt to stabilize income by running deficits during regional recessions and surpluses during regional booms. Nevertheless, such a policy is less likely to

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[2] The Eastern Caribbean Currency Union comprises six IMF member countries: Antigua and Barbuda (ATG), Dominica (DMA), Grenada (GRD), St. Kitts and Nevis (KNA), St. Lucia (LCA), and St. Vincent and the Grenadines (VCT); and two British territories, Anguilla and Montserrat. In this paper we focus on the six IMF members.

[3] For summaries of previous IMF work on the ECCU and wider Caribbean, see Sahay, Robinson, and Cashin (2006) and Bauer, Cashin, and Panth (2008). See IMF (2009a, 2009b) for recent IMF reports on the ECCU, and Pineda, Cashin and Sun (2010) for an analysis of the EC$ real exchange rate.

be effective than a fiscal insurance mechanism, because the country's fiscal policy requires that budget deficits be repaid by higher taxes or lower spending by the same country at some point in the near future, while a fiscal insurance mechanism can redistribute the fiscal burden across its membership.[4]

From a theoretical perspective, Alesina et al. (1995) emphasize the existence of many benefits associated with large fiscal jurisdictions, but at the same time recognize the existence of large political and economic costs. In particular, they argue that when there are two or more identical members, except for the fact that their shocks are not perfectly correlated, a move toward centralization of fiscal policy is Pareto superior.

In the empirical literature which studies the United States federal government as an alternative mechanism to mitigate shocks, there is a wide range in the estimates of the possible benefits of risk-sharing, ranging from about 10 percent (von Hagen, 1992) to 38 percent (Sala-i-Martin and Sachs, 1992) of the initial shock, explained by several reasons such as the methodology, the inclusion of redistribution and stabilization effects, and the data used.

Sala-i-Martin and Sachs (1992) find that a one dollar reduction in a U.S. region's personal income per capita triggers a decrease in federal taxes of about 34 cents, and an increase in federal transfers of 6 cents, resulting in a final reduction in disposable income per capita of 60 cents (or about 40 percent of income mitigation). Similarly, von Hagen (1992) finds that the United States fiscal system provides about 10 percent of income mitigation.

Other authors have studied the federal government of the United States in its shock mitigation role, and, using alternative approaches, have obtained different results. Bayoumi and Masson (1995) study the United States and Canada (another federal government) using cross-sectional and time-series evidence, distinguishing redistribution and stabilization effects, decomposing the federal government effect, and capturing the individual effects of transfers and taxes.

Asdrubali et al. (1996) describe three channels through which risk-sharing can occur in a federal regime. First, members can share risk via cross-ownership of productive assets, though this requires the existence of a developed capital market. Second, consumption can be smoothed by adjusting their portfolio of assets through lending and borrowing on national credit markets. Third, regions can share risk through a fiscal insurance mechanism that collects taxes from, and provides transfers to, currency union members. In this paper we focus on this last channel.

In this context, Dos Reis (2004) describes a fiscal insurance mechanism and supports its implementation for the ECCU. Using numerical simulations for partial and full insurance

[4] For additional details in a Caribbean context, see Duttagupta and Tolosa (2006) and Araujo (2009).

schemes it quantifies the required size of the initial buffer, and simulates the welfare gains in terms of lower volatility and a lower initial buffer as compared with complete self-insurance.

This paper aims to: (i) identify the type of shocks affecting ECCU-member countries; (ii) ascertain whether asymmetric and temporary shocks are an important source of risk for ECCU members; (iii) study whether a hypothetical Eastern Caribbean fiscal insurance mechanism could insure its members against asymmetric income shocks; and (iv) calculate the impact of shocks on disposable income per capita. In doing so, we replicate the analysis of Cohen and Wyplosz (1989), run regressions in levels between the changes in income and the changes in income taxes and transfers, and run regressions in growth rates between income, and income tax revenue and transfers, for each ECCU member and for the ECCU as a whole. We also propose a scenario in which the hypothetical Eastern Caribbean fiscal insurance mechanism collects taxes from, and provides transfers to, its members.

