Macroeconomic Fluctuations Under Natural Disaster Shocks in Central America and The Caribbean

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Motivation

- Each year, the Atlantic basin experiences an average of 9.8 named storms,
- Only a few each year are destructive enough to significantly impact a country's macroeconomy,
- The damage wrought by a disaster shock can include :
  1. Home and building destruction,
  2. Capital stock destruction.

The aim of this paper

- This paper examines the role of disaster shock in Caribbean and Central America,
  - a Panel var,
  - a representative agent dynamic stochastic general equilibrium model,

Previous literature

1. Aghion and Howitt (1998), (endogenous growth theory),
2. Sosa and Cashin (2013), (Var model),
3. Strobl (2012), (Panel data)
4. Noy (2009), (Panel data),
5. Acevedo (2014), (Panel var),
6. Gorio (2009), (DSGE model).

Model Specification

Panel var

$$x_{i,t} = x_0 + \sum_{k=1}^{n} A_k x_{i,t-k} + \sum_{k=0}^{n} B_k d_{i,t-k} + e_{i,t}, \quad i = 1, \ldots N; t = 1, \ldots T \tag{1}$$

- $\mathbf{x}_{i,t} = [y_{i,t}, i_{i,t}, c_{i,t}, tb_{i,t}, r_{i,t}]'$,
- $d_{i,t} = [storm_{i,t}, earth_{i,t}]'$,

Contemporaneous Impact for Caribbean countries

$$d_0 = \begin{pmatrix} d_{1,1} \\ 0 \\ d_{3,1} \\ 0 \\ 0 \end{pmatrix}$$

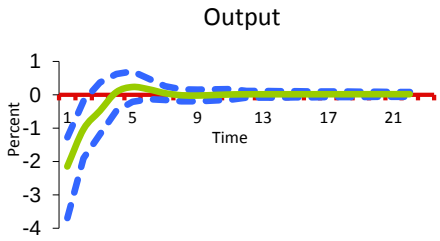
Contemporaneous Impact for Central America countries

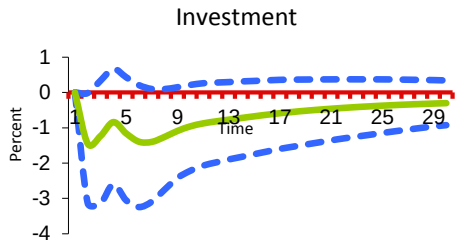
$$d_0 = \begin{pmatrix} d_{1,1} & d_{1,2} \\ 0 & 0 \\ d_{3,1} & d_{3,2} \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$

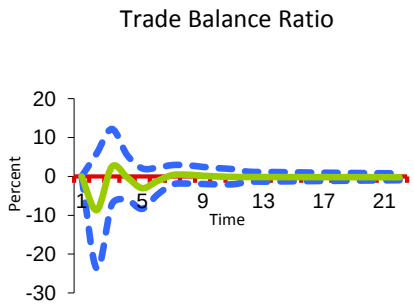
Data and Estimation

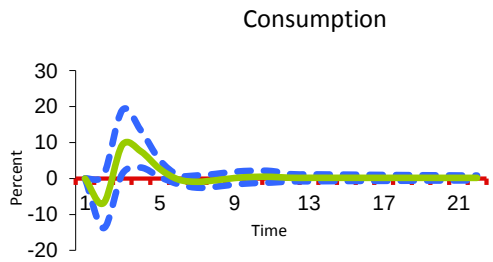
- Panel of 10 Caribbean countries, (1993-2011),
- Panel of 7 Central America countries, (1993-2012),
- Annual data,

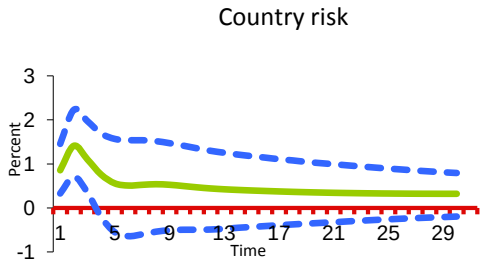
Caribbean Economies





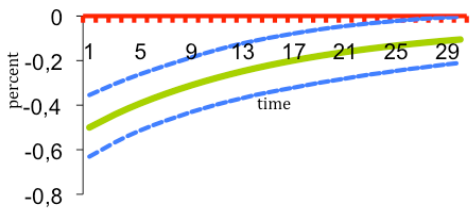




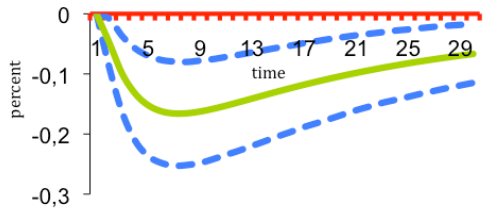


Central America (storm)

