No Pain, No Gain. Multinational Banks in the Business Cycle

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Abstract

We study the role of multinational banks in the propagation of business cycles in host countries. In our economy, multinational banks can transfer liquidity across borders through internal capital markets. However, their scarce knowledge of local firms' collateral hinders their allocation of liquidity to firms. We find that, through the interaction between the "liquidity origination" advantage and the "liquidity allocation" disadvantage, multinational banks can act as a short-run stabilizer in the immediate aftermath of domestic liquidity shocks but be a drag on the recovery in the medium and long run. We study structural and cyclical policies that can ameliorate the trade-off induced by the presence of multinational banks.

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1   Introduction

Banking is increasingly a global activity. In the last two decades, multinational banks have expanded their presence in advanced and emerging countries. As documented by BIS (2008), the international claims of BIS reporting banks rose from $6 trillion in 1990 to $37 trillion in 2007, over 70% of world GDP. In Central and Eastern Europe and in Latin America, large European and U.S. banks have expanded their network of subsidiaries and branches. And the expansion of multinational banks is expected to accelerate in transition countries, such as China and Russia (BIS, 2016). While the growing importance of multinational banks is well documented, we still have limited understanding of how global banking can influence the macroeconomic stability of host countries facing an inflow of foreign banks. This poses relevant challenges to policy makers. In the 1990s, several countries liberalized foreign bank entry into their credit systems (Clarke et al., 2003). However, more recently, in the aftermath of the global financial crisis, concerns have been mounting about the risk of instability associated with the expansion of global banks (Goulding and Nolle, 2012).

Fundamental questions arise naturally from these observations. Do multinational banks help insulate host countries from negative shocks or do they instead exacerbate their effects, amplifying business cycle fluctuations? Under what conditions, and following which shocks, do multinational banks better help stabilize host economies? The goal of this paper is to help address these questions building on two key findings of the empirical banking literature on multinational banks. On the one hand, multinational banks have been found to outpace local banks in mobilizing liquidity in a timely manner, helping overcome liquidity shortages in host economies. This advantage stems from their ability to tap internal capital markets and transfer liquidity across borders, relaxing resource constraints without the need to resort to costly local deposits (Cetorelli and Goldberg, 2012b). To fix ideas, we will label this the "liquidity origination" advantage of multinational banks. On the other hand, several empirical banking studies have found that multinational banks can experience disadvantages in allocating their liquidity to firms in host countries due to their more limited experience with local borrowers (Giannetti and Ongena, 2012; Mian, 2006). This is due do their disadvantage vis-a-vis local banks at monitoring and collecting information about assets and activities of local businesses, especially small and medium-sized informationally opaque firms or firms with limited international outreach (e.g., in real estate or in other non-tradeable sectors). We will label this the "liquidity allocation" disadvantage of multinational banks.[1]

We embed these two features of multinational banks in an otherwise standard two-country DSGE model where banks provide financing to firms. We then ask our model: how do these features determine multinational banks' (de)stabilizing role in host countries? And how do structural and policy features of the banking sector influence this role?

In our economy, firms can borrow from local banks or from multinational ones. When borrowing, firms face collateral constraints. Building on the above empirical findings of the banking literature, we characterize multinational banks with two features: they have internal capital markets which allow them to make transfers, subject to costs, as well as (partly) consolidated balance sheets between parents and affiliates; and ii) they are less efficient at managing and liquidating local entrepreneurs' collateral assets. The "liquidity origination" advantage and the "liquidity allocation" disadvantage give rise to a rich channel of transmission of real and financial shocks. Multinational banks can easily supplant scarce liquidity in response to liquidity shortages in the host country through transfers to their affiliates via internal capital markets. This is not feasible for local banks, which rely on domestic liquidity. However, the reshuffling of local firms' borrowing to multinational banks is not without costs. The pledgeability of collateral gets eroded by the switch from domestic to multinational banks both directly (multinational banks are less able to liquidate local collateral) and via general equilibrium effects (firms' demand for

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[1]Foreign banks can suffer from limited knowledge of the local markets, assets, and legal procedures, especially when assets are inherently local and non-tradable, and when markets are informationally opaque, as it is the case in several emerging countries (Boot and Kanatas, 1995; Bulow and Rogoff, 1989; Diwan, 1990). Domestic banks may possess private information not available to multinational banks.

collateral assets is lower when borrowing from banks that are less knowledgeable about local collateral, triggering a drop in collateral asset values).

We perturb the host economy with two types of shocks: a financial shock that originates in the domestic banking sector and a productivity shock. A trade-off arises in the impact of multinational banks in response to such shocks. Consider the domestic financial shock. On impact, multinational banks play a stabilizing role by swiftly transferring liquidity across borders. This helps compensate for the drop in local banks' credit. However, over the medium run, the resulting reallocation in local firms' borrowing reduces the average pledgeability of collateral; the reduced collateral pledgeability, in turn, shrinks credit. Overall, a "no pain, no gain" message arises: following the shock, multinational banks act as a short-run buffer, but the reallocation they trigger in the credit market slows down the recovery. Consider next a TFP shock, which reduces firms' demand for credit and multinational banks' return from investing in the host economy. On impact multinational banks amplify the shock by repatriating liquidity to their parents in the foreign country. However, again, a trade-off arises: in the medium run, the reallocation of borrowing in the credit market makes the economy recover more quickly. At the cost of belaboring this point: depending on the nature of the shock, multinational banks can act as a stabilizer or an amplifier in the short run, but in the medium run their presence is the source of a trade-off.

We examine how structural and cyclical policies affect the trade-off induced by multinational banks. A higher degree of consolidation of multinational banks' balance sheets (due, e.g., to a regulation that incentivizes their entry through branches rather than subsidiaries) mitigates the amplification effects following a local financial shock (i.e., induces "less pain" in the short run impact) without costs in the medium-term recovery. By contrast, higher costs of multinational banks' transfers (due to regulations inhibiting internal capital markets) have a nuanced effect, eroding the stabilizing role of multinational banks in the short run but also mitigating their destabilizing impact in the medium run. And a similar conclusion applies to the nature of multinational banks' transfers, that is, whether the transfers take the form of loans from parents to affiliates or equity injections.

We also study the role of cyclical policies, focusing on credit market interventions that influence the loan-to-value ratios faced by firms in the loan market. This is indeed the type of policies that have been implemented in various emerging countries facing a large inflow of multinational banks (see, e.g., Bierut et al., 2015, for the case of Poland and other Eastern European countries). We find that a policy-maker interested in mitigating the trade-off induced by multinational banks should device countercyclical policies targeting multinational banks. Instead, perhaps surprisingly, no benefit appears to arise from countercyclical policies targeting equally local and multinational banks.

The remainder of the paper unfolds as follows. In the next section, we relate the analysis to prior literature. Section 3 lays out the model and solves for agents' decisions. Section 4 presents the calibration and the simulation results. In Section 5, we study structural and cyclical policies. Section 6 concludes.

2 Prior Literature

2.1 Empirical motivation

The paper relates to the empirical literature on the lending and liquidity management of multinational banks. We build on the empirical findings of a broad strand of banking studies on the pros and cons of multinational banks. Papers that investigate the role of internal capital markets in transferring liquidity include De Haas and Van Lelyveld (2010) and Cetorelli and Goldberg (2012b). De Haas and Van Lelyveld (2010) find for emerging Europe that during local crises lending by foreign banks has been more stable than lending by domestic banks. Cetorelli and Goldberg (2012b) show that following liquidity shocks multinational banks can be a stabilizing force because they withstand the shocks better than domestic banks by transferring liquidity across borders (see also Haselmann, 2006). However, multinational banks also exhibit less experience about domestic activities and assets. Several studies find that this can result in tighter financing constraints for small and medium size local enterprises as foreign banks may serve only large and transparent customers (Cárdenas et al., 2003). Mian (2006) finds that in Pakistan foreign banks avoid lending to opaque firms, especially if the cultural and geographical distance between the CEO and the loan officer is large.[2] Giannetti and Ongena (2012) obtain evidence that in Eastern European countries small, informationally opaque firms are penalized by multinational banks relative to large firms (for similar evidence for Argentina, see Berger et al., 2001). Degryse et al. (2012) study Polish firms and find support for the hypothesis that multinational banks penalize small, local customers. There is also some evidence that foreign-owned banks are less likely to lend to informationally opaque small businesses than domestically-owned banks (Clarke et al., 2006; Gormley, 2010).[3]

The paper also relates to the evidence on the aggregate effects of multinational banks. This evidence is still mixed, with the results suggesting that multinational banks can be a buffer or an amplifier depending on conditions and types of shocks. Multinational banks have been shown to maintain credit amidst a negative financial shock in a host country in which they operate thanks to cross-border internal flows (Cetorelli and Goldberg, 2012a).[4] Claessens and Horen (2014) uncover evidence that the impact of foreign banks on a country's stability varies across bank characteristics such as capitalization and liquidity. De Haas and Lelyveld (2014) conclude that during the 2008-09 global financial crisis the subsidiaries of multinational banks acted as destabilizers by curtailing credit growth more

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[2]According to a survey on lending practices to SMEs (Jenkins, 2002), international banks and banks specialized in foreign trade or in mortgage finance were not interested in the market for micro and small firms loans. The banks reported that high administrative costs and lack of network and personnel to serve the markets were strong deterrents to engage in such business.

[3]Dell'Ariccia et al. (1999) explore theoretically the consequences of the limited knowledge of banks entering a new market. Foreign banks often have a shorter history in lending to local firms than domestic banks and may also have a more limited understanding of local insolvency practices. This is especially the case in emerging countries, where bankruptcy laws are often porous (Hermalin et al., 1999; Rajan and Zingales, 1998). Foreign lenders may also have to resort to expensive local experts (Hermalin et al., 1999).

[4]See Rai and Kamil (2010) for analogous evidence on multinational bank affiliated in Latin America.

than domestic banks.

2.2 Related theoretical studies

The paper relates to the growing theoretical literature on the macroeconomic role of multinational banks. A strand of studies investigate the role of multinational banks in the international transmission of financial or real shocks and in international business cycle synchronization. Kalemli-Ozcan et al. (2013) study the effect of financial integration on the transmission of international business cycles for developed countries. Other studies that stress the common lender effect of multinational banks include Kollmann et al. (2011), Guerrieri et al. (2012), Lakdawala et al. (2017), Olivero (2010), Meier (2013), and Niepmann (2016). Unlike this class of models which emphasize the common lender aspect of multinational banks, we focus on the behavior of multinational banks in transferring liquidity across borders and allocating this liquidity to local customers. This uncovers a novel mechanism of influence of multinational banks on the macroeconomic stability of host countries.