We find that for the ECCU, symmetric shocks are quantitatively more important than asymmetric shocks, and that asymmetric shocks tend to be more temporary than permanent. This implies that an important part of the shocks affecting the ECCU members are asymmetric and temporary, so cannot be readily addressed by a common monetary policy, and need alternative mitigation policies. We also find that when the ECCU is hit by a one dollar negative income shock, a hypothetical ECCU fiscal insurance mechanism would be able to mitigate the effects of that shock, absorbing between 3 and 7 percent of the initial shock. Finally, the results from the regressions in growth rates suggest that a hypothetical Eastern Caribbean fiscal insurance mechanism would provide mitigation in the amount of 7 percent of the average income per capita.

The paper continues as follows. Section II analyzes the nature of the shocks affecting ECCU member countries, calculates the relative importance of symmetric and asymmetric shocks, and their permanent and temporary components. Sections III, IV and V quantify the shock-mitigation potential of a hypothetical ECCU fiscal insurance mechanism. Finally, conclusions are presented in Section VI.

II. Nature of the Shocks Affecting the ECCU

In the economic union literature it is well known that asymmetric shocks (i.e., those requiring a different optimal policy response for each individual member) are a potential threat to union cohesiveness. This literature suggests that asymmetric and temporary shocks are the most harmful, motivating a discussion about alternative economic policies to address them.

In this section we analyze the nature of shocks affecting ECCU member countries over the last four decades, calculating the relative importance of symmetric and asymmetric shocks, and their permanent and temporary components. The approach of Cohen and Wyplosz (1989)

is applied and the variable studied is annual real GDP in constant prices[5] (in millions of Eastern Caribbean dollars, EC$), for the broadest sample available, 1970–2009.[6]

There are alternative methods for assessing the symmetry or asymmetry of shocks and for identifying and separating their permanent and temporary components, such as measures of synchronicity of business cycles and those derived from vector autoregressive models. We follow the approach of Cohen and Wyplosz (1989), because we only want to compare, and not decompose or separate, the relative proportion of symmetric and asymmetric shocks' permanent and temporary components.

The approach of Cohen and Wyplosz (1989) proceeds as follows: (i) report the levels (natural logarithm) of real GDP for each ECCU member with respect to the whole ECCU, excluding the country concerned in each case; (ii) calculate the "sums", which identify the symmetric shocks, and the "differences" for the asymmetric shocks; (iii) obtain the standard deviation of the sums and the differences; and (iv) report the ratio between the standard deviation of the sums and the standard deviation of the differences. If the ratio is greater than one, this implies that symmetric shocks are more important than asymmetric ones.

To assess the relative importance of permanent versus temporary shock components, we: (i) obtain the permanent and temporary components of the symmetric and asymmetric shocks (for this purpose we use the Hodrick-Prescott filter); (ii) calculate the standard deviation of the temporary components and of the original series, for the symmetric and asymmetric shocks; and (iii) report the ratio between the standard deviation of the temporary component and the standard deviation of the original series, for both symmetric and asymmetric shocks. If the ratio is relatively high, it indicates that temporary shocks are more prevalent than permanent shocks.

The relative importance of symmetric versus asymmetric shocks affecting ECCU countries is presented in Table 1. The first two columns show the size of the symmetric and asymmetric shocks, measured by their standard deviation, and the third column shows the ratio between them; i.e., symmetric to asymmetric shocks. In all the cases the ratios are greater than one, meaning that for all ECCU members, symmetric shocks are more prevalent than asymmetric shocks.

Table 2 shows the size of the temporary component of shocks affecting the ECCU, measured by the ratio between the standard deviation of the temporary component and the standard deviation of the original series, for both symmetric and asymmetric shocks. The temporary component of symmetric shocks is only about 5 percent of the total shock; in contrast, the

[5] Higher-frequency data are not available for ECCU countries.

[6] The source of the data is the IMF's *World Economic Outlook*.

temporary component of asymmetric shocks is about one-third of the total shock for all ECCU members (an exception is St. Vincent and the Grenadines, where it is about two-thirds of the total shock). These results imply that in spite of the relative importance of symmetric shocks, asymmetric and temporary shocks are still important, suggesting the need for alternative economic policies, beyond the common monetary policy, to mitigate this type of shock.

