A PROOFS

A.1 PROOF OF PROPOSITION 1

Proof. When the borrowing constraint is currently not binding, the decentralized Euler equation (4.2) becomes:

$$U_{de}^{el,t} = \beta E_t R_{t+1} U_{de}^{el,t+1},$$

and the representative SOE planner’s Euler equation (4.19) becomes:

$$U_{soep}^{el,t} = \beta E_t R_{t+1} U_{soep}^{el,t+1} + \beta E_t R_{t+1} \mu_{soep}^{el} \Psi_{soep}^{el}.$$  \hspace{1cm} (A.2)

The last term is positive because $\Psi_{soep}^{el} > 0$, and $\mu_{soep}^{el} > 0$ given the collateral constraint will bind in the next period with a positive probability.

Consider a reallocation of resources by the representative SOE planner starting from the optimal allocations in the decentralized equilibrium. This implies holding one more unit of bonds yields identical marginal costs to the decentralized agents and the SOE planner, $U_{de}^{el,t} = U_{soep}^{el,t}$, but higher marginal benefits to the SOE planner because $\beta E_t R_{t+1} U_{de}^{el,t+1} = \beta E_t R_{t+1} U_{soep}^{el,t+1}$ and the last term of (A.2) is positive. Therefore, the SOE planner values bond holdings more than the decentralized agents.

\square

A.2 PROOF OF LEMMA 1

Proof. Plug in bond market clearing condition (4.5) into (4.3) to yield:

$$\beta^* R_{t+1} [y_1^* + b_{t+1}] = y_2^* - R_{t+1} b_{t+1}. \hspace{1cm} (A.3)$$

Rearrange terms to get an expression for the world interest rate:

$$R_{t+1} = \frac{y_2^*}{(1 + \beta^*) b_{t+1} + \beta^* y_1^*}. \hspace{1cm} (A.4)$$

Taking first derivative with respect to the periphery countries’ bond holdings yields:

$$\frac{\partial R_{t+1}}{\partial b_{t+1}} = \frac{-(1 + \beta^*) y_2^*}{[(1 + \beta^*) b_{t+1} + \beta^* y_1^*]^2} < 0. \hspace{1cm} (A.5)$$

\square

A.3 PROOF OF LEMMA 2

Proof. Assume the borrowing constraint never binds, then the periphery coordinator’s Euler equation (4.23) becomes:

$$U_{pc}^{el,t} = \beta E_t R_{t+1} U_{pc}^{el,t+1} + \beta E_t U_{pc}^{el,t+1} b_{t+1} \frac{\partial R_{t+1}}{\partial b_{t+1}}. \hspace{1cm} (A.6)$$

Compared to the decentralized Euler equation (A.1), the last term in the equation above is the marginal benefit obtained from interest rate manipulation, normalized by the marginal utility $U_{pc}^{el,t+1}$, and hence measures the coordinator’s incentive to strategically manage the...
world interest rate. Using (A.5), we can show that the first derivative of $b_{t+1}(\partial R_{t+1}/\partial b_{t+1})$ is given by:

$$
\frac{(1 + \beta^*)y_t^2[(1 + \beta^*)b_{t+1} - \beta^*y_t^1]}{[(1 + \beta^*)b_{t+1} + \beta^*y_t^1]^3}.
$$

(A.7)

We focus on the most empirically relevant parameter space: $(1 + \beta^*)b_{t+1} + \beta^*y_t^1 > 0$ and $(1 + \beta^*)b_{t+1} - \beta^*y_t^1 < 0$. This implies the incentive term $b_{t+1}(\partial R_{t+1}/\partial b_{t+1})$ is decreasing in $b_{t+1}$. Given that $(\partial R_{t+1}/\partial b_{t+1}) < 0$ from lemma 1, it is easy to see when the peripheral countries decide to save ($b_{t+1} > 0$), $b_{t+1}(\partial R_{t+1}/\partial b_{t+1})$ is negative, so the incentive to manipulate the world interest rate is stronger as the saving amount is higher. In contrast, when the peripheral countries decide to borrow ($b_{t+1} < 0$), $b_{t+1}(\partial R_{t+1}/\partial b_{t+1})$ is positive, so the desire to manage the world interest rate is stronger as the borrowing amount is higher.

\[\square\]