More closely related to our model is a handful of papers that stress the microeconomic features of multinational banks. De Blas and Russ (2013) put forward a model of cross-border loan flows through multinational affiliates or arms-length lending. They find that the gains from foreign participation depend on the financial development of the host country, as measured by the transaction costs involved in obtaining loans. Fillat et al. (2017) differentiate between branches and subsidiaries of global banks. They assume monopolistic competition in the market for loans and introduce a deposit insurance premium on a risk basis. The mechanism we explore in our analysis differs sharply from those stressed by these studies.

3 The Model Economy

3.1 Environment

Preferences. Time is discrete and the horizon infinite. The economy consists of two countries, the host country and the foreign country. There are a continuum of representative households and a continuum of representative entrepreneurs in each country. The preferences of households are given by

$$\mathbb{E}\sum_{t=0}^{\infty}\beta^t\frac{\left(C_t-\frac{H_t^{1+\epsilon}}{1+\epsilon}\right)^{1-\gamma}-1}{1-\gamma}, \quad \mathbb{E}\sum_{t=0}^{\infty}\beta^t\frac{\left(C_t^*-\frac{H_t^{*,1+\epsilon}}{1+\epsilon}\right)^{1-\gamma}-1}{1-\gamma},$$

where C_t and C_t^* denote households' consumption in the host country and the foreign country, and H_t and H_t^* denote labor. The preferences of entrepreneurs are given by

$$\mathbb{E}_t \sum_{j=0}^{\infty} \beta_e^j \frac{\left(C_{t+j}^e\right)^{1-\gamma_e} - 1}{1-\gamma_e}, \qquad \mathbb{E}_t \sum_{j=0}^{\infty} \beta_e^j \frac{\left(C_{t+j}^{e,*}\right)^{1-\gamma_e} - 1}{1-\gamma_e}.$$

To generate an incentive for entrepreneurs to borrow, we assume that they are less patient than households, i.e., $\beta_e < \beta$.

Technology. Entrepreneurs in each country have access to a constant-returns-to-scale production technology that uses labor and capital to produce goods used for consumption and investment:

$$Y_t = A_t K_{t-1}^\alpha H_t^{1-\alpha}, \tag{1}$$

$$Y_t^* = A_t^* K_{t-1}^{*\alpha} H_t^{*1-\alpha}. \tag{2}$$

There is a capital-good production firm in each country, which is owned by the representative household in the respective country. The capital-good producer in the host country can invest in I_t units of capital goods, which cost $I_t \left[1 + f\left(\frac{I_t}{I_{t-1}}\right)\right]$ units of consumption goods. $f(.)$ captures the adjustment cost in the capital-producing technology, and satisfies $f(1) = 0$, $f'(1) = 0$, and $f''(.) > 0$. The technology of the capital-good production firm in the foreign country is analogous.

Capital accumulation follows the laws of motion

$$K_t = (1-\delta)K_{t-1} + I_t, \tag{3}$$

$$K_t^* = (1-\delta)K_{t-1}^* + I_t^*, \tag{4}$$

where δ denotes the capital depreciation rate.

3.2 Banks

Within the representative household there are two types of agents, workers and bankers. Each worker supplies labor in a competitive labor market and earns wage income. Each banker operates a bank and transfers profits back to the household subject to the banker's flow of fund constraint. Every period, a fraction $1 - \sigma$ of bankers exit their business and become workers, while an equal mass of workers become bankers. Within the household there is perfect consumption insurance.

There are two types of banks. The first is a bank whose business is inherently local. A local bank in the host country gathers deposits from host-country households and extends loans to host-country entrepreneurs (and analogously for a local bank in the foreign country). The second type is a global bank. A global bank consists of a parent that operates

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(gathers deposits and extends loans) in the foreign country and an affiliate that operates in the host country. It is run by a pair of bankers from the foreign country household. To capture the linkage between the parent and the affiliate, we assume that a global bank can make transfers between the parent and the affiliate subject to a cost. When the bankers exit, they terminate the business at both the parent and the affiliate.

The sequence of events in period t is the following. First, aggregate shocks realize. Then, production takes place. Thereafter, banks learn whether they exit and new banks enter the business. Finally, surviving banks take deposits from households and extend loans to entrepreneurs. Global banks also make transfers between the parent and the affiliate.

3.2.1 Global banks' problem

We first describe the decision problem of the affiliate of a global bank. After the aggregate shocks realize, the affiliate chooses loans to firms in the host country X_t^g and deposits D_t^g to maximize the expected discounted sum of profits it repatriates to the household in the foreign country

$$V_t^g \equiv \max_{\{X_{t+j}^g, D_{t+j}^g\}_{j\geq 0}} \mathbb{E}_t \sum_{j=0}^{\infty} (1-\sigma)\sigma^j \Lambda_{t,t+j+1}^* N_{t+j+1}^g$$

$$\text{s.t.} \quad X_t^g = N_t^g + Z_t^g + D_t^g, \qquad\qquad\qquad [\lambda_t^g] \qquad (5)$$

$$R_t^D D_t^g + \theta Z_t^g \leq \xi \left[(1-\phi) R_t^{X,g} X_t^g + \phi R_t^{X,g,*} X_t^{g,*} \right], \qquad [\mu_t^g] \qquad (6)$$

where R_t^D is the gross deposit rate, $R_t^{X,g}$ is the gross loan rate charged by the affiliate, and net worth is defined as $N_{t+1}^g = R_t^{X,g} X_t^g - R_t^D D_t^g$.[5] The affiliate takes as given the parent bank's portfolio choice and the transfer Z_t^g it receives from the parent bank (or makes to the parent, if $Z_t^g < 0$). Equation (5) is the flow of funds (resource) constraint with an associated shadow value of λ_t^g. Equation (6) is a collateral constraint on external fund raising, which requires that the weighted sum of bank liabilities (deposits and transfers received from the parent) cannot exceed a fraction ξ of bank assets. The constraint consolidates the collateral assets of the affiliate and the parent bank, where the weight on the parent is $\phi \leq 0.5$.[6] $\theta \leq 1$ captures the assumption that the transfer Z_t^g from the parent to the affiliate may require less collateral than deposits $R_t^D D_t^g$, to the extent that the transfer consists of an equity injection by the parent, rather than a loan. Constraint (6) can also be interpreted as a (regulatory or market) capital constraint.

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[5] As we discuss below, because of different collateral liquidation technologies, the loan rates charged by the various types of banks can differ.

[6] This is a natural way to introduce consolidation of balance sheets of parents and affiliates in our setting. It is straightforward to show that, if we allowed the parameter ϕ to also multiply liabilities in (6), given that we impose a symmetric constraint for the parent, then this would imply decoupling the balance sheets of parent and affiliate. Formal details are available from the authors.

The first order conditions w.r.t. X_t^g and D_t^g are

$$[\partial X_t^g]: \quad -\lambda_t^g + \xi(1-\phi)\mu_t^g R_t^{X,g} + \mathbb{E}_t \Lambda_{t,t+1}^* \left(1 - \sigma + \sigma\lambda_{t+1}^g\right) R_t^{X,g} = 0, \qquad (7)$$

$$[\partial D_t^g]: \quad -\mu_t^g R_t^D - \mathbb{E}_t \Lambda_{t,t+1}^* \left(1 - \sigma + \sigma\lambda_{t+1}^g\right) R_t^D = \lambda_t^g. \qquad (8)$$

Consider (7). Increasing loans tightens the current resource constraint (λ_t^g) but relaxes the next period resource constraint (λ_{t+1}^g). Further, a larger volume of loans tends to relax the bank's collateral (capital) constraint (μ_t^g). Equation (8) equalizes the marginal cost of deposits to their marginal benefit. The former is given by a tighter collateral constraint for the bank (μ_t^g) (since deposits are subject to a capital requirement) and a tighter resource constraint in the next period (λ_{t+1}^g). The marginal benefit is given by the relaxation in the current resource constraint (λ_t^g).

The envelope condition reads:

$$[Z_t^g]: \quad \frac{\partial V_t^g}{\partial Z_t^g} = \lambda_t^g - \theta\mu_t^g.$$

It states that a larger transfer received from the parent relaxes the resource constraint of the affiliate but can tighten its capital constraint by a factor θ.

The parent bank maximizes the discounted sum of profits of the parent bank and the affiliate. Besides deposit taking and loan extension in the foreign country, the parent bank also chooses the amount of transfer to make to the affiliate (or receive from the affiliate) in the host country:

$$\max_{\{Z_{t+j}^{g,*}, Z_{t+j}^g, X_{t+j}^{g,*}, D_{t+j}^{g,*}\}_{j\geq 0}} \quad \mathbb{E}_t \sum_{j=0}^{\infty} (1-\sigma)\sigma^j \Lambda_{t,t+j+1}^* N_{t+j+1}^{g,*} + V_t^g,$$

$$\text{s.t.} \quad Z_t^{g,*} + Z_t^g = 0, \qquad\qquad\qquad\qquad\qquad [\gamma_t^{g,*}] \qquad (9)$$

$$X_t^{g,*} = N_t^{g,*} + Z_t^{g,*} - \frac{\psi}{2}\left(Z_t^{g,*} - \bar{Z}^{g,*}\right)^2 + D_t^{g,*}, \qquad [\lambda_t^{g,*}] \qquad (10)$$

$$R_t^{D,*} D_t^{g,*} + \theta Z_t^{g,*} \leq \xi\left[(1-\phi)R_t^{X,g,*}X_t^{g,*} + \phi R_t^{X,g}X_t^g\right], \qquad [\mu_t^{g,*}] \qquad (11)$$

where net worth is defined as $N_{t+1}^{g,*} = R_t^{X,g,*}X_t^{g,*} - R_t^{D,*}D_t^{g,*}$. Similar as before, the collateral constraint (11) consolidates the balance sheets of the parent and the affiliate, where $\phi \leq 0.5$ is the weight on the affiliate.[7] Transfers between the parent and the affiliate incur a quadratic cost as in the flow of funds constraint (10). Chinn and Ito (2008), Portes and Rey (2005) and Buch (2005) discuss frictions in moving funds in and out of a given banking location.[8]

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[7]The consolidation of banks' balance sheets signals a stronger branch structure. This can be captured by the parameter ϕ.