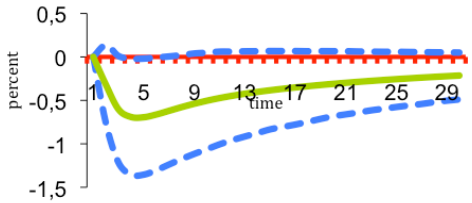
Output



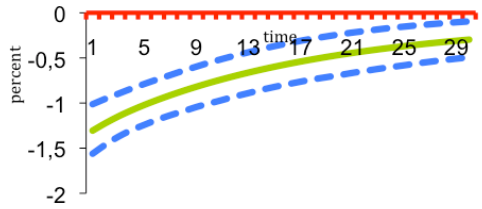
Investment



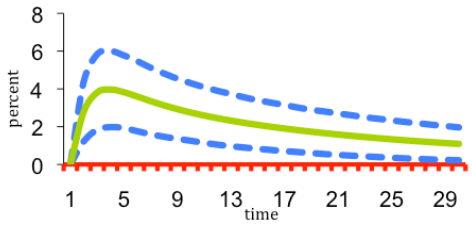
Trade Balance Ratio



Consumption

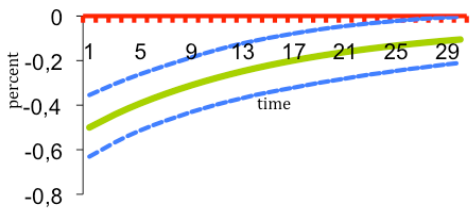


Country Risk



Central America (storm)

Output



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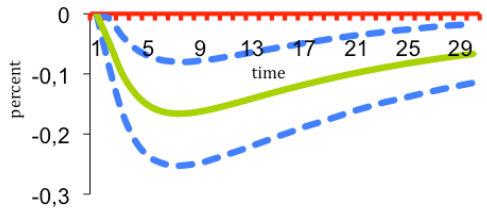
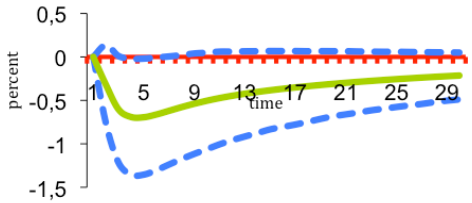
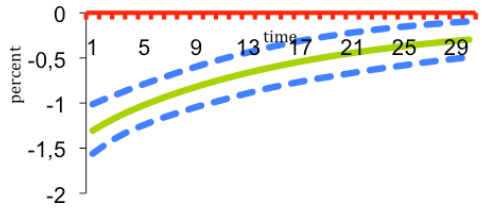


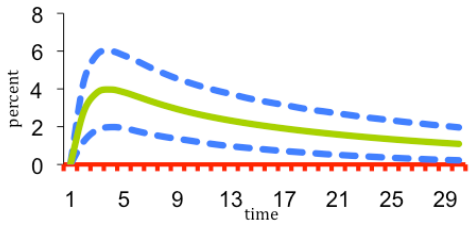
Trade Balance Ratio



Consumption

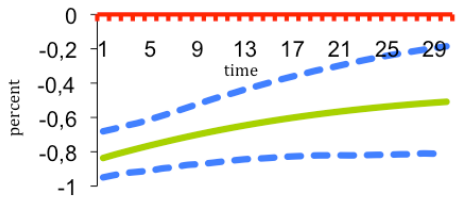


Country Risk

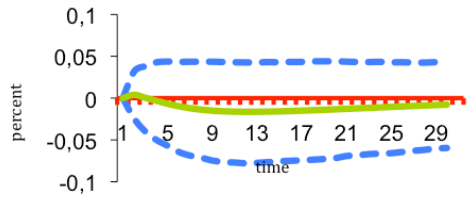


Central America (earthquake)