### A.4 Proof of Proposition 2

**Proof.** When the borrowing constraint is currently not binding, $\mu_t = 0$. The periphery coordinator’s Euler equation (4.23) becomes:

$$
U_{t,t}^\text{per} = \beta E_t R_{t+1} U_{t,t+1}^\text{per} + \beta E_t R_{t+1} \mu_{t+1}^\text{per} \Psi_{t+1}^\text{per} + \beta E_t [U_{t,t+1}^\text{per} + \mu_{t+1}^\text{per} \Psi_{t+1}^\text{per}] b_{t+1} \frac{\partial R_{t+1}}{\partial b_{t+1}}. \tag{A.8}
$$

Given that the Lagrangian multiplier $\lambda_{t+1} = U_{t,t+1} + \mu_{t+1} \Psi_{t+1} > 0$, and $\partial R_{t+1}/\partial b_{t+1} < 0$ from Lemma 1, it is obvious when peripheral countries are saving, i.e. $b_{t+1} > 0$, the last term of (A.8) is negative. On the other hand, when peripheral countries are borrowing, i.e. $b_{t+1} < 0$, the last term of (A.8) is positive.

Next we compare the periphery coordinator’s valuation of bond positions relative to the SOE planners and decentralized agents.

**Periphery Coordinator vs. SOE planners:** Consider a reallocation of resources by the coordinator starting from the SOE planners’ optimal allocations. This implies holding one more unit of bonds yields identical marginal costs to the SOE planners and the periphery coordinator, $U_{t,t}^\text{per} = U_{t,t}^\text{soep}$, but different marginal benefits. Because at the initial allocations, $\beta E_t R_{t+1} U_{t,t+1}^\text{soep} + \beta E_t R_{t+1} \mu_{t+1}^\text{soep} \Psi_{t+1}^\text{soep} = \beta E_t R_{t+1} U_{t,t+1}^\text{per} + \beta E_t R_{t+1} \mu_{t+1}^\text{per} \Psi_{t+1}^\text{per}$, so when the last term of (A.8) is positive (negative), the periphery coordinator values bond holdings more (less) than the SOE planners.

**Periphery Coordinator vs. Decentralized agents:** Consider a reallocation of resources by the coordinator starting from the optimal allocations in the decentralized equilibrium. This implies holding one more unit of bonds yields identical marginal costs to the decentralized agents and the periphery coordinator, $U_{t,t}^\text{de} = U_{t,t}^\text{per}$, but different marginal benefits. Because at the initial allocations, $\beta E_t R_{t+1} U_{t,t+1}^\text{de} = \beta E_t R_{t+1} U_{t,t+1}^\text{per}$, comparing (A.1) to (A.8) to see that the marginal benefits differ by the sum of two terms: $\beta E_t R_{t+1} \mu_{t+1}^\text{de} \Psi_{t+1}^\text{per} + \mu_{t+1}^\text{de} \Psi_{t+1}^\text{per} b_{t+1} \frac{\partial R_{t+1}}{\partial b_{t+1}}$. When the peripheral countries are saving $b_{t+1} > 0$, the last term is negative and the sum may be positive or negative depending on the relative strength of the two terms, hence the periphery coordinator may value additional bond holdings more or less relative to the decentralized agents. On the other hand, when the peripheral countries are borrowing $b_{t+1} < 0$, the sum of the two terms is always positive, so the periphery coordinator always values bond holdings more relative to the decentralized agents.
A.5 Proof of Proposition 3

Proof. We write the Euler equations under the three equilibria respectively below:

\[ U^{de}_{T,t} = \beta E_t R_{t+1} U^{de}_{T,t+1} (1 + \tau_t) + \mu_t^{de} \]  
(A.9)

\[ U^{soep}_{T,t} = \beta E_t R_{t+1} [U^{soep}_{T,t+1} + \mu_t^{soep} \Psi_{t+1}^{soep}] + \mu_t^{soep} (1 - \Psi_t^{soep}) \]  
(A.10)

\[ U^{pc}_{T,t} = \beta E_t R_{t+1} [U^{pc}_{T,t+1} + \mu_t^{pc} \Psi_t^{pc}] + \mu_t^{pc} (1 - \Psi_t^{pc}) + \beta E_t [U^{pc}_{T,t+1} + \mu_t^{pc} \Psi_t^{pc}] b_{t+1} \frac{\partial R_{t+1}}{\partial b_{t+1}}. \]  
(A.11)