[8]The cost of making transfers may be higher for subsidiaries. However, ring-fencing provisions may limit

The first order conditions for loans and deposits are isomorphic to those of the affiliate. As for the transfer choice,

$$[\partial Z_t^{g,*}]: \quad \lambda_t^{g,*} - \psi \left(Z_t^{g,*} - \bar{Z}^{g,*} \right) \lambda_t^{g,*} - \theta \mu_t^{g,*} + \gamma_t^{g,*} = 0,$$

$$[\partial Z_t^g]: \quad \frac{\partial V_t^g}{\partial Z_t^g} + \gamma_t^{g,*} = 0.$$

Combining the FOC of $Z_t^{g,*}$ and Z_t^g with the affiliate's envelope conditions, we obtain

$$\lambda_t^{g,*} - \theta \mu_t^{g,*} - \psi \left(Z_t^{g,*} - \bar{Z}^{g,*} \right) \lambda_t^{g,*} = \lambda_t^g - \theta \mu_t^g. \tag{12}$$

When $\psi = 0$ (there is no adjustment cost of making transfers) and $\theta = 0$ (transfers from the parent do not absorb capital), the shadow value of net worth is equalized between the parent and the affiliate $(\lambda_t^{g,*} = \lambda_t^g)$.[9]

3.2.2 Local banks' problem

The local banks make decisions on deposit taking and loan extension to maximize their value. In the host country, local banks solve the following problem

$$V_t^l \equiv \max_{\{X_{t+j}^l, D_{t+j}^l\}_{j \geq 0}} \quad \mathbb{E}_t \sum_{j=0}^{\infty} (1-\sigma)\sigma^j \Lambda_{t,t+j+1} N_{t+j+1}^l,$$

$$\text{s.t.} \quad X_t^l = N_t^l + D_t^l, \qquad\qquad\qquad\qquad [\lambda_t^l] \tag{13}$$

$$R_t^D D_t^l \leq \xi R_t^{X,l} X_t^l, \qquad\qquad\qquad\qquad [\mu_t^l] \tag{14}$$

where net worth is defined as $N_{t+1}^l = R_t^{X,l} X_t^l - R_t^D D_t^l$. The local banks' problem differs from the global banks' in that (i) the local banks do not receive or make any transfer; (ii) their collateral constraint (14) only involves their own balance sheets. The first order conditions are

$$[\partial X_t^l]: \quad -\lambda_t^l + \xi \mu_t^l R_t^{X,l} + \mathbb{E}_t \Lambda_{t,t+1} \left(1 - \sigma + \sigma \lambda_{t+1}^l \right) R_t^{X,l} = 0, \tag{15}$$

$$[\partial D_t^l]: \quad \lambda_t^l - \mu_t^l R_t^D - \mathbb{E}_t \Lambda_{t,t+1} \left(1 - \sigma + \sigma \lambda_{t+1}^l \right) R_t^D = 0. \tag{16}$$

Local banks in the foreign country solve a symmetric problem.

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the responsibility of a parent bank to support its branches. Such provisions, adopted by several banks in recent years, establish that a parent bank is not required to assist a foreign branch if it becomes illiquid due to extreme circumstances. On the other hand, concerns about loss of reputation can lead banks to support their subsidiaries, although they were not legally bound to do so.

[9]For tractability, we assume that bankers that operate the same type of bank pool their resources and make decisions together. Therefore adjustment costs depend on the aggregate transfer $Z_t^{g,*}$.

3.3 Entrepreneurs

The representative entrepreneur in the host country uses labor H_t and capital K_t to produce output Y_t. To finance the purchase of capital and their own consumption, entrepreneurs can take loans from global banks (X_t^g) and local banks (X_t^l) that operate in the host country by pledging capital stocks as collateral. Collateral is necessary because of enforcement problems. To capture the disadvantage of global banks due to their more limited experience with local firms in the host country, we assume different collateral liquidation technologies of global and local banks. In case of debt repudiation, local banks can liquidate a fraction κ^l of the collateral; global banks can liquidate a fraction $\kappa^g > \kappa^l$ of the collateral, but they also need to pay a convex liquidation cost. That is, global banks are more efficient at liquidating collateral when the amount of collateral is small (perhaps of their more sophisticated lending technologies), but their liquidation technology exhibits decreasing returns to scale.[10]

The entrepreneur solves the following problem:

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\max_{\{H_{t+j}, C_{t+j}^e, K_{t+j}, X_{t+j}^g, X_{t+j}^l, f_{t+j}\}_{j \geq 0}} \quad \mathbb{E}_t \sum_{j=0}^{\infty} \beta_e^j \frac{\left(C_{t+j}^e\right)^{1-\gamma_e} - 1}{1 - \gamma_e}
$$

s.t. $\quad C_t^e + Q_t K_t + R_{t-1}^{X,g} X_{t-1}^g + R_{t-1}^{X,l} X_{t-1}^l = X_t^g + X_t^l + Y_t - W_t H_t + (1-\delta)Q_t K_{t-1},$

$$
R_t^{X,g} X_t^g \leq \kappa^g \left[(1-f_t)Q_t K_t - \frac{\nu}{2\bar{Q}\bar{K}} (1-f_t)^2 Q_t^2 K_t^2 \right], \qquad [\omega_t^g] \qquad (17)
$$

$$
R_t^{X,l} X_t^l \leq \kappa^l \left(f_t Q_t K_t \right), \qquad\qquad\qquad\qquad [\omega_t^l] \qquad (18)
$$

where f_t is the fraction of capital stock that is pledged as collateral to the local bank, Q_t is the price of capital, and $W_t H_t$ is the wage bill. In the constraint for borrowing from global banks (17), the marginal pledgeability of capital declines as the entrepreneurs borrow more from global banks.

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[10]There is a broad literature in banking that analyzes banks' technology for collateral liquidation and monitoring (see e.g. Minetti, 2011, and references therein). Aiyagari and Gertler (1991) assume that, while "households" are not specialist and face quadratic costs in trading assets, "traders" are specialist and face proportional costs (normalized to zero). One can think that in our economy, if their local experience and knowledge were as abundant as for domestic lenders, foreign lenders would have a linear liquidation technology with a lower average liquidation cost than the domestic. Yet they suffer from diseconomies to scale. Hence, for sufficiently high values of collateral, the advantage due to their organized offices is offset by the disadvantage due to their limited local experience.

The first order conditions are

$$[\partial H_t] \quad \frac{(1-\alpha)Y_t}{H_t} = W_t, \tag{19}$$

$$[\partial K_t] \quad -Q_t U_{c^e,t} + \kappa_t^g \omega_t^g \left[(1-f_t)Q_t - \frac{\nu}{\bar{Q}\bar{K}}(1-f_t)^2 Q_t^2 K_t \right] + \kappa^l \omega_t^l f_t Q_t,$$

$$+ \beta_e \mathbb{E}_t \left[(1-\delta)Q_{t+1} + \frac{\alpha Y_{t+1}}{K_t} \right] U_{c^e,t+1} = 0, \tag{20}$$

$$[\partial f_t] \quad f_t = 1 - \frac{\bar{Q}\bar{K}}{\nu Q_t K_t} \frac{\kappa^g \omega_t^g - \kappa^l \omega_t^l}{\kappa^g \omega_t^g}, \tag{21}$$

$$[\partial X_t^g] \quad U_{c^e,t} - \omega_t^g R_t^{X,g} - \beta_e \mathbb{E}_t R_t^{X,g} U_{c^e,t+1} = 0, \tag{22}$$

$$[\partial X_t^l] \quad U_{c^e,t} - \omega_t^l R_t^{X,l} - \beta_e \mathbb{E}_t R_t^{X,l} U_{c^e,t+1} = 0. \tag{23}$$

The foreign country's representative entrepreneur solves a symmetric problem.[11]

To recapitulate, in this model global banks and local banks differ in two dimensions. At the liquidity origination stage, global banks have the advantage that the affiliates can quickly obtain funds from the parent (or repatriate liquidity to the parent) through the transfer. At the liquidity allocation stage, global banks have a liquidation technology that is initially more efficient than the local banks but exhibits decreasing-returns-to-scale.

3.4   Capital good producers

The rest of the model is standard. The capital good producer in the host country chooses investment to maximize the present discounted value of lifetime profits, that is

$$\max_{I_t} \quad \mathbb{E}_t \sum_{j=0}^{\infty} \Lambda_{t,t+j} \left\{ Q_{t+j} I_{t+j} - \left[1 + f\left(\frac{I_{t+j}}{I_{t+j-1}} \right) \right] I_{t+j} \right\}.$$

From the profit maximization condition, the price of capital goods is equal to the marginal cost of producing capital goods:

$$Q_t = 1 + f\left(\frac{I_t}{I_{t-1}} \right) + \frac{I_t}{I_{t-1}} f'\left(\frac{I_t}{I_{t-1}} \right) - \mathbb{E}_t \Lambda_{t,t+1} \left(\frac{I_{t+1}}{I_t} \right)^2 f'\left(\frac{I_{t+1}}{I_t} \right).$$

The capital good producer in the foreign country solves a similar problem.

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[11]In the Appendix (Figure A.1), we conduct robustness analysis by allowing multinational banks to experience lower diseconomies to scale in collateral liquidation in the foreign economy than in the host economy. The results remain virtually unchanged.

3.5 Households

The representative household in the host country maximizes its life-time utility by choosing consumption C_t, deposits D_t, and labor supply H_t. It solves the following problem

$$\max_{C_t, H_t, D_t} \quad \mathbb{E} \sum_{t=0}^{\infty} \beta^t \frac{\left(C_t - \frac{H_t^{1+\epsilon}}{1+\epsilon}\right)^{1-\gamma} - 1}{1-\gamma},$$

$$\text{s.t.} \quad C_t = W_t H_t + \Pi_t + R_{t-1}^D D_{t-1} - D_t, \tag{24}$$

where Π_t is the profits transferred to the households by bankers and capital-good producers. The first order conditions read

$$[\partial H_t] \quad H_t^\epsilon = W_t, \tag{25}$$

$$[\partial D_t] \quad 1 = \mathbb{E}_t \Lambda_{t,t+1} R_t^D. \tag{26}$$

The household in the foreign country solves a symmetric problem.

