

Global Banking and Macroeconomic Stability.

Liquidity, Control, and Monitoring*

Elton Beqiraj[†] Qingqing Cao[‡] Ralph De Haas[§] Raoul Minetti[¶]

Abstract

We study how the organizational structure of global banks shapes their impact on macroeconomic stability. We develop a two-country dynamic general equilibrium model in which global banks can exert control over the loan monitoring activities of local affiliates and allocate liquidity across their conglomerates. We show that global banks with a centralized business model (loan officers hired centrally by parents and deep internal capital markets) help stabilize the host economy following financial shocks but can amplify the effects of real shocks. The model predictions are consistent with the behavior of a large panel of global bank parents and affiliates.

JEL codes: E32, E44, F23, F36, F65, G21

Keywords: Global banks; Business cycle dynamics; Monitoring; Liquidity.

*We thank Victoria Marino for excellent research assistance. We thank the editor and two anonymous referees for their comments. For their discussions and comments, we also thank Juan M. Morelli, Robert Kollmann, Richard Portes, Bryan Hardy, Andrea Ferrero, as well as seminar and conference participants at the NBER International Seminar on Macroeconomics (BIS, Basel), California State University Northridge, Katholieke Universiteit Leuven, Luiss University (Rome), Michigan State University, Texas Tech University, Toronto Metropolitan University, University of Maryland Baltimore County, University of Naples-CSEF (Center for Studies in Economics and Finance), University of Essex, University of Rome (