By comparing the three Euler equations, it is straightforward to show that a tax on private agent’s bond holdings:

\[ \tau_t^{soep} = E_t \Psi_{t+1}^{soep} / E_t U^{soep}_{T,t+1} - \mu_t^{soep} \Psi_t^{soep} / \beta E_t R_{t+1} U^{soep}_{T,t+1}, \]  
(A.12)

restores the national regulator’s equilibrium allocations, and a tax

\[ \tau_t^{pc} = E_t \Psi_t^{pc} / E_t U^{pc}_{T,t+1} - (\mu_t^{pc} \Psi_t^{pc}) / (\beta E_t R_{t+1} U^{pc}_{T,t+1}) \]

\[ + E_t [U^{pc}_{T,t+1} + \mu_t^{pc} \Psi_t^{pc}] b_{t+1} \frac{\partial R_{t+1}}{\partial b_{t+1}} / (E_t R_{t+1} U^{pc}_{T,t+1}), \]  
(A.13)

where \( \partial R_{t+1} / \partial b_{t+1} \) is given by (A.5), implements the periphery coordinator’s allocations when the proceeds are redistributed to the private agents in a lump-sum fashion.

B Solution Methods

This section describes the global non-linear numerical methods that we use to solve the three equilibria in our paper. For all three equilibria, the state variables are the bond position for all the peripheral countries \( b \), the current endowment realization \( y \) (consists of tradable endowment \( y_T \) and nontradable endowment \( y_N \)), and current financial condition realization \( \kappa \). We discretize the bond position space into a 900-point evenly-spaced grid. We use the method described by Tauchen (1986) to discretize the tradable and nontradable endowment processes. We allow 4 realizations for both tradable and nontradable endowments, so there is a total of 16 endowment realizations. The processes for the endowment and financial condition are discussed in section 5.1.

B.1 Decentralized Agents’ and SOE planner’s Problem We use Euler equation iteration to solve for the decision rules of the decentralized agents’ and the representative SOE planner’s problem. The solution method involves iterating on the recursive Euler equation until it converges and it is described in Coleman (1991) and Baxter (1991). It is then incorporated into models with occasionally binding constraints by Bianchi (2011) and we follow his algorithm closely to solve for the decentralized agents’ and the representative SOE planner’s problems. To solve the decentralized agents’ problem, we need to solve for functions
\{b'(b, y, \kappa), c_T(b, y, \kappa), c(b, y, \kappa), p(b, y, \kappa), \mu(b, y, \kappa)\} such that:

\begin{align}
U_T(c(b, y, \kappa)) &= \beta R(b')E_{y', \kappa'}|y, \kappa U_T(c(b', y', \kappa')) + \mu(b, y, \kappa) \quad \text{(B.1)} \\
c(b, y, \kappa) &= \left[\omega (c_T(b, y, \kappa))^{-\eta} + (1 - \omega)(y_N)^{-\eta}\right]^{-1/\eta} \quad \text{(B.2)} \\
c_T(b, y, \kappa) + b'(b, y, \kappa) &= y_T + R(b)b \quad \text{(B.3)} \\
-b'(b, y, \kappa) &\leq \kappa(y_T + p(b, y, \kappa)y_N) \quad \text{(B.4)} \\
p(b, y, \kappa) &= \frac{1 - \omega}{\omega} \left(\frac{c_T(b, y, \kappa)}{y_N}\right)^{1+\eta}, \quad \text{(B.5)}
\end{align}

where the world interest rate function \(R(b)\) is given by (4.4). The algorithm to solve the decentralized agents’ problem follows:

1. Discretize the state space and generate a grid according to the method described above. We use linear interpolation to interpolate over the bond position grid.

2. Make an initial guess of \(\{b'_0(b, y, \kappa), c_{T,0}(b, y, \kappa), c_0(b, y, \kappa), p_0(b, y, \kappa), \mu_0(b, y, \kappa)\}\) for each state \((b, y, \kappa)\).

3. Set \(j = 0\).

4. For a given \(j\) and function \(\{b'(b, y, \kappa), c_{T,j}(b, y, \kappa), c_j(b, y, \kappa), p_j(b, y, \kappa), \mu_j(b, y, \kappa)\}\), we can solve for \(\{b'_{j+1}(b, y, \kappa), c_{T,j+1}(b, y, \kappa), c_{j+1}(b, y, \kappa), p_{j+1}(b, y, \kappa), \mu_{j+1}(b, y, \kappa)\}\) for a state \((b, y, \kappa)\) by
   
   (a) Assume the collateral constraint (B.4) is not binding. Set \(\mu_{j+1}(b, y, \kappa) = 0\) and solve for \(b'_{j+1}(b, y, \kappa), c_{T,j+1}(b, y, \kappa), c_{j+1}(b, y, \kappa)\) and \(p_{j+1}(b, y, \kappa)\) using (B.1), (B.2), (B.3), (B.5) and a one-dimensional root finding algorithm.