III. AN ECCU FISCAL INSURANCE MECHANISM

In this section we replace the present situation of the ECCU with a hypothetical scenario in which the ECCU has a fiscal insurance mechanism responsible for the collection of taxes from, and the provision of transfers to, ECCU members. As the ECCU is at present a currency union with no fiscal policy at the federal level, a key assumption is needed. We assume that all the actual historical income tax revenue collected from, and transfers made to, each member, during the period of study, are equal to the respective amounts that would have been collected and transferred by a hypothetical fiscal insurance mechanism. We run regressions in levels and in growth rates, to measure the potential income-shock-mitigation benefits that an Eastern Caribbean fiscal insurance mechanism could provide when its members experience an adverse income shock.

We choose to run regressions in levels (the approach of Sala-i-Martin and Sachs (1992)) and in growth rates (the approach of von Hagen (1992)) because these papers are seminal in the economic union literature, and they present the most extreme results of income stabilization for the United States (as noted earlier, Sala-i-Martin and Sachs (1992) calculate 38 percent and von Hagen (1992) 9 percent income mitigation, respectively; see Table 3).

The data cover the period 1990–2008, the most comprehensive set of data available, and considers the following variables: GDP at market prices in EC$ millions; transfers in EC$ millions (which includes grants and contributions, and retirement benefits); income tax revenue in EC$ millions; the consumer price index (CPI); and population.[7] The data on GDP at market prices comes from the IMF's *World Economic Outlook* (WEO), while the transfers and income tax revenue data come from ECCU country authorities. The CPI and the population data come from the IMF's *Information Notice System* (INS) and *International Financial Statistics* (IFS) databases, respectively.

[7] To measure the impact on disposable income per capita, we should use personal income tax per capita. However, for the majority of ECCU members these data are not available, and so we had to use instead income tax revenue data.

IV. Empirical Estimation: Regressions in Levels

This section describes the Sala-i-Martin and Sachs (1992) methodology, presents the regression results, and calculates the impact an income shock has on the ECCU and on member-country disposable incomes. Before proceeding, we analyze the possibility of non-stationarity by estimating augmented Dickey-Fuller tests for the dependent and independent time series studied (relative transfers per capita, relative income tax revenue per capita, and relative income per capita).[8]

We find that: (i) almost all the variables (in levels) are non-stationary, while their first differences are stationary; (ii) among the relative transfers per capita, only Dominica and Grenada exhibit stationary time series; (iii) the relative income tax revenue per capita time series for Grenada, St. Kitts and Nevis, and St. Vincent and the Grenadines are stationary; and (iv) none of the relative income per capita variables is stationary. Although many of the variables studied are not stationary, we proceed with the estimation because, as far as the authors are aware, there is no similar evidence for the ECCU and its members.

A. Methodology

To obtain the reduction in disposable income per capita for an ECCU member country in the presence of an adverse income shock, the change in the disposable income per capita is defined as:

$$\Delta YD_i = \Delta Y_i + \Delta TR_i - \Delta TX_i \tag{1}$$

where: ΔYD_i represents the change in the disposable income per capita of the *i*th ECCU member; ΔY_i corresponds to the change in income per capita in the *i*th ECCU member; ΔTR_i is the change in the transfers per capita in the *i*th ECCU member; and ΔTX_i corresponds to the change in the income tax revenue per capita in the *i*th ECCU member.

The income per capita-transfers per capita elasticity is defined as $\beta_{TR_i} = \dfrac{\Delta TR_i / TR_i}{\Delta Y_i / Y_i}$ and the income per capita-income tax revenue per capita elasticity is defined as $\beta_{TX_i} = \dfrac{\Delta TX_i / TX_i}{\Delta Y_i / Y_i}$.

The change in disposable income per capita can be expressed as a function of the change in transfers per capita, income tax revenue per capita, income per capita and the elasticities just defined, as:

[8] These variables are relative to the corresponding ECCU variable.

$$\Delta YD_i = \Delta Y_i - \Delta Y_i * \beta_{TRi} * \left[TR_i / Y_i \right] - \Delta Y_i * \beta_{TXi} * \left[TX_i / Y_i \right] \quad (2)$$

where:

$LTr_i = \Delta Y_i * \beta_{TR_i} * [TR_i / Y_i]$ is denoted as the "transfers effect" and
$LTx_i = \Delta Y_i * \beta_{TX_i} * [TX_i / Y_i]$ is denoted as the "taxes effect."