3.6 Closing the model

Each period, a fraction $1-\sigma$ of bankers exit, and an equal mass of workers become bankers. Bankers who enter receive $\frac{\zeta}{1-\sigma}$ of total asset values of existing bankers. The following are the evolution of the aggregate net worth of the four types of bankers: the affiliates in the host country, the parents, the local banks in host country, and the local banks in the foreign country:

$$N_{t+1}^g = \sigma \left(R_t^{X,g} X_t^g - R_t^D D_t^g \right) + \zeta R_t^{X,g} X_t^g, \tag{27}$$

$$N_{t+1}^{g,*} = \sigma \left(R_t^{X,g,*} X_t^{g,*} - R_t^{D,*} D_t^{g,*} \right) + \zeta R_t^{X,g,*} X_t^{g,*}, \tag{28}$$

$$N_{t+1}^{l,*} = \sigma \left(R_t^{X,l,*} X_t^{l,*} - R_t^{D,*} D_t^{l,*} \right) + \zeta R_t^{X,l,*} X_t^{l,*}. \tag{29}$$

$$N_{t+1}^l = \sigma \left(R_t^{X,l} X_t^l - R_t^D D_t^l \right) + \zeta R_t^{X,l} X_t^l, \tag{30}$$

Market clearing conditions for the deposit market in each country are

$$D_t = D_t^g + D_t^l, \tag{31}$$

$$D_t^* = D_t^{g,*} + D_t^{l,*}. \tag{32}$$

The profits earned by the host country's household come from local banks and capital good producers:

$$\Pi_t = (1-\sigma) \left(R_t^{X,l} X_t^l - R_t^D D_t^l \right) - \zeta R_t^{X,l} X_t^l + Q_t I_t - \left[1 + f\left(\frac{I_t}{I_{t-1}} \right) \right] I_t.$$

The profits earned by the foreign country's household come from local and global banks and capital good producers:

$$
\begin{aligned}
\Pi_t^* =& (1-\sigma)\left(R_t^{X,g,*}X_t^{g,*} - R_t^{D,*}D_t^{g,*}\right) + (1-\sigma)\left(R_t^{X,g}X_t^g - R_t^D D_t^g\right) \\
& + (1-\sigma)\left(R_t^{X,l,*}X_t^{l,*} - R_t^{D,*}D_t^{l,*}\right) - \zeta(R_t^{X,g,*}X_t^{g,*} + R_t^{X,g}X_t^g + R_t^{X,l,*}X_t^{l,*}) \\
& + Q_t^* I_t^* - \left[1 + f\left(\frac{I_t^*}{I_{t-1}^*}\right)\right] I_t^*.
\end{aligned}
\tag{33}
$$

The social resource constraint requires that world goods markets clear:

$$
C_t + C_t^* + C_t^e + C_t^{e,*} + I_t\left[1 + f\left(\frac{I_t}{I_{t-1}}\right)\right] + I_t^*\left[1 + f\left(\frac{I_t^*}{I_{t-1}^*}\right)\right] + \frac{\psi}{2}\left(Z_t^{g*} - \bar{Z}^{g,*}\right)^2 = Y_t + Y_t^*.
$$

4 Results

In this section we study the impulse responses of the model economy. We are especially interested in understanding under what conditions multinational banks act as shock amplifiers or absorbers in the host economy. From the discussion of the results below, it will become clear that the presence of multinational banks induces a trade-off between the immediate response of the economy to shocks and the pace of the recovery after negative shocks. This trade-off arises from the interaction between the ability of multinational banks to transfer liquidity through internal capital markets and the difficulty they face in allocating this liquidity to local entrepreneurs.

4.1 Calibration

The model is solved numerically by locally approximating around the non-stochastic steady state. Parameters are shown in Table 1. For most parameters regarding the households' preferences and production technology, we use standard values. We set the discount factor of entrepreneurs β_e to 0.98, smaller than the household discount factor $\beta = 0.99$. This is necessary to generate borrowing of entrepreneurs from bankers in the household. We let entrepreneurs be risk neutral and set $\gamma_e = 0$. Following Gertler et al. (2012), we set $f''(1) = 1$, so that the steady-state elasticity of capital price to investment is 1.

The parameters governing the tightness of bank constraints are the probability of surviving of bankers σ, the fraction of assets brought by new bankers ζ, and the fraction of bank assets as collateral ξ. We choose $\xi = 0.880$, so the bank leverage equals 8.33 in the steady state, consistent with bank capital to total assets for United States in the FRED database. Following Gertler et al. (2012), we set $\sigma = 0.969$, implying that bankers survive for eight years on average. We set the percentage of assets brought in by new bankers, ζ, such that the steady-state spread between loan rate and deposit rate is 100 basis points per year. The parameters κ^L, κ^G and ν dictate the tightness of entrepreneurs' constraints.

We set $\kappa^L = 0.6$ to match the loan-to-value ratio for U.S. firms. We set $\kappa^G = 0.65$, higher than κ^L, and we set ν such that local bank loans are about three times as large as global bank loans.[12]

The parameter ϕ dictates the degree of consolidation of global bank balance sheets. We interpret ϕ as the share of foreign loans accounted for by foreign branches (rather than subsidiaries): $\phi = 0.5$ indicates full consolidation (only branches and no subsidiaries); $\phi = 0$ indicates complete separation (only subsidiaries and no branches). Empirically the share of branches vs subsidiaries varies depending on the specific hosting country (Fiechter et al., 2011). We set $\phi = 0.4$ in the benchmark calibration and show the sensitivity of results as ϕ varies from 0 to 0.5.[13] The parameter θ is the weight of transfers in the bank constraint. Data on the composition of liquidity flows in internal capital markets are scarce and, when available, refer to a small sample of banks. These studies (see, e.g., Allen et al., 2013; Vujić, 2015) conclude that loans generally account for the largest share of transfers between parents and affiliates. We calibrate θ to 0.6.[14]

In steady state, the loan rates of local banks and affiliates of multinational banks are equal. This stems from a no-arbitrage condition: affiliates and local banks borrow at the same deposit rate, so they will necessarily have the same loan rate in equilibrium. This also implies that necessarily ω^l and ω^g (the entrepreneur's Lagrangian multiplier associated with the borrowing constraints vis à vis the two types of banks) must be the same in steady state. In the steady state, the next export of the host country is 0.46% of GDP. The steady-state value of the transfer is 0.

4.2 Host country liquidity shocks

In this section, following prior studies (see e.g., Gertler and Karadi, 2011; Guerrieri et al., 2012) we experiment with a one-period (i.e., serially uncorrelated) unexpected drop of 1% in the net worth of local banks in the host country (N_t^l). This can be thought as a domestic liquidity (credit) supply shock originating in the local banking sector.[15] The results are presented in Figure 1. To better grasp the role of multinational banks we compare the responses in our economy with two benchmark settings. The first benchmark is an economy where multinational banks cannot make transfers, that is, internal capital markets are shut

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[12]In 2007, the world foreign bank assets represented about 25% of total bank assets (Global Financial development Database, World Bank).

[13]Düwel (2013) documents that in the first half of 2007, German multinational banks had on average euro 10.678 trillion assets in foreign branches and euro 5.611 trillion assets in foreign subsidiaries. Therefore, branches' assets were 65.55% of bank foreign assets. This implies ϕ=0.6555/(1+0.6555)=0.4.

[14]According to data in Allen et al. (2013) and Vujić (2015), for example, on average in 2007-2009, for Unicredit, a major Italian banking group with a large network of affiliates in Eastern Europe, the flows between Polish affiliates and the parent bank consisted for about 57% of loans and other non-equity flows. For Citigroup, in 2007, the flows between Polish affiliates and the parent bank consisted for about 60% of loans and other non-equity flows.

[15]The shock can represent (in reduced form) a wave of defaults hitting banks' portfolios or a drop in banks' asset values. In the Appendix (Figure A.2) we show that the results remain virtually unaffected if we posit that the shock takes the form of a transfer from local banks to entrepreneurs and households, rather than a deadweight loss for the local banking sector.

down (Figure 2). In this case, the only links between host and foreign country are that the affiliates of the multinational banks in the host country are owned by the households in the foreign country,[16] and that the parents' and affiliates' balance sheets are partially consolidated. The two countries are decoupled otherwise. The second benchmark is an economy where entrepreneurs cannot alter the allocation of collateral pledges between local and multinational banks (Figure 3).

4.2.1 The role of multinational banks

A reduction in the net worth of local banks in the host country tightens their collateral constraint (μ_t^l rises) and thereby lowers their loan supply. When multinational banks are allowed to transfer funds between parents in the foreign country and affiliates in the host country, affiliates receive a transfer (Z_t^g). This occurs because, following the negative net worth shock to local banks in that country and their resulting credit contraction, the marginal value of liquidity in the affiliate offices rises. The net worth and loanable liquidity of multinational banks increases as a result, boosting their credit supply.[17] As a result of the loan supply cut of local banks and the increase in the loan supply of multinational banks' affiliates, entrepreneurs respond by lowering the share of capital that they pledge as collateral to local banks. Then, the amount of loans obtained from affiliates of multinationals increases and that obtained from local banks falls, that is, the share f_t of borrowing from local banks drops.

In the short run (first four quarters after the shock) the presence of multinational banks thus works to mitigate the impact of the shock. Thanks to the increase in their supply of loans, facilitated by the transfers from the parents, the collateral constraint for entrepreneurs is relaxed and they can afford to cut their demand for capital and investment by less during the first few periods after the shock. This can be immediately grasped by comparing the impulse responses in our economy with those of the economy in which transfers of multinational banks are muted.

In the medium-long run, however, the presence of multinational banks acts towards amplifying the effects of the shock, acting as a drag on the recovery. In fact, as entrepreneurs reduce their pledges to local banks (lowering f_t), their collateral gets reallocated towards multinational banks. Since multinational banks exhibit decreasing returns in collateral liquidity, this has the effect of progressively reducing the average pledgeability of capital as collateral. In addition, since the marginal value of capital as collateral keeps dropping as entrepreneurs switch to global affiliates (the less efficient collateral liquidators), entrepreneurs' appetite for collateral tends to drop, too. This makes the collateral price

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[16]Therefore, bank profits in the host country are transferred to foreign households.

[17]An excess supply of credit is generated and entrepreneurs must borrow more for the loan market to clear. Hence, the loan rate must go down. Due to arbitrage, loan rates must go down in the same way for loans from local banks and from affiliates of multinational banks. Intuitively, from the Euler condition of entrepreneurs, if loan rates drop, the Lagrangian multipliers ω_t^g and ω_t^l associated with entrepreneurs' borrowing constraints will go up (the higher loan demand will make the borrowing constraint tighter).

recover more slowly than in the benchmark setting with muted transfers of multinational banks, causing a more persistent output contraction in the host country.

Both the stabilization effect described first and the amplification effect discussed later work at the same time and in every period after the shock. However, the stabilizer effect works quicker (as soon as the transfer takes place), and the amplifier effect builds up over time (since it depends on the endogenous persistence of banks' net worth). Thus, the stabilizer effect dominates at the beginning, and the amplifier effect starts dominating after the fourteenth quarter. This is clear from the comparison between the baseline and the no-transfer impulse responses in Figure 2.

