# Discussion of "Financial Intermediation in a Global Environment" (Victoria Nuguer).

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**Discussion of**
**"Financial Intermediation in a Global Environment" (Victoria Nuguer, Bank of Mexico)**

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The 2007-09 global financial crisis has led to a rethinking of the role of financial intermediaries for economic fluctuations. Before the financial crisis, the workhorse macro models used by policy institutions and by academic researchers abstracted from banks (e.g., Christiano et al. (2005)). The crisis has stimulated much research that incorporates banks into quantitative dynamic stochastic general equilibrium (DSGE) models. Given the global nature of the banking industry, and of the financial crisis, that research has frequently focused on open economy models; see, e.g., Devereux and Sutherland (2011), Kollmann et al. (2011, 2013), Perri and Quadrini (2011), Ueda (2012), Dedola et al. (2013), Kamber and Thoenissen (2013) and Kollmann (2013). In this new class of DSGE models, bank capital is a key state variable for real activity; negative shocks to bank capital are predicted to increase the spread between banks' lending and deposit rates, and to trigger a fall in bank credit, investment and output; with a globalized banking system, losses on bank assets in one country can thus lead to a worldwide recession.

The paper by Victoria Nuguer makes a very interesting contribution to the new literature on open economy DSGE models with banks. Her paper highlights the role of country asymmetries for the transmission of banking shocks, and for the optimal policy response to those shocks. While most related studies assume symmetric countries, Victoria considers a world with two countries of vastly different size. The small country has a comparative advantage in banking,

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and its banks are thus larger than banks in the big country. The model is calibrated to data for Switzerland and the US.

The non-financial aspects of the model follow the International Real Business Cycle literature (Backus, Kehoe and Kydland (1994)). Each country is specialized in the production of a tradable intermediate good. All markets are competitive; prices and wages are flexible. The modeling of banks in Victoria's paper is inspired by Gertler and Kiyotaki (2010) and Dedola et al. (2013). Each country is inhabited by a representative family; a constant fraction of the family members are production workers; the remaining members are bankers (there are random switches between these occupations). Workers cannot directly provide their savings to non-financial firms (that borrow to finance physical investment); instead, savings have to be channeled to firms via banks. To prevent embezzlement of bank assets by bankers, a minimum fraction of bank assets has to be funded with bankers' personal net worth (accumulated past profits). This capital requirement limits bank asset holdings. To ensure that the bank capital requirement is always binding, the model assumes that bankers have finite expected job spells, which restricts their net worth accumulation. Crucially, the model posits that bankers in the small country have longer expected job spells (than bankers in the big country); thus, the average small-country bank has more assets than a typical bank in the big country. Small-country banks hence hold a share of their assets abroad; the model assumes that foreign investment takes the form of loans to big-country banks (big-country banks only hold local assets). The interest rate on loans is assumed to equal the rate of return on physical capital in the borrowing country. The model postulates that the global interbank market is frictionless (there is no agency problem between banks).

The analysis in the paper centers on the effects of exogenous stochastic 'capital quality' shocks in the big country. These shocks are non-positive, i.e. they may *destroy* a fraction of the big country's physical capital stock (the shocks are introduced to capture the fall in US real estate prices that triggered the global financial crisis). The net worth of both big- and small-country banks drops, in response to a negative capital quality shock in the big country. The model predicts that this induces a fall in bank lending, physical investment and output in both countries. As mentioned above, qualitatively similar cross-country transmission effects (via global banks) have been discussed in previous studies that assume symmetric countries. Nevertheless, Victoria's analysis is interesting, as it shows that the transmission of foreign

financial shocks is especially powerful to a small foreign country with large banks. The same intuitive point was previously made by Kamber and Thoenissen (2013), albeit in a banking model with a different structure. Victoria provides a statistical analysis (vector autoregressions) using data for the US and Switzerland that supports the prediction of strong shock transmission from the US to Switzerland, during the global financial structure.

A key property of the model, which is not discussed in the paper, is that the stochastic capital quality shocks in the big country *raise* the unconditional expected welfare of the small country, compared to welfare in the deterministic steady state of the world economy (without shocks). This surprising prediction is important for interpreting the welfare effects of stabilization policy (see below). (Big-country unconditional welfare is lower in the presence of the stochastic big-country capital quality shocks, but this is not astonishing as the shocks only takes zero or negative values; in the stochastic economy, the mean big-country capital stock is thus smaller than in the deterministic steady state.) Tables 2 and E.1 show that the higher small-country unconditional welfare (under stochastic shocks) reflects an increase in mean small-country net foreign asset holdings (compared to the deterministic steady state), which is accompanied by a rise in mean consumption and a fall in mean hours worked in the small country.[2] More research on these effects would be useful. I conjecture that the higher average small-country net foreign asset position (under stochastic shocks) might reflect an increase in the average return on physical capital in the big country, which raises the average return on the small country's foreign assets. Hence, the small-country unconditional welfare increase (induced by the foreign stochastic shocks) might hinge on two key assumptions: (1) the return on foreign loans made by small-country banks is indexed to the foreign physical capital return; (2) the small country is a net lender. Welfare spillovers would change if standard unconditional bank loans were assumed. If the small country were structurally a net *debtor*, then big-country stochastic shocks might make the small country worse off, due to a rise in the return on the country's foreign liabilities. Note also that adverse big-country shocks worsen the small-country's terms of trade. A stronger terms of trade deterioration (than under the baseline calibration), due to greater