To obtain the elasticities previously defined we estimate the following two-equation model:

$$\ln(transfers_i) = \alpha_{TR_i} + \beta_{TR_i} \ln(income_i) + \gamma_{TR_i} TIME_i + \varepsilon_i \quad (3)$$

$$\ln(taxes_i) = \alpha_{TX_i} + \beta_{TX_i} \ln(income_i) + \gamma_{TX_i} TIME_i + \nu_i \quad (4)$$

where: $transfers_i$ corresponds to the ratio between transfers per capita in the *i*th member and transfers per capita in the ECCU as a whole; $taxes_i$ corresponds to the ratio between income tax revenue per capita in the *i*th member and income tax revenue per capita in the ECCU as a whole; and $income_i$ corresponds to the ratio between income per capita in the *i*th member and income per capita in the ECCU as a whole. The $TIME_i$ variable represents the trend component of $transfers_i$ and $taxes_i$ not explained by $income_i$ changes. Finally, α_{TX_i} and α_{TR_i} are the constants of the model, while ε_i and ν_i are the errors. In this setup, β_{TR_i} and β_{TX_i} represent the percentage change in country relative transfers per capita and country relative income tax revenue per capita, when relative income per capita changes by one percent.

As noted above, the model variables are relative transfers per capita, relative income tax revenue per capita, and relative income per capita. These were obtained by taking each member country's GDP at market prices, transfers, and income tax revenue, deflating by the CPI and dividing by the national population; and then dividing the corresponding member variable (numerator) by the respective variable for the whole ECCU (denominator).

As noted by Sala-i-Martin and Sachs (1992), running the regressions in levels has two problems: (i) simultaneity bias; and (ii) heteroskedasticity and/or correlation in the actual (true) errors terms across members. In spite of these problems, we proceed estimating the regressions by Ordinary Least Squares (OLS), which would yield coefficients that are downward-biased and possibly affected by heteroskedasticy and/or correlation in the actual error terms across members. To correct for simultaneity bias we run regressions using Instrumental Variables (IV), and the instruments are the natural logarithm of: the real effective exchange rate, the real oil price, ECCU aggregate GDP growth, and tourist arrivals.

The real oil price for the ECCU was obtained by deflating crude oil prices by the ECCU CPI.[9] [10] The real effective exchange rate was obtained from the IMF's *International Financial Statistics* (IFS) database; the ECCU aggregate GDP growth and tourist arrivals were obtained from the ECCU country authorities. To partially address the heteroskedasticity problem, we estimate Seemingly Unrelated Regressions (SUR).[11] Also, given the characteristics of the data, we run panel data regressions (fixed effects (FE) and random effects (RE)), which provide an aggregate coefficient for the ECCU as a whole.

B. Results

This section presents the results obtained for the elasticities β_{TR_i} and β_{TX_i}, which are listed in Tables 4 and 5. While Table 4 reports the elasticities between relative transfers per capita and relative income per capita (β_{TR_i}), Table 5 presents the elasticities between relative income tax revenue and relative income per capita (β_{TX_i}). We focus on those coefficients that are statistically significant, and where the minimum and the maximum of the 95 percent confidence interval have the same sign as the coefficient.

In Table 4, with the exception of Antigua and Barbuda, Dominica and the ECCU, none of the β_{TR_i} coefficients are statistically significant. The coefficients of Antigua and Barbuda are positive, indicating a positive relationship between relative transfers per capita and relative income per capita. Additionally, independent of the estimation method, these coefficients are greater than one, meaning that a one percent decrease in the relative income per capita implies a more than one percent contraction in the relative transfers per capita, and indicate that insurance mechanism transfers would not help to mitigate income shocks in Antigua and Barbuda.[12] On the other hand, the coefficients of Dominica and the ECCU are negative, meaning that a decrease in relative income per capita implies an increase in the relative transfers per capita, suggesting that insurance mechanism transfers could mitigate income shocks.