The role of multinational banks can be alternatively be grasped by comparing our economy with a second benchmark economy in which the share of capital pledged to local banks as collateral (f) is fixed. The comparison is displayed in Figure 3. The impulse response functions show a milder short-run negative effect, and a larger long-run negative effect, in our model relative to the comparison model with a fixed f. This is because, ultimately, global banks end up becoming less efficient at liquidating entrepreneurs' collateral.

The first three columns of Table 2 show the cumulative percentage change in response to the shock of both investment and output after eight, sixteen and twenty-eight quarters, respectively. The last column of Table 2 shows instead the first quarter in which the difference between the baseline model and the alternative model with either no transfers or with fixed share of entrepreneurs' collateral flips sign. In our economy, the fact that transfers are allowed between parent banks in the foreign country and their affiliates in the host country, i.e. we allow for internal capital markets, works to mitigate the effects of shocks in the short run. However, the amplifier effect induced by the allocation disadvantage of multinational banks dominates in the long run.

4.3   Host country TFP shocks

In this section we experiment with a negative 1% shock to total factor productivity in the host country. We assume that $\log(A_t)$ follows an AR(1) process:

$$\log(A_t) - \log(\bar{A}) = \rho^A \left[\log(A_{t-1}) - \log(\bar{A})\right] + e_t^A$$

The results of this experiment are shown in Figure 5 for both the baseline case and an alternative model where multinational banks cannot make transfers ($Z_t^G = Z_t^{G,*} = 0$). In the host country, lower TFP lowers the marginal product of capital and causes the capital price Q to fall. As a result, the collateral value of entrepreneurs falls and their demand for credit from both global banks and local banks and their demand for capital all fall. As investment drops, output does too. As a result, transfers to affiliates in the host country fall (the parents repatriate funds from the affiliates in the host country), loans by multinational banks fall (by more than in the case of no transfers), loans by local banks also fall (this time by less, though) and the overall supply of credit drops. In line with

the findings of the empirical literature, following a drop in returns in the host country, multinational banks act as a destabilizer of the negative shock because they repatriate liquidity to their parent offices.

Again, however, a trade-off arises between the short run and the medium-long run. In fact, entrepreneurs in the host country now pledge a larger fraction of collateral to the local banks (f increases). As f rises, the value of collateral drops but less than in the benchmark setting. As a result the collateral constraints for entrepreneurs borrowing from both local banks and affiliates of multinationals tighten but less than in the benchmark (both ω^g and ω^l rise). This sustains the demand for capital (since its marginal value as collateral is now higher), which in turn helps the host economy to recover faster from the TFP shock. In conclusion, in this case the presence of multinational banks acts as an amplifier of the shock in the short run but as a stabilizer in the medium-long run.

5 Structural and Cyclical Policies

In this section, we investigate how structural features of the economy and cyclical policies affect the mechanisms of the model. Our goal is to understand whether the policy maker can implement structural reforms or cyclical interventions that ameliorate the trade-off induced by the presence of multinational banks.

5.1 Structural features

We assess the sensitivity of the (de)stabilizer role of multinational banks to three structural features of the economy. The first consists of the cost of making transfers for multinational banks, as captured by the parameter ψ. In the recent past, several countries have implemented reforms that have altered the cost of transferring funds for global banks (Nowotny et al., 2014). The second feature consists of the degree of consolidation of multinational banks' balance sheets, as captured by the parameter ϕ. Since consolidation happens for branches but not for subsidiaries, we interpret ϕ as especially reflecting the share of affiliates consisting of branches rather than subsidiaries. Finally, we consider the degree to which transfers through internal capital markets in multinational banks are subject to capital requirements, as captured by the parameter θ.

Figure 4(a) illustrates the role of the costs of making transfers (as measured by ψ). Higher costs mean smaller transfers, all else equal. Thus, the stabilizing property of transfers in the short run becomes weaker as ψ rises. On the other hand, as ψ increases, the switch from local to global banks is reduced, too, and this means that the destabilizing effect associated with the switch to global banks, and the reduction in collateral pledgeability, get moderated.

Figure 4(b) illustrates the extent to which the consolidation of banks' balance sheets influences the (de)stabilizer role of multinational banks. When the consolidation parameter $\phi = 0$ (which can interpreted as multinational banks entering the host country only via

subsidiaries), the negative effects are all more pronounced. Since ϕ may be interpreted as the share of branches (relative to subsidiaries), this implies that multinational banks' choice to enter host countries as a branch helps mitigate negative developments in those countries. This is because when balance sheets are consolidated, the parent offices of global banks have a stronger incentive to make transfers to their affiliates. In fact, by boosting affiliates' loans, parent banks also gain in terms of relaxation of their capital constraints.

Finally, Figure 4(c) illustrates the effects of the weight attached to transfers in the banks' capital constraint (as measured by θ). A higher θ (meaning that transfers absorb more capital, e.g., consisting of loans rather than equity injections) reduces the stabilizing role of multinational banks in the short run with the benefit, however, of a faster recovery. Intuitively, every time the affiliate in the host country receives a transfer, its borrowing constraint tightens more than in the case of a lower θ, so that the transfer contributes less to expanding the affiliate's lending capacity. Parent banks in the foreign country internalize this effect and react by transferring a smaller amount. Through this channel, a higher θ dilutes the stabilizing role of multinational banks in the short run (the liquidity origination channel), at the same time also reducing the cost of multinational banks in slowing down the recovery.

5.2 Cyclical policies

In Section 5.1, we examined the effects of shocks for different structural features of the economy. In this section, we study to what extent cyclical policies can ameliorate the trade-off we uncovered in the model. Inspired by the experience of some emerging countries in recent years (see, e.g., Bierut et al., 2015, for the case of Poland), we model the policy as an adjustment of the loan-to-value ratio of the host-country's firms. We consider both a policy that discriminates between local and global banks and a policy that instead treats the two types of banks in the same way. Under the former, we assume that when a firm borrows from global banks its loan to value ratio is adjusted according to the following rule contingent on the output of the economy

$$\tilde{\kappa}_t^g = \chi \tilde{Y}_t,$$

where $\tilde{\kappa}_t^g$ and $\tilde{Y}_t$ are percentage deviations from the steady-state values. We focus on counter-cyclical policies by setting $\chi < 0$: that is, the loan-to-value ratio is increased in a recession, and vice versa in a boom. We assume that the foreign country's κ^g remains constant. Figure 6(a) shows the responses to a local bank net worth shock in the host country. It compares the countercyclical-policy scenario with the baseline one where $\chi = 0$. We set $\chi = -5$ in the countercyclical-policy scenario, that is, κ^g increases by 5% from its steady-state value (0.65) when output drops by 1%. As output gradually declines after the shock, κ^g also gradually increases. The lower κ^g has the direct effect of increasing the credit supply; it also has the indirect effect of inducing firms to switch from local

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banks to global banks (a decrease in f_t).[18] In the initial few quarters after the shock, the indirect effect dominates, which makes the counter-cyclical policy counter-productive in those periods. Intuitively, firms are induced to borrow more from global banks, which at the margin have a less efficient technology for repossessing and liquidating their collateral. As noted, this tends to depress the access to credit of the local firms. However, after a few periods (about 7 quarters in Figure 8) the direct effect of the policy gains strength and induces a relaxation of the collateral constraint faced by local firms, implying a faster recovery from the shock.

Next, we experiment with an alternative policy which does not differentiate between local and global banks but alleviates the loan-to-value ratio of borrowing from the two types of banks in the same way. That is, we assume that

$$\tilde{\kappa}_t^g = \chi \tilde{Y}_t, \quad \text{and} \quad \tilde{\kappa}_t^l = \chi \tilde{Y}_t.$$

Figure 6(b) shows again the responses to a local bank net worth shock in the host economy. In this experiment we make the elasticity of policy smaller by setting $\chi = -1.25$, as the policy affects both local and global banks (recall that in steady state global bank loans are about one third of local bank loans, so a χ of -1.25 implies that the overall responsiveness of the policy is similar to the previous experiment). We envisage three effects of this policy: the first is the direct effect of relaxing loan to value ratios, which in itself acts as a stabilizer. The second effect consists of the reduced incentive of entrepreneurs to demand capital for collateral purposes, since now the borrowing constraint is looser. This tends to depress the collateral price. Finally, the depressed collateral price incentivizes entrepreneurs to switch towards multinational banks, which are less efficient liquidators anyway. The latter two effects act as a drag on the recovery. The impulse responses suggest that the direct effect gets dominated both in the short and the medium-long run, inducing a larger negative response of the economy when this policy is implemented.

To summarize, the experiments of this section suggest that, in order to ameliorate the trade-off induced by multinational banks, a policy-maker should implement countercyclical policies targeting multinational banks. By contrast, no clear benefit appears to arise from countercyclical policies which target equally local and multinational banks.

6   Conclusion

This paper investigates the impact of multinational banks on the macroeconomic stability of host economies. The analysis builds on two well-documented findings of the empirical banking literature regarding the benefits and costs of multinational banks. Multinational banks can swiftly transfer liquidity across borders through their internal capital markets

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[18]The switching is exacerbated by a larger decline in asset prices Q_t. As $kappa^g$ becomes higher, firms have a lower demand for collateral assets, exacerbating the fall in Q_t.

but may face difficulties in allocating this liquidity to local firms. We have found that the interaction between these two mechanisms is a source of a trade-off between the short-run and the medium-run response of the economy to domestic shocks. For example, following a domestic liquidity shock, multinational banks help to partially insulate the economy from the shock in the short run but slow down the recovery in the medium-long run.

The model leaves open interesting questions. Although there appears to be no free-lunch policy in our setting, we have found that a countercyclical macroprudential (credit) policy targeting multinational banks can be beneficial in mitigating the trade-offs induced by the presence of multinational banks. Perhaps more surprisingly, the analysis suggests that structural reforms affecting the mode of entry of multinational banks can be key for enhancing the stabilizing role of multinational banks in the business cycle of host countries. In the analysis, we have taken a first step towards investigating this aspect, by capturing in reduced form entry via subsidiaries or branches. However, multinational banks can also enter host countries via brownfield investments (e.g., acquiring local banks) rather than greenfield entry, and this might also have implications for multinational banks' behavior over the business cycle. We leave this and other issues to future research.