   (b) Use price function from the last step \(p_j(b, y, \kappa)\), check if the collateral constraint (B.4) is satisfied. By using the last iteration’s price function, we can avoid the problem of multiplicity in the root finding problem and it becomes innocuous when the price function converges. For robustness check, we start from different initial guesses and always get the same result. We also plot the collateral constraint after the code converges and find no multiplicity.

   (c) If the collateral constraint is satisfied, move to the next grid point.

   (d) If the collateral constraint is not satisfied, set \(b'_{j+1}(b, y, \kappa) = -\kappa(y_T + p_j(b, y, \kappa)y_N)\) and then solve for \(c_{T,j+1}(b, y, \kappa), c_{j+1}(b, y, \kappa), \mu_{j+1}(b, y, \kappa)\) and \(p_{j+1}(b, y, \kappa)\) using (B.1), (B.2), (B.3) and (B.5).

5. Check for convergence. If \(|x_j(b, y, \kappa) - x_{j+1}(b, y, \kappa)| > \epsilon\) for any \((b, y, \kappa)\) and \(x \in \{b', c_T, c, p, \mu\}\), then go back to step 3 with \(j = j + 1\). Otherwise, the iteration converges and we have found the equilibrium.

To solve for the representative SOE planner’s problem, we use the same algorithm above. However, instead of using decentralized agents’ Euler equation (B.1), we use the representative SOE planner’s Euler equation:

\begin{align}
U_T(c(b, y, \kappa)) &= \beta R(b')E_{y', \kappa'}|y, \kappa [U_T(c(b', y', \kappa')) + \mu(b', y', \kappa')\Psi(b', y', \kappa')] \\
&\quad + \mu(b, y, \kappa)(1 - \Psi(b, y, \kappa)), \quad \text{(B.6)}
\end{align}

where \(\Psi(b, y, \kappa) = \kappa p(b, y, \kappa)(1 + \eta)(y_N/c_T(b, y, \kappa))\).
B.2 Periphery Coordinator’s Problem

We use value function iteration to solve the periphery coordinator’s problem. The periphery coordinator’s problem can be written recursively as:

\[
V(b, y, \kappa) = \max_{b'} u(c(b, y, \kappa)) + \beta E(V(b', y', \kappa') | y, \kappa)
\]

(B.7)

\[
c_T(b, y, \kappa) + b' = y_T + \frac{by_2}{(1 + \beta^*)b + \beta^*y_1}
\]

(B.8)

\[
b' \leq \kappa \left( y_T + \frac{1 - \omega}{\omega} \left( \frac{c_T(b, y, \kappa)}{y_{N, t}} \right)^{1+\eta} y_N \right)
\]

(B.9)

\[
c(b, y, \kappa) = \left[ \omega(c_T(b, y, \kappa))^{-\eta} + (1 - \omega)(y_N)^{-\eta} \right]^{-1/\eta}.
\]

(B.10)

We use cubic splines to approximate the value function of the periphery coordinator \(V(b, y, \kappa)\) and solve the maximization problem using sequential quadratic programming algorithm (Kraft, 1994) from the NLopt package in Fortran developed by Johnson (2014). We then apply the standard value function iteration method to solve for the decision rules of the periphery coordinator under each state \((b, y, \kappa)\).

C Calibration to Latin American Countries

As discussed in section 5.6.1, our alternative calibration includes data from 1970 to 2011 on five Latin American countries: Argentina, Colombia, Guatemala, Uruguay, and Venezuela. We follow the same calibration strategy as in the baseline calibration, except for \(\beta\). We now set the discount factor of the periphery countries \(\beta\) to match the average real interest rate of the selected group of Latin American countries, which is different from the U.S. interest rate. Note that in our alternative calibration, our definition of the tradable sector for Latin American countries includes agriculture, mining, and manufacturing. The calibrated parameter values are listed in table C.1. The estimated bivariate autoregressive coefficients and the variance-covariance matrix for the endowment process are shown below:

\[
\rho = \begin{bmatrix}
0.4610 & -0.0149 \\
0.5719 & 0.3525
\end{bmatrix}, \quad \Omega = \begin{bmatrix}
0.00979828 & 0.0115977 \\
0.0115977 & 0.017627
\end{bmatrix}.
\]