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[9] The crude oil price (in U.S. dollars per barrel) corresponds to the simple average of three spot prices; Dated Brent, West Texas Intermediate, and Dubai Fateh. This nominal price was obtained from the IMF's *International Financial Statistics* database.

[10] The ECCU CPI is the average of the ECCU members' CPI.

[11] In the presence of heteroskedasticy and/or correlation in the true error terms, OLS estimation yields unbiased coefficients but a biased variance-covariance matrix, affecting the statistical significance of the estimated coefficients. SUR does not correct for heteroskedasticity or correlation, but does allow for the existence of different errors in each country equation.

[12] In the OLS and IV cases the confidence intervals also have positive extreme values, which confirm the positive relation.

In the case of the income per capita–income tax revenue per capita elasticities (β_{TX_i}), only Dominica, St. Lucia and the ECCU estimated coefficients are significant, suggesting positive relationships but with differing magnitudes. While the coefficients of Dominica and St. Lucia are greater than one, evidencing progressive tax systems, those for the ECCU are positive but less than one (Table 5).

C. Impact on Disposable Income

This section calculates how much of a negative income shock to an ECCU member country would be absorbed by a hypothetical ECCU insurance mechanism, in the form of transfers and income taxes. Using equation (2), the elasticities in Tables 4 and 5, and the period-average share of GDP of transfers and income tax revenue (see Table 7), and assuming that the change in income per capita is equal to one EC dollar, we calculate (in Table 6) for each ECCU member and for the ECCU as a whole, the associated change in: income tax revenue per capita ("taxes effect"); transfers per capita ("transfers effect"); and the change in disposable income per capita (ΔYD). OLS, IV, and SUR regressions provide coefficients for each country; FE and RE regressions present coefficients for the ECCU as a whole.

Given the above-mentioned negative income shock, ECCU disposable income per capita (after considering the transfers and taxes effects), is calculated at 93 cents, implying that transfers and income tax revenues would mitigate about 7 cents of an adverse one-dollar income shock. Additionally, only considering the "taxes effect," the coefficients for the ECCU imply a disposable income reduction of 97 cents, and a consequent income mitigation of 3 cents in the dollar (Table 6).

At the country level Dominica's disposable income per capita decreases to about 85 cents—this is a better situation in comparison with the original reduction of one dollar. On the other hand, only considering the "transfers effect," Antigua and Barbuda ends up worse off, with a reduction in its disposable income per capita of 103 to 111 cents, instead of the original one-dollar negative income shock. Finally, in an intermediate but still better-off case, only considering the "taxes effect," St. Lucia could mitigate about 9 cents in the dollar of a negative income shock, with a decrease of 91 cents in its disposable income per capita.

V. Empirical Estimation: Regressions in Growth Rates

A. Methodology

A fiscal insurance mechanism can serve two different purposes, first to respond to *persistent* differences in income levels and reduce inequalities among its members ("redistribution effect"), and second to stabilize income when member countries face *temporary* negative income shocks, again redistributing income among them ("stabilization effect"). Running regressions in growth rates (following von Hagen (1992)) distinguishes between these two effects, focusing on the second. The variables of study are the growth of: GDP per capita at

market prices; transfers per capita (which includes grants, contributions and retirement benefits), and income tax revenue per capita.

To measure the responsiveness of transfers and income tax revenue to changes in the economic conditions, the following equations are estimated:

(5) $$TRgrowth_i = \alpha_{TR_i} + \beta_{TR_i} Incomegrowth_i + \sigma_i$$

(6) $$TXgrowth_i = \alpha_{TX_i} + \beta_{TX_i} Incomegrowth_i + \gamma_i$$

where: "*i*" denotes the *i*th ECCU member; $TRgrowth_i$ is the growth of transfers per capita in the *i*th member; $TXgrowth_i$ represents the growth of income tax revenue per capita in the *i*th member; and $Incomegrowth_i$ corresponds to the growth of income per capita in the *i*th member.

In equation (5), β_{TR_i} illustrates the average elasticity of transfers per capita and income per capita growth in the *i*th country member. In equation (6) β_{TX_i} represents the average elasticity of income tax revenue and income per capita growth in the *i*th country member. As previously, α_{TR_i} and α_{TX_i} are the constants of the model, and σ_i and γ_i are the errors.