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Table 1: Parameters

		Value	Target/Source
Preferences			
Household discount factor	β	0.990	
Household CRRA	γ	2.000	
Inverse Frisch elasticity	ϵ	1.000	
Entrepreneur discount factor	β_e	0.980	
Entrepreneur CRRA	γ_e	0.000	
Technology			
Capital share of output	α	0.330	
Capital depreciation	δ	0.025	
Investment adjustment cost	$f''(1)$	1.000	Gertler et al (2012)
Bankers			
% bank asset as collateral	ξ	0.880	Leverage=8.33
Weight of foreign assets in constraint	ϕ	0.400	
Adjustment cost to transfers	ψ	0.100	
Weight on transfers in the constraint	θ	0.600	
% assets liquidated by local banks	κ^l	0.600	Loan-to-Value 60%
% assets liquidated by global banks	κ^g	0.650	
Cost of global bank liquidation	ν	0.308	$\bar{X}^G/\bar{X}^L = 1/3$
% assets brought by new bankers	ζ	$1.358e-04$	
Probability of surviving bankers	σ	0.969	Gertler et al (2012)

Table 2: Short-Run vs Long-Run Effects

	8 Q	16 Q	28 Q	first quarter
Investment	-1.817	-2.500	-3.003	
Output	-0.085	-0.269	-0.561	