Table C.2 reports the simulated model moments and their data counterparts. Our model is able to produce more volatile consumption relative to output as observed in the data. The model also matches the standard deviation of the current account to GDP ratio and the correlation of consumption with GDP. The current account/GDP ratio is strongly countercyclical in the data, but our model predicts the ratio to be acyclical. The model implies an average per capita consumption drop of 9.5% during crises, which is comparable to the observed drop of 9.1% during the 2001 Latin American debt crisis.

D Decomposition of Shocks

In our baseline model, the peripheral countries are subject to three shocks: the financial shock, the nontradable endowment shock, and the tradable endowment shock. In this section we investigate the role and the relative contribution of each shock to the model statistics. Table D.1 shows the average NFA position, the probability of crisis, and the welfare gains when we shut down each shock in turn. Table D.1 shows that, in general, less uncertainty reduces the probability of crisis. As a result, the peripheral countries lower their average NFA position since their need for precautionary savings is weakened.
Table C.1: Parameters for Calibration to Latin American Countries

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Parameter Value</th>
<th>Source/Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peripheral Countries</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount Factor</td>
<td>$\beta = 0.94$</td>
<td>Average Real Interest Rate of Sample Economies</td>
</tr>
<tr>
<td>Risk Aversion</td>
<td>$\gamma = 2$</td>
<td>Standard Value</td>
</tr>
<tr>
<td>Preference for Tradable Goods</td>
<td>$\omega = 0.385$</td>
<td>Share of Tradable Output $= 38.5%$</td>
</tr>
<tr>
<td>Elasticity of Substitution</td>
<td>$1/(1 + \eta) = 0.83$</td>
<td>Bianchi (2011)</td>
</tr>
<tr>
<td>Income Process</td>
<td>See Text</td>
<td>Selected Group of Economies</td>
</tr>
<tr>
<td>Collateral Coefficient (high)</td>
<td>$\kappa_h = 0.35$</td>
<td>Average NFA/Tradable GDP $= -0.35$</td>
</tr>
<tr>
<td>Collateral Coefficient (low)</td>
<td>$\kappa_l = 0.165$</td>
<td>Consumption Drop during 2001 Debt Crisis</td>
</tr>
<tr>
<td>Collateral Coefficient Transition Prob.</td>
<td>$P_{hh} = 0.9$</td>
<td>Bianchi and Mendoza (2018)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Core Country</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount Factor</td>
<td>$\beta^* = 0.9874$</td>
<td>Average U.S. Real Interest Rate</td>
</tr>
<tr>
<td>Endowment in 1st Period of Life</td>
<td>$y_1^* = 135$</td>
<td>World Interest Rate Elasticity</td>
</tr>
<tr>
<td>Endowment in 2nd Period of Life</td>
<td>$y_2^* = 135$</td>
<td>World Interest Rate Elasticity</td>
</tr>
</tbody>
</table>

Data source: The income, its sectoral breakdown, and consumption data are from the UN National Accounts Main Aggregates Database. The NFA data is from Lane and Milesi-Ferretti (2006). The sample covers data from 1970 to 2011 on five Latin American economies: Argentina, Colombia, Guatemala, Uruguay, and Venezuela. The real interest rate in Latin American countries is calculated as the average U.S. real interest rate plus the average sovereign bond spread. The bond spread data is from the JPM EMBI GLOBAL.

Table C.2: Calibration to Latin American Countries: Moments

<table>
<thead>
<tr>
<th>Moments</th>
<th>Description</th>
<th>Data Decentralized Equilibrium</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E(b/y_T)$</td>
<td>Average NFA/Tradable GDP Ratio</td>
<td>-35% -35%</td>
</tr>
<tr>
<td>$E[(c_{\text{crisis },t} - c_{\text{crisis },t-1})/c_{\text{crisis },t-1}]$</td>
<td>Consumption Drop during Crises</td>
<td>-9.1% -9.5%</td>
</tr>
<tr>
<td>$\sigma(c)/\sigma(y)$</td>
<td>Std Dev of Consumption Relative to GDP</td>
<td>1.08 1.06</td>
</tr>
<tr>
<td>$\sigma(ca/y)/\sigma(y)$</td>
<td>Std Dev of Current Account Relative to GDP</td>
<td>0.18 0.19</td>
</tr>
<tr>
<td>$\rho(c,y)$</td>
<td>Consumption Correlation with GDP</td>
<td>0.99 0.90</td>
</tr>
<tr>
<td>$\rho(ca/y,y)$</td>
<td>Current Account/GDP Correlation with GDP</td>
<td>-0.56 -0.01</td>
</tr>
</tbody>
</table>

$^a$ GDP and consumption data are from the UN National Accounts Main Aggregates Database. Current account balance data come from the IMF's WEO database.