For the ECCU, we estimate pooled OLS regressions which include all the cross section and time series data, and FE and RE regressions. For the individual ECCU members we estimate SUR regressions.

B. Results

Table 8 shows that the growth of ECCU income tax revenue per capita is directly related with the growth of ECCU income per capita. This link is statistically significant and the coefficient is about 1.3. Thus, a decline in the income per capita growth of one percent leads to a contraction of the growth of the income tax revenue per capita of about 1.3 percent. The ECCU growth of transfers per capita does not seem to be related to the growth of income per capita. Considering the statistical significance an Eastern Caribbean fiscal insurance tax would provide mitigation to average income per capita of about 7 percent.

At the country level, the relationship between the growth of transfers per capita and the growth of income per capita does not yield statistically significant coefficients (apart from Grenada). However, the growth rates of income tax revenue per capita and income per capita do yield statistically significant coefficients for Antigua and Barbuda, Dominica, St. Kitts and Nevis, and St. Lucia, which are all positive and greater than 1.7, implying a positive and greater than proportional relationship. Combining the significant results for each ECCU

country we find that an Eastern Caribbean fiscal insurance mechanism would provide mitigation to average income per capita, from the original income shock, of 4 percent for Antigua and Barbuda, 11 percent for Dominica, 13 percent for St. Kitts and Nevis, and 11 percent for St. Lucia.

VI. CONCLUSIONS

This paper finds that among the shocks affecting ECCU countries, symmetric shocks have been quantitatively more important than asymmetric shocks, but these shocks tend to be more temporary than permanent. These asymmetric and temporary shocks, the most harmful according to the economic union literature, are an important feature of the ECCU that cannot be addressed by the currency union's common monetary policy, implying the need for alternative economic policies.

Our findings indicate that an Eastern Caribbean fiscal insurance mechanism could provide shock-mitigation benefits for the ECCU as a whole, mitigating about 7 percent of the total negative income shock, and also being of benefit for the majority of its members.

Following Sala-i-Martin and Sachs (1991) and von Hagen (1992), we found that when ECCU member countries are affected by a one dollar (adverse) income shock, an ECCU fiscal insurance mechanism would be able to mitigate the risk, absorbing on average about 7 cents in the dollar of the income shock. Each member of the currency union could benefit as well, although the extent of shock mitigation differs across individual countries. While this paper finds benefits from an ECCU insurance mechanism, in comparison with the Sala-i-Martin (1991) results for the states of the United States, the hypothetical ECCU insurance mechanism provides much smaller levels of country risk mitigation.

An aim of this investigation is to provide a baseline for quantifying the effects of an income shock on the disposable income of the ECCU and its member countries. Estimations using alternative empirical methods await further investigation.

Table 1: ECCU: Relative Importance of Symmetric Versus Asymmetric Shocks

	Symmetric (1)	Asymmetric (2)	Ratio (1)/(2)
Antigua and Barbuda (ATG)	0.46	0.04	12.17
Dominica (DMA)	0.38	0.08	4.53
Grenada (GRD)	0.42	0.04	9.47
St. Kitts and Nevis (KNA)	0.45	0.02	18.08
St. Lucia (LCA)	0.46	0.04	10.15
St. Vincent and the Grenadines (VCT)	0.45	0.01	32.39

Source: Authors' calculations.

Table 2: ECCU: Temporary Component of Shocks (in percent)

	Symmetric	Asymmetric
Antigua and Barbuda (ATG)	5.25	31.41
Dominica (DMA)	6.09	20.64
Grenada (GRD)	6.44	37.22
St. Kitts and Nevis (KNA)	4.65	38.54
St. Lucia (LCA)	5.93	33.59
St. Vincent and the Grenadines (VCT)	5.10	66.56

Source: Authors' calculations.

Table 3: Income Stabilization by the United States Federal Government (in percent)

Sachs and Sala-i-Martin (1992)	38
von Hagen (1992)	9-10
Goodhart and Smith (1993)	13
Bayoumi and Mason (1995)	17
Asdrubali et al (1996)	30
Obstfeld and Peri (1998)	13
Melitz and Zumer (1998)	20
Fatas (1998)	11

Source: Furceri (2004).