No transfer				
Investment	-2.140	-2.596	-2.937	7
Output	-0.106	-0.306	-0.589	18
Fix f				
Investment	-1.808	-1.938	-1.836	5
Output	-0.094	-0.252	-0.433	9

Note: the first three columns show the cumulative percentage change. The last column shows the first quarter in which the difference between the full model and the benchmark flips sign.
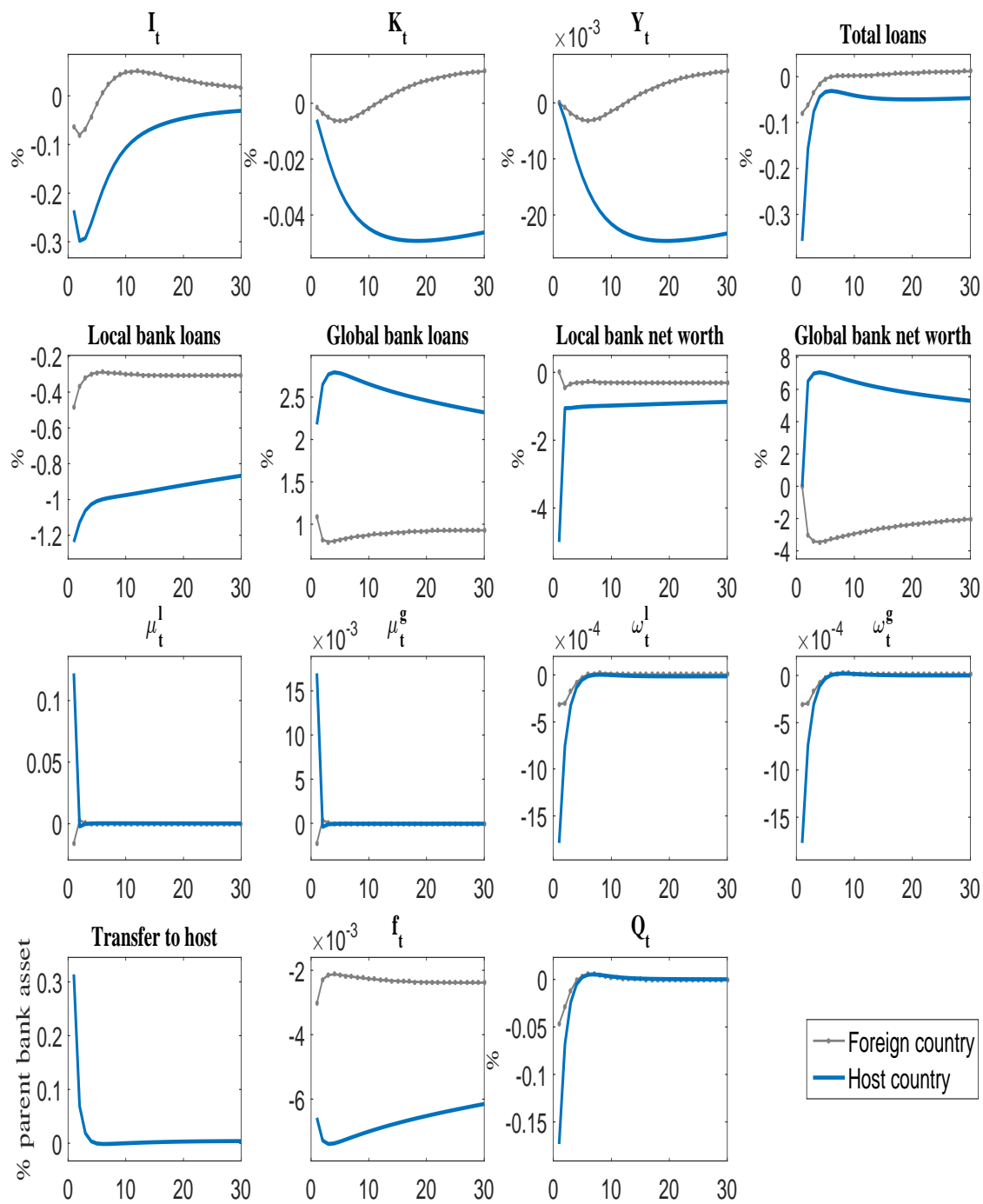
Figure 1: Benchmark Model: IRFs to a 5% negative shock to net worth of local banks in the foreign/host country.
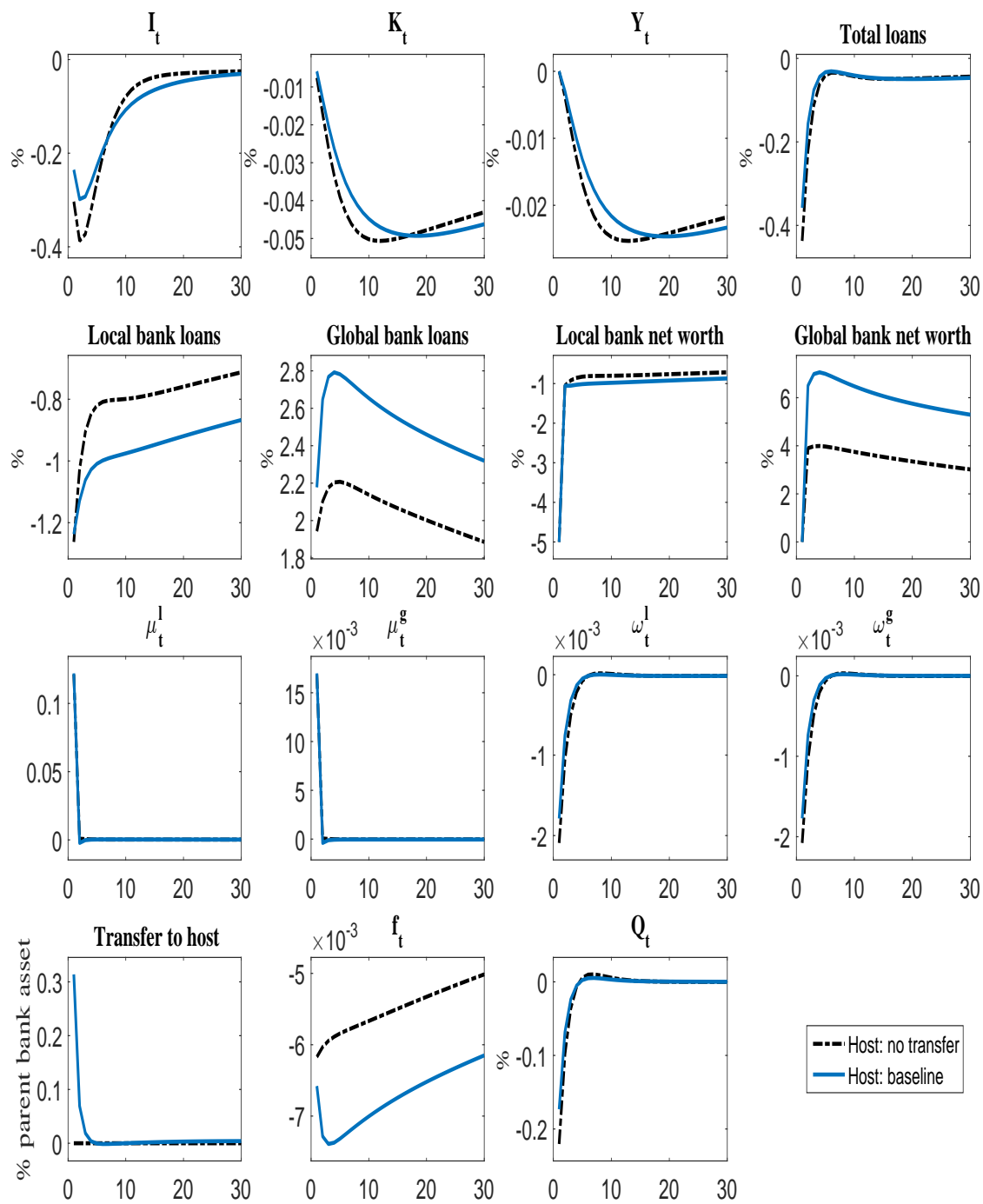
Figure 2: Shut down the internal capital market of multinational banks. The figure shows impulse responses to a negative 5% local bank net worth shock in the host country.
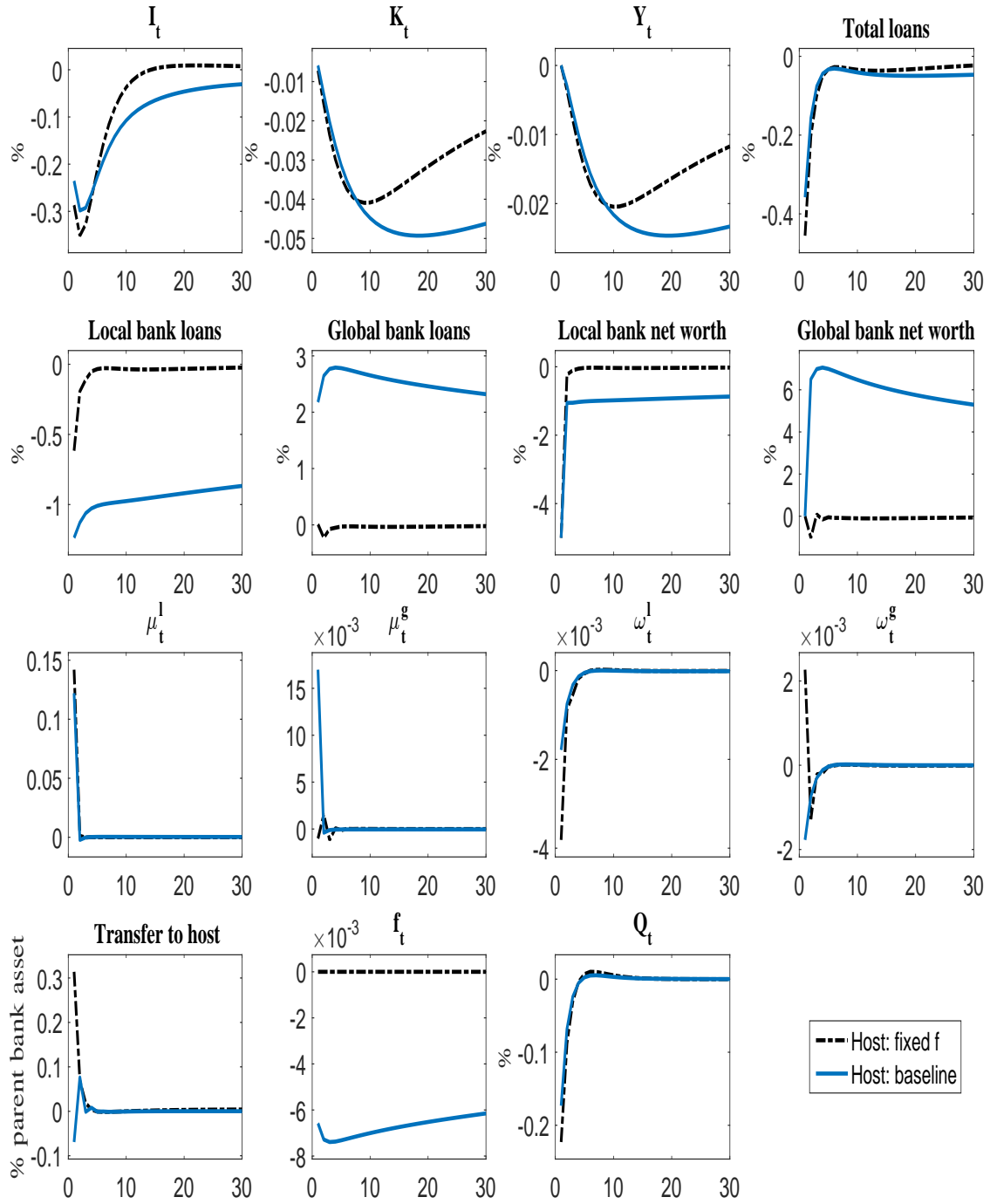
Figure 3: Shut down the collateral reallocation between local and multinational banks. The figure shows impulse responses to a negative 5% local bank net worth shock in the host country.
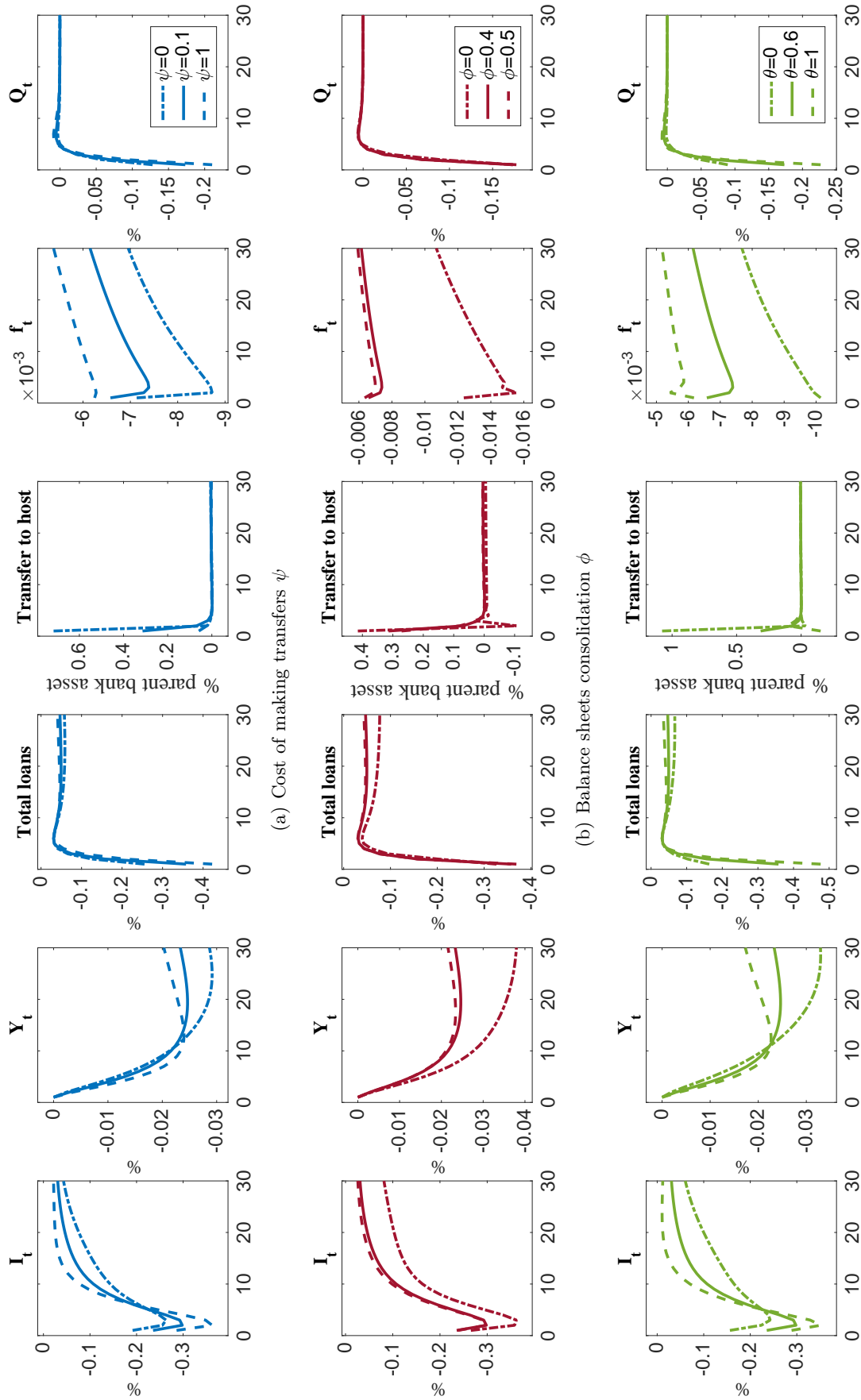
(a) Cost of making transfers ψ