$^b$ The GDP, $y$, is in units of tradables and is calculated as the sum of tradable and nontradable output $y = y_T + py_N$.

$^c$ We take the log of all the data and HP-filter it with the exception of the current account balance.

Of the three shocks, the tradable endowment shock contributes the most to generate the model statistics. When the peripheral countries’ tradable endowment is fixed at its mean, the probability of crisis becomes much smaller. In addition, the precautionary saving motive is greatly weakened and the average NFA position plunges to 0.84% of the tradable GDP. Since there is only a negligible probability that the peripheral countries will experience a financial crisis, national regulation improves welfare only marginally at $3.17 \times 10^{-5}\%$ of the permanent consumption. In this case, there is little room for the periphery coordinator to exert market power when borrowing and saving in the international financial market due to the low average NFA position. As a result, the welfare gain in the periphery countries and the welfare loss in the core country are significantly less than those in the baseline case.

Nontradable goods shock plays a qualitatively similar role to the tradable goods shock, but it is quantitatively less important. We can see from the third column that the probability of crisis and the average NFA are lower in all three equilibria. In addition, the welfare gain is lower than in the baseline case. Lastly, the financial shock is the least significant contributor to the model dynamics but affects the crisis probability substantially. However, even though the probability of crisis is lower when the financial shock is absent, the SOE planner can still yield
a higher welfare gain relative to the baseline result. This is because the peripheral countries save less in the absence of financial shocks, and thus they have a higher rate of return from savings.

<table>
<thead>
<tr>
<th>Table D.1: Decomposition of Shocks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
</tr>
<tr>
<td><strong>Decentralized Agents</strong></td>
</tr>
<tr>
<td><strong>Probability of Crisis</strong></td>
</tr>
<tr>
<td><strong>SOE Planners</strong></td>
</tr>
<tr>
<td><strong>Probability of Crisis</strong></td>
</tr>
<tr>
<td><strong>Periphery Welfare Gain</strong></td>
</tr>
<tr>
<td><strong>Core Welfare Gain</strong></td>
</tr>
<tr>
<td><strong>Periphery Coordinator</strong></td>
</tr>
<tr>
<td><strong>Probability of Crisis</strong></td>
</tr>
<tr>
<td><strong>Periphery Welfare Gain</strong></td>
</tr>
<tr>
<td><strong>Core Welfare Gain</strong></td>
</tr>
</tbody>
</table>

E ALTERNATIVE CALIBRATION WITH HIGHER PROBABILITY OF CRISIS

In this section, we experiment with an alternative calibration to the Asian countries that generates a higher probability of crisis relative to our benchmark calibration. This calibration differs from the benchmark in two aspects. First, we detrend the tradable and nontradable endowment process with quadratic trends instead of the HP-filter in the benchmark case. As a result, the tradable and nontradable endowment processes become more volatile relative to those in the benchmark calibration. The estimated autoregressive coefficients and the variance-covariance matrix are shown below:

$$\rho = \begin{bmatrix} 1.3247 & -0.5083 \\ 0.7517 & 0.1421 \end{bmatrix}, \quad \Omega = \begin{bmatrix} 0.0107731 & 0.0101895 \\ 0.0101895 & 0.0104328 \end{bmatrix}.$$

Second, we use the log utility instead of the CRRA utility function with a risk aversion parameter of $\gamma = 2$ as in the benchmark calibration. The low risk aversion reduces the precautionary savings that households in the peripheral countries accumulate when they are close to the collateral constraint binding region. Therefore, the households are constrained by collateral more frequently. We follow the same strategy to calibrate the remaining parameters as in the baseline case. The financial constraint tightness parameter $\kappa_l$ changes from 0.33 to 0.28 while parameter $\kappa_l$ changes from 0.15 to 0.10. Meanwhile, the other parameter values stay the same.