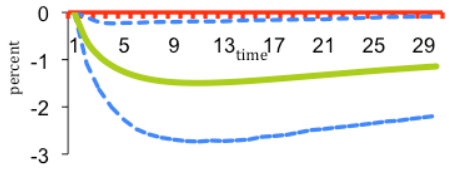
Output



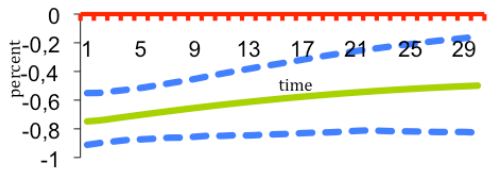
Investment



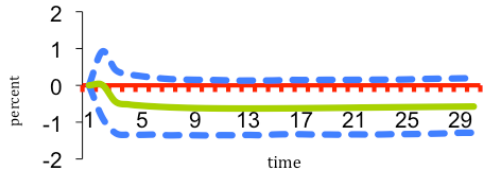
Trade Balance Ratio



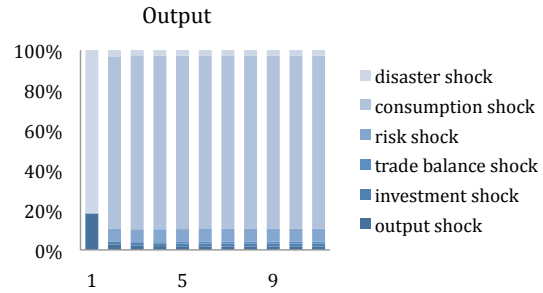
Consumption

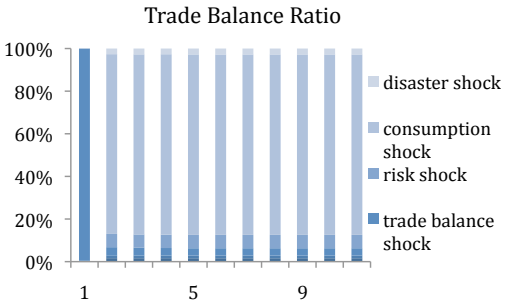


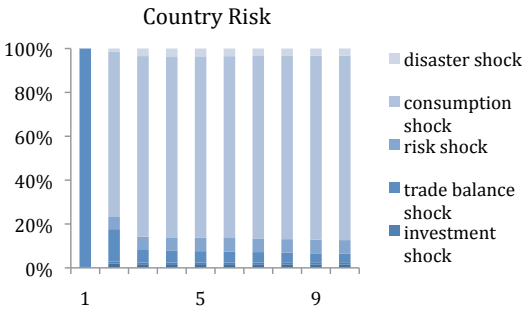
Country Risk



Caribbean Economies







we introduce a risk disaster realization on Gourio (2012) methodology in a standard neoclassical small open economy initially developed by Mendoza (1991) and extended by Schmitt-Grohe and Uribe (2003), Aguiar and Gopinath (2007), Garcia-Cicco et all (2010)

Assumptions

1. Production funtion, $Y_t = e^{z_t} K_t^{\alpha} (A_t L_t)^{1-\alpha}$
2. Temporary productivity shock, $z_t = \rho_z z_{t-1} + \epsilon_{z,t}$
3. Permanent productivity shock, $A_t = e^{g_t} A_{t-1}$,
   $g_t = \rho_g g_{t-1} + (1 - \rho_g)\mu_g + \epsilon_{g,t}$
4. Capital low motion,
   $K_{t+1} = (1 - \bar{\pi} h_{t+1} d_k) \{(1 - \delta) K_t + I_t - \Phi(K_{t+1}, K_t)\}$
5. Utility function, $U = E_0 \sum_{t=0}^{\infty} \beta^t u(C_t, L_t)$
6. Debt,
   $$\frac{B_{t+1}}{q_t} = B_t - Y_t + C_t + \frac{K_{t+1}}{1 - \bar{\pi} h_{t+1} d_k} - (1 - \delta) K_t + \frac{\phi}{2} \left(\frac{K_{t+1}}{K_t} - e^{\mu_g} \right)^2 K_t$$
7. Financial friction, $q_t = 1 + r^{\star} + \psi \left[e^{\frac{B_{t+1}}{A_t} - \bar{b}} - 1 \right] + e^{(s_t - 1)} - 1$
8. Country risk shock $s_t = -\eta_z (1 - \bar{\pi} h_{t+1} d_k) E_t z_{t+1} + \epsilon_{s,t+1}$

1. Introducing a disaster shock in a standard DSGE improves the model fit.
2. Such a result can find support for the well-known Aguiar, Gopinath (2007) hypothesis that the *cycle* is the *trend*.
3. Our theoretical model provides a baseline framework that could be used to compare the effectiveness of several economic policy (monetary and fiscal policies, aid policy and optimal reserve policy...) under a disaster risk.