Table 4: Elasticities of Relative Transfers and Relative Income Per Capita

Dependent variable: ln (relative transfers per capita)

Country		β_{TR}	*t*-statistic	95% Confidence Interval		Trend	R^2	Adj R^2
ATG	OLS	3.831**	2.47	0.529	7.133	0.029**	0.41	0.33
	IV	7.013*	3.16	2.256	11.768	0.038*	0.39	0.30
	SUR	1.810***	1.87	-0.131	3.752		0.27	
DMA	OLS	-1.803***	-1.76	-3.989	0.383	0.059*	0.88	0.87
	IV	-3.177**	-2.22	-6.250	-0.105	0.053*	0.87	0.85
	SUR	1.548	1.08	-1.337	4.433		0.07	
GRD	OLS	-0.351	-0.80	-1.286	0.583	-0.035*	0.83	0.81
	IV	-0.605	-1.08	-1.803	0.593	-0.032*	0.82	0.80
	SUR	-0.089	-0.18	-1.050	0.873		0.02	
KNA	OLS	-0.526	-0.39	-3.657	2.605	-0.022	0.18	-0.02
	IV	-0.086	-0.06	-3.518	3.345	-0.023	0.17	-0.04
	SUR	-0.955	-1.30	-2.433	0.523		0.05	
LCA	OLS	0.553	0.47	-1.943	3.049	0.033	0.58	0.53
	IV	0.785	0.31	-4.632	6.202	0.037	0.58	0.52
	SUR	-0.224	-1.07	-0.642	0.194		0.06	
VCT	OLS	1.556	0.77	-2.974	6.085	0.012	0.32	0.18
	IV	0.211	1.31	-1.525	5.749	-0.005	0.17	-0.01
	SUR	-0.599	-1.00	-1.793	0.596		0.01	
ECCU	FE	-1.304*	-3.07	-2.150	-0.459		0.10	
	RE	0.012	0.06	-0.393	0.417		0.10	

Note: * Statistically significant at 99 percent level.
** Statistically significant at 95 percent level.
*** Statistically significant at 90 percent level.

Source: Authors' calculations.

Table 5: Elasticities of Relative Income Tax Revenue and Relative Income Per Capita

Dependent variable: ln (relative income tax revenue per capita)

Country		β_{TX}	*t*-statistic	95% Confidence Interval		Trend	R^2	Adj R^2
ATG	OLS	1.582	1.06	-1.603	4.768	0.022***	0.23	0.13
	IV	0.911	0.40	-4.001	5.824	0.021***	0.22	0.11
	SUR	1.605	1.26	-0.935	4.145		-0.04	
DMA	OLS	1.335***	1.86	-0.201	2.870	-0.017*	0.69	0.64
	IV	0.440	0.45	-1.678	2.558	-0.020*	0.67	0.61
	SUR	3.105*	7.15	2.242	3.969		0.52	
GRD	OLS	-2.185	-1.21	-6.064	1.693	0.043	0.15	0.03
	IV	-2.451	-1.14	-7.088	2.187	0.044	0.17	0.04
	SUR	1.105	1.38	-0.485	2.695		-0.06	
KNA	OLS	0.368	0.57	-1.010	1.746	0.031*	0.71	0.68
	IV	0.381	0.38	-1.781	2.542	0.031	0.71	0.67
	SUR	-1.138	-1.36	-2.804	0.527		0.01	
LCA	OLS	1.394***	1.84	-0.222	3.010	-0.003	0.82	0.79
	IV	1.755	1.07	-1.749	5.258	0.003	0.81	0.78
	SUR	1.459*	11.33	1.203	1.715		0.81	
VCT	OLS	-0.138	-0.12	-2.550	2.274	0.004	0.02	-0.11
	IV	-0.549	-0.36	-3.807	2.708	0.009	0.01	-0.13
	SUR	0.108	0.50	-0.326	0.543		0.05	
ECCU	FE	0.726**	1.99	0.001	1.452		0.04	
	RE	0.518***	1.89	-0.020	1.056		0.06	

Note: * Statistically significant at 99 percent level.
** Statistically significant at 95 percent level.
*** Statistically significant at 90 percent level.

Source: Authors' calculations.