Figure E.1 plots the ergodic distributions of the bond positions in the three equilibria. The qualitative property of the distribution is the same as the benchmark case. But it is more skewed to the right and has a higher weight in the binding region relative to the one under the benchmark calibration in figure 4. From table E.1, we can see that this alternative calibration produces a crisis probability of 1.36%, which is significantly higher than that under our benchmark calibration, and an average welfare loss\(^1\) from conducting the country-level macroprudential policy that is of similar magnitude relative to our benchmark result.

Table E.2 reports the business cycle statistics of the data under the benchmark calibration, and under the alternative calibration. Overall, it performs worse than the benchmark in

---

\(^1\)With log utility, we cannot use the closed-form expression (5.3) to calculate the peripheral welfare gain. Therefore, we calculate the welfare gain as the percentage of permanent consumption numerically, similar to the method Berigno et al. (2013) used in section 3.1 of their study.
Figure E.1: Ergodic Distributions of Bond Positions under the Alternative Calibration

Table E.1: Summary of Statistics for the Three Equilibria under the Alternative Calibration

<table>
<thead>
<tr>
<th></th>
<th>Decentralized</th>
<th>SOE Planner</th>
<th>Periphery Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average NFA of Periphery</strong> (Percentage of tradable GDP)</td>
<td>33.16%</td>
<td>33.82%</td>
<td>17.78%</td>
</tr>
<tr>
<td><strong>Crisis Probability in Periphery</strong> (Per year)</td>
<td>1.36%</td>
<td>1.29%</td>
<td>1.42%</td>
</tr>
<tr>
<td><strong>Welfare Gain in Periphery</strong> (Percentage of permanent composite consumption)</td>
<td>-</td>
<td>$-3.91 \times 10^{-5}$%</td>
<td>0.032%</td>
</tr>
<tr>
<td><strong>Welfare Gain in Core</strong> (Percentage of constant consumption over life)</td>
<td>-</td>
<td>$5.43 \times 10^{-6}$%</td>
<td>$-6.09 \times 10^{-4}$%</td>
</tr>
</tbody>
</table>

terms of matching the selected business cycle moments. For example, consumption becomes less volatile relative to output, which is inconsistent with the salient observation for EMEs ($\sigma(c) / \sigma(y) = 0.88$ in this calibration vs. 1.14 in the data). The ratio of the standard deviation of the current account to the standard deviation of the output becomes much smaller relative to the data counterpart. Moreover, the highest consumption drop during crises we can generate under this calibration is 4.1%, which is much milder than the observed drop of 6.3% during the 1997 Asian crisis.
Table E.2: First and Second Moments of Data under Two Calibrations

<table>
<thead>
<tr>
<th>Moments</th>
<th>Description</th>
<th>Data</th>
<th>Benchmark Calibration</th>
<th>Alternative Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E(b/y_T)$</td>
<td>Average NFA/Tradable GDP Ratio</td>
<td>32%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>$E[(c_{crisis,t} - c_{crisis,t-1})/c_{crisis,t-1}]$</td>
<td>Consumption Drop during Crises</td>
<td>-6.3%</td>
<td>-5.8%</td>
<td>-4.1%</td>
</tr>
<tr>
<td>$\sigma(c)/\sigma(y)$</td>
<td>Std Dev of Consumption Relative to GDP</td>
<td>1.14</td>
<td>1.00</td>
<td>0.88</td>
</tr>
<tr>
<td>$\sigma(ca/y)/\sigma(y)$</td>
<td>Std Dev of Current Account Relative to GDP</td>
<td>0.31</td>
<td>0.29</td>
<td>0.08</td>
</tr>
<tr>
<td>$\rho(c,y)$</td>
<td>Consumption Correlation with GDP</td>
<td>0.99</td>
<td>0.71</td>
<td>0.98</td>
</tr>
<tr>
<td>$\rho(ca/y,y)$</td>
<td>Current Account/GDP Correlation with GDP</td>
<td>-0.49</td>
<td>0.37</td>
<td>0.57</td>
</tr>
</tbody>
</table>

*a* GDP and consumption data are from the UN National Accounts Main Aggregates Database. Current account balance data come from the IMF’s WEO database.

*b* The GDP, $y$, is in units of tradables and calculated as the sum of tradable and nontradable output $y = y_T + py_N$.

*c* We take the log of all the data and HP-filter it with the exception of the current account balance.
REFERENCES