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[2] Using a second-order approximation of the utility function, I infer from the first and second moments of consumption and hours reported in Table 2, that the rise in unconditional small country welfare (due to big-country capital quality shocks) is equivalent to a permanent 0.79% consumption increase; the fall in big-country unconditional welfare is equivalent to a 0.27% permanent consumption cut.

complementarity between domestic and foreign tradables, too might imply a fall in small-country unconditional welfare.

An important contribution of Victoria's paper is the analysis of 'unconventional' central bank policies in response to adverse capital quality shocks in the big country. Three types of policy interventions (by both countries) are considered: bank equity injections, central bank lending to non-financial firms, and central bank lending to foreign banks. These types of policies have similar effects. Importantly, the model assumes that central banks do not face a collateral constraint (capital requirement), i.e. central banks have an advantage over commercial banks in making loans. As might be expected, central bank intervention (in response to shocks that impair commercial banks) stabilizes credit, investment and output, both in the domestic economy, and abroad. Stabilization policy by the big country's central bank can markedly dampen the contraction of output in the small country (naturally, small-country central bank interventions have a much more muted stabilizing effect on the big country).

Rules-based stabilization policy (governed by policy feedback rules under full commitment) by a given country *raises* domestic *unconditional* expected welfare, but *lowers* foreign unconditional welfare. The negative effect on foreign unconditional welfare might seem astonishing. However, this effect is in line with the fact that, in this model, random adverse capital quality shocks in the big country *raise* small country unconditional welfare (see above). Hence, it is not surprising that big-country policy interventions (that stabilize the domestic economy) reduce unconditional welfare in the small country. (However, it seems less clear why small-country stabilization policy lowers big-country unconditional welfare.) It would be very useful to investigate the robustness of that foreign unconditional welfare effect of stabilization policy--it might hinge on the assumption that the small country is a foreign creditor (see above).

An immediate implication of the *negative* foreign unconditional welfare effect of stabilization policy is that the non-cooperative policy equilibrium (Nash) implies excessively aggressive response to financial shocks. Under Nash, unconditional welfare in both countries is lower than in the absence of any (domestic or foreign) policy response to financial shocks. In the model, coordinated stabilization policy that maximizes a (population-) weighted sum of the two countries' unconditional welfare implies that only the central bank of the big country intervenes.

This result is interesting, however it seems at odds with observed policies during the recent global financial crisis. During the crisis, international policy coordination was intense, but

big and *small* countries alike intervened aggressively to stabilize lending and bank equity. The welfare and policy results in this paper differ starkly from the ones obtained by Dedola et al. (2013) for a symmetric two-country model with banks. In that model, domestic stabilization policy raises foreign unconditional welfare, and thus there is too little intervention under Nash. A key insight of Victoria's paper is thus that the international spillovers of stabilization policy, and the global policy equilibrium, are sensitive to country asymmetries.

In my view, Victoria's paper suggests many interesting avenues for future research. For example, her model assumes a frictionless global interbank market (as mentioned above). Yet, the interbank market was severely impaired during the global financial crisis (sharp rise in interbank spreads). It would be useful to extend the model by allowing for frictions in the interbank market. A second useful research avenue would be to consider bigger shocks. The model calibration assumes that an adverse -1.5% capital quality shocks in the big country occurs on average every 28 years. The unconditional welfare cost of the assumed shock process is small. An adverse shock triggers a fall in the price of physical capital that is very modest when compared, for example, to the 40% fall in US and European stock prices in 2008. The shocks assumed in the model do not threaten the solvency of the banking system. It would be very interesting to study the effect of bigger shocks that imperil the banking system. With bigger shocks, the welfare effects of unconventional policy might be much greater. However, analysis of big shocks would require the use to global numerical model solution methods, instead of the local numerical approximations employed in the paper. A third research avenue would be to assume price or wage stickiness. With nominal rigidities, the fall in aggregate demand induced by adverse banking shocks can have a much greater effect on output than in a flex price/wage world; accordingly, unconventional central bank policies too would boost aggregate output much more, in a world with nominal rigidities (see Kollmann et al. (2012, 2013) for New Keynesian models with banks, and bank rescue measures conducted by the government). Finally, it can be noted that the present model abstracts from conventional monetary and fiscal policy. During the global financial crisis, unconventional policies were combined with very large changes in conventional monetary and fiscal policy instruments. It would be fruitful to extend the model here by allowing for conventional macro policy tools; this would shed light on the optimal conventional/unconventional policy mix for coping with financial shocks.

In summary, Victoria Nuguer's paper provides important insights into the role of country asymmetries for the transmission of financial shocks, and for optimal policy. Her paper also suggests fascinating avenues for future research.

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