Table 6: Changes in Transfers, Income Tax Revenue and Disposable Income Per Capita Due to One Dollar Income Shock

		Transfers effect			Taxes effect			Disposable income		
Country		Estimated	Min	Max	Estimated	Min	Max	Estimated 1/	Min	Max
ATG	OLS	0.06	0.01	0.11	n.a.	n.a.	n.a.	1.06	1.01	1.11
	IV	0.11	0.03	0.18	n.a.	n.a.	n.a.	1.11	1.03	1.18
	SUR	0.03	0.00	0.06	n.a.	n.a.	n.a.	1.03	1.00	1.06
DMA	OLS	-0.06	-0.14	0.01	0.08	-0.01	0.17	0.86	0.88	0.84
	IV	-0.11	-0.21	0.00	0.04	0.02	0.07	0.85	0.77	0.93
	SUR	n.a.	n.a.	n.a.	0.19	0.14	0.24	0.81	0.86	0.76
GRD	OLS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	IV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	SUR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
KNA	OLS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	IV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	SUR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LCA	OLS	n.a.	n.a.	n.a.	0.09	-0.01	0.19	0.91	1.01	0.81
	IV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	SUR	n.a.	n.a.	n.a.	0.09	0.08	0.11	0.91	0.92	0.89
VCT	OLS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	IV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	SUR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ECCU	FE	-0.03	0.03	0.05	0.04	0.00	0.07	0.93	1.03	0.93
	RE	n.a.	n.a.	n.a.	0.03	0.00	0.05	0.97	1.00	0.97

1 / Disposable income per capita includes only the transfers effect for ATG and the ECCU RE, only the taxes effect for LCA, and both effects for DMA.
n.a.: Not available due to statistical insignificance of elasticities calculated in Tables 4 and 5.

Table 7: Real Average Transfers and Real Average Income Tax Revenue, 1990-2008 (in percent of GDP)

	Transfers	Income tax revenue
Antigua and Barbuda (ATG)	1.5	2.4
Dominica (DMA)	3.4	6.1
Grenada (GRD)	2.8	3.8
St. Kitts and Nevis (KNA)	2.0	6.1
St. Lucia (LCA)	3.6	6.3
St. Vincent and the Grenadines (VCT)	2.6	7.4
ECCU	2.4	5.1

Source: Authors' calculations.

Table 8: Growth Rates of Transfers, Income Tax Revenue, and Income Per Capita

Dependent variable: Growth rate of transfers per capita

Country		β_{TR}	*t*-statistic	95% Confidence Interval		R^2
ATG	SUR	0.402	(0.59)	-0.969	1.772	0.02
DMA	SUR	0.764	(0.31)	-4.149	5.679	-0.02
GRD	SUR	1.522	(1.78)	0.422	2.623	0.06
KNA	SUR	1.265	(0.53)	-3.529	6.058	0.01
LCA	SUR	0.990	(0.95)	-1.110	3.091	0.05
VCT	SUR	-0.536	(-0.82)	-1.843	0.771	0.09
	OLS	0.075	(0.15)	-0.905	1.055	0.00
ECCU	FE	0.085	(0.17)	-0.926	1.096	0.00
	RE	0.075	(0.15)	-0.891	1.041	0.00

Dependent variable: Growth rate of income tax revenue per capita

Country		β_{TX}	*t*-statistic	95% Confidence Interval		R^2
ATG	SUR	1.802**	(2.59)	0.411	3.193	0.07
DMA	SUR	1.775**	(2.36)	0.274	3.277	-0.03
GRD	SUR	0.788	(0.92)	-0.913	2.489	0.07
KNA	SUR	2.067*	(5.12)	1.261	2.873	0.48
LCA	SUR	1.789*	(3.54)	0.781	2.798	0.33
VCT	SUR	-0.801	(-1.55)	-1.831	0.229	-0.03
	OLS	1.332*	(3.61)	0.599	2.064	0.12
ECCU	FE	1.354*	(3.52)	0.590	2.119	0.12
	RE	1.332*	(3.61)	0.609	2.055	0.12

Note: * Statistically significant at 99 percent level.
** Statistically significant at 95 percent level.

Source: Authors' calculations.

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