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International transmission of financial shocks in an estimated DSGE model☆

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A B S T R A C T

This paper investigates the transmission of financial shocks across large economies. To quantify these effects, we estimate a two-region open economy DSGE model that includes frictions in credit markets. The baseline model fails to replicate the high correlation between the U.S. and Euro Area macroeconomic variables. Allowing for an ad hoc, cross-regional correlation in financial shocks considerably improves the model's ability to match the data. We extend the baseline model by including global banks, and generate an endogenous cross-regional correlation of borrowing costs. Simulations demonstrate large spillover effects, and highlight the importance of including frictions in international financial contracts for more accurately capturing the high cross-regional correlation.

1. Introduction

The recent financial crisis that originated in the U.S. clearly demonstrated that financial frictions can have a significant impact on the level of economic activity, even in advanced economies. An important

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characteristic of the crisis was that the contractionary effects of the financial shock were not confined to the U.S., and countries with exposure to U.S. financial markets were negatively and significantly affected. Although international trade was an important factor in the cross-country spillover of the crisis, the immediate response of foreign economies was prompted by their exposure to distressed U.S. assets and funding markets. These cross-country real-financial linkages are evident in the data even in non-crisis times; in particular, the observed correlation of U.S. and Euro Area stock market indices and cost-of-debt measures are quite high, and these financial linkages arguably contribute to the observed high correlation of output across the two regions (see Fig. 1). Any realistic large-open-economy model would therefore be expected to replicate and account for these high levels of correlations.

In this paper, we construct and estimate a two-region, open-economy, dynamic stochastic general-equilibrium (DSGE) model to quantify the effects of U.S. financial shocks on Euro Area economies. The model features the financial accelerator mechanism of Bernanke et al. (1999) and Carlstrom and Fuerst (1997) in order to capture the amplification and propagation effects of financial frictions. We find that the baseline model, in which the two regions are linked only through international trade and bond markets, fails to generate the high degree of macroeconomic correlation between the U.S. and Euro Area economies. We find much larger international spillover effects, and a higher degree of cross-regional macroeconomic correlation, when we allow financial shocks to be correlated across the two regions. Specifically, the estimated correlation of financial shocks across the two regions is large, and this generates a considerably larger Euro Area response to U.S. financial shocks.

Despite these improvements, allowing for an ad hoc correlation between the financial shocks of the two regions may be inadequate in making sound predictions for the spillover effects of financial shocks. Specifically, predictions based on the estimated values of the correlation coefficients of financial shocks would be inaccurate when these shocks do not behave the way they do on average, or if they are endogenously determined by other variables in the model. Therefore, in the second half of the paper, we extend the baseline model with global banking to investigate one reason why financial shocks could be correlated across regions. Using this model, we generate an endogenous correlation between financial shocks, and compare the results with those obtained from the model estimated using ad hoc correlations. In our extension, we focus on shocks to the cost-of-debt (i.e. credit spreads), and more rigorously model the supply side of credit by allowing banking activity to be global. In this extension of the model, banks pay their depositors a premium over the risk-free rate when raising loanable funds, and similar to the standard financial accelerator framework, this spread is an increasing function of banks' leverage. The optimality conditions from this model indicate that lending rates faced by entrepreneurs in each region depend not only on borrowers' leverage, but also on the banks' leverage. Therefore, shocks that affect banks' net worth have a similar, symmetric effect on risk premiums in both regions. The impulse responses in this extended model demonstrate a large response of Euro Area output to U.S. shocks.

The results more generally suggest that models in which financial frictions only apply to domestic contracts are not sufficient for generating a large foreign response to domestic shocks. To obtain a larger response, financial frictions need to be incorporated into international financial contracts as well. In this paper, we incorporate this through global banking. Our assumption that banking activity is global in scale is not an unrealistic one. In particular, recent studies such as Bruno and Shin (2013) and Cetorelli and Goldberg (2012) illustrate the rapid pace of bank globalization, and data from BIS-reporting banks indicate that the growth in external assets and liabilities of global banks has outpaced the growth in world GDP over the past 20 years. In our model, we find that global banks are an important source of international spillover effects. This is also consistent with the usual finding in the literature that international banking, conducted largely through internal capital markets, has a significant effect on local business cycles (e.g. Alpanda and Aysun, 2012; Buch, 2000; Dahl and Shrieves, 1999; De Haas and Van Lelyveld, 2006, 2010; Goldberg, 2002; Jeanneau and Micu, 2002; Martinez Peria et al., 2002; Morgan and Strahan, 2004).

In our model, banks pay a premium (positively related to their leverage) in raising loanable funds, which effectively broadens the scope of how financial shocks can affect the real economy (domestically and internationally). Specifically, in the usual financial accelerator framework, financial shocks are transmitted to the real economy only through borrower balance sheets (through the credit demand side), while banks play a passive role. By contrast, recent studies (following the Great Recession)