(b) Balance sheets consolidation ϕ

(c) Weight of transfers in global banks' capital constraint θ

Figure 4: The role of structural features. The figure shows impulse responses to a negative 5% local bank net worth shock in the host country.
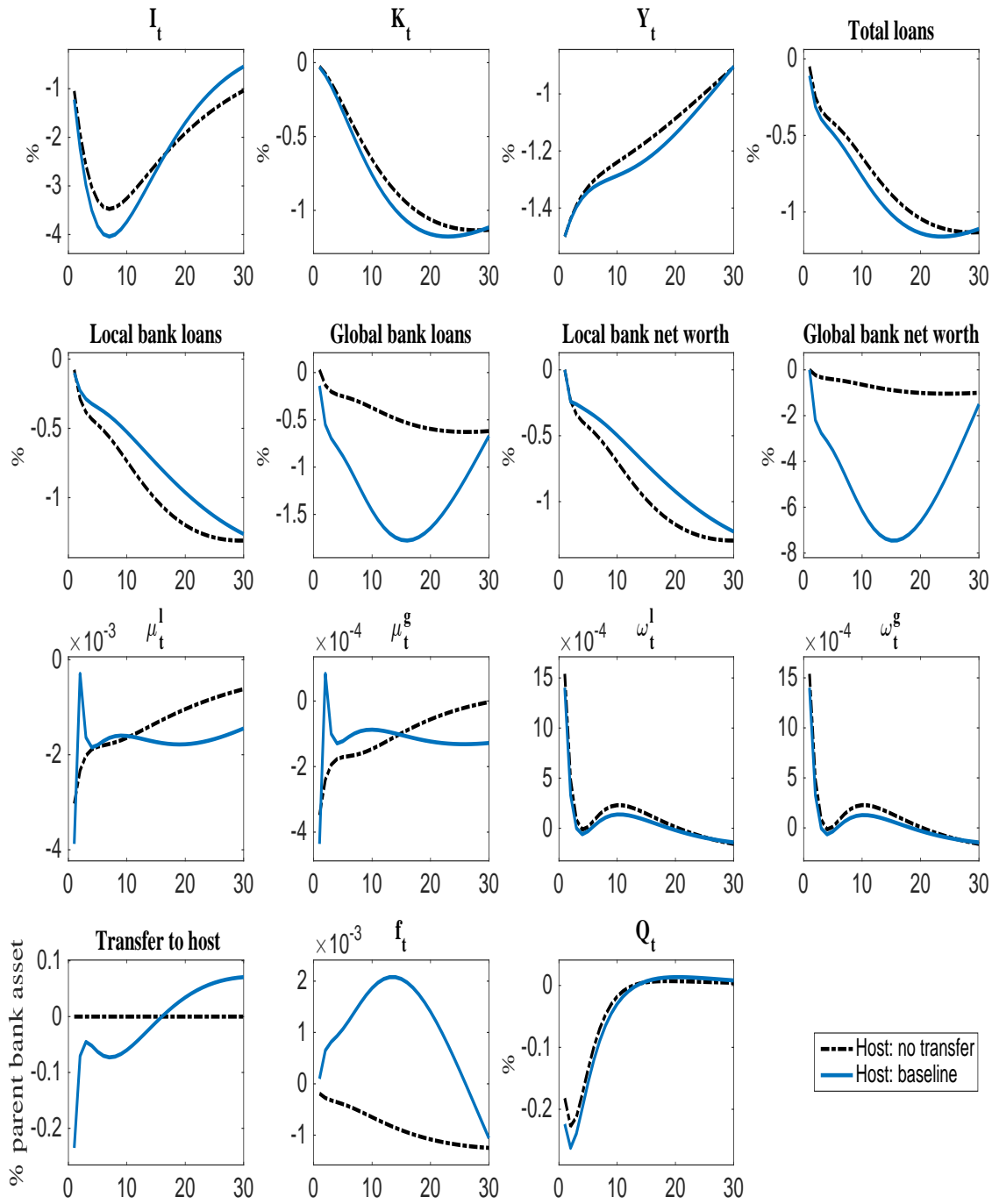
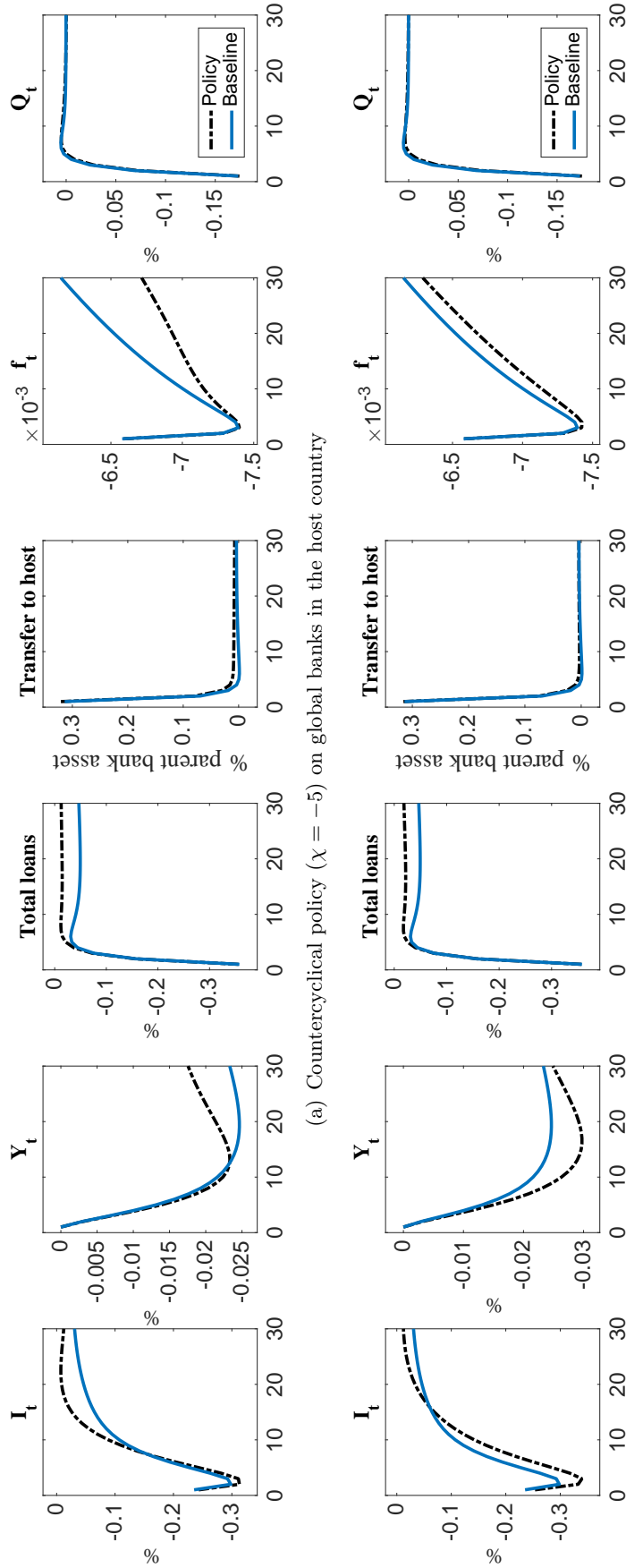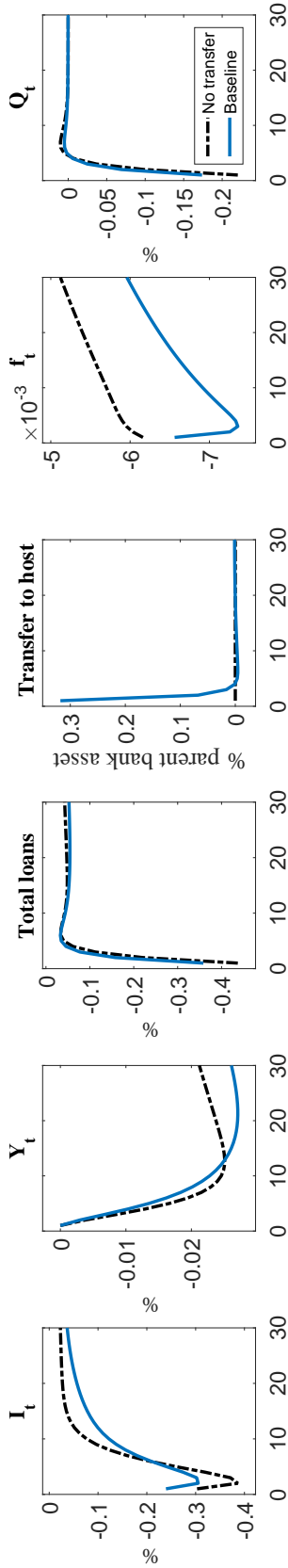Figure 5: IRFs to a 1% negative shock to TFP in the host country

(a) Countercyclical policy ($\chi = -5$) on global banks in the host country

(b) Countercyclical policy ($\chi = -1.25$) on both global and local banks in the host country

Figure 6: Credit policy. The figure shows impulse responses to a negative 5% local bank net worth shock in the host country.

Appendix

(a): Shut down the internal capital market of multinational banks.
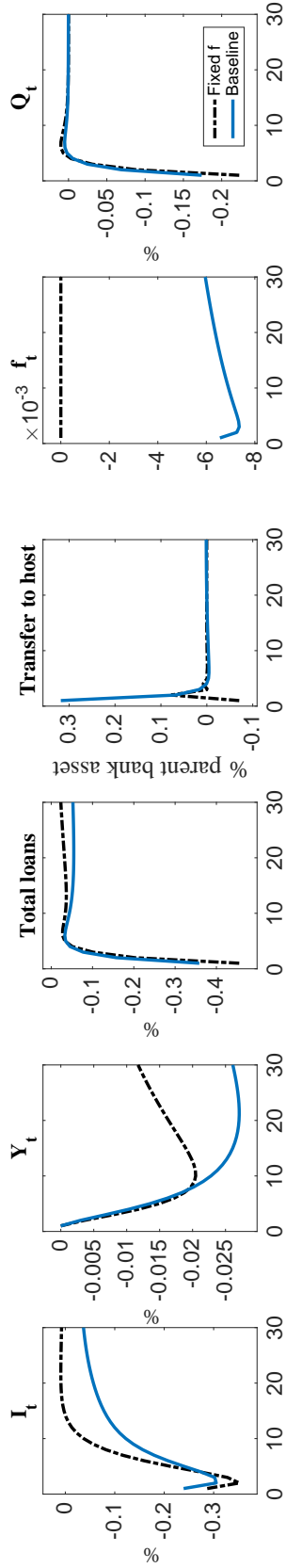
(b): Shut down the collateral reallocation between local and multinational banks.

Figure A.1: Robustness: the liquidation technology of the multinational bank in the foreign country is assumed to have less curvature ($\nu = 0.129$; κ^g is calibrated to 0.62 to so that local loans are three times as large as foreign loans). The figure shows impulse responses to a negative 5% local bank net worth shock in the host country.

(a): Shut down the internal capital market of multinational banks.

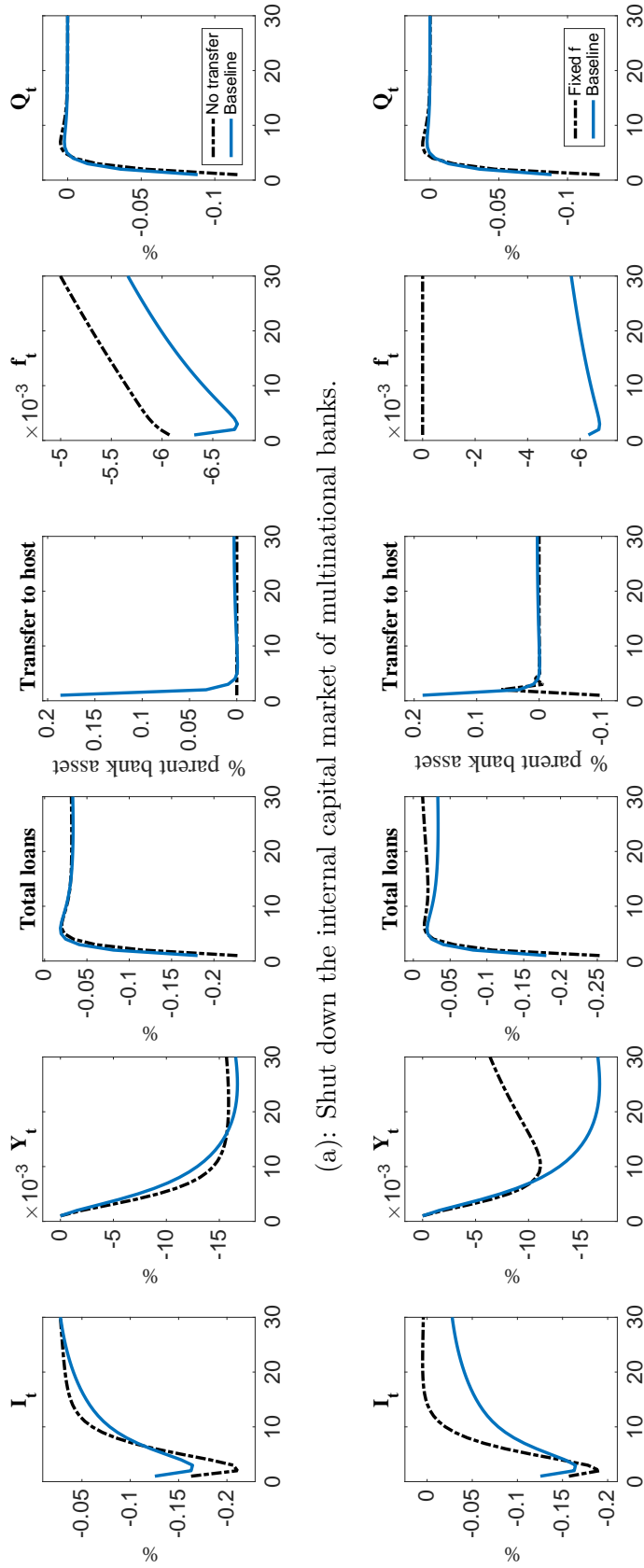(b): Shut down the collateral reallocation between local and multinational banks.

Figure A.2: Robustness: assume that local bank transfers half net worth loss to the household and half to entrepreneurs. The figure shows impulse responses to a negative 5% local bank net worth shock in the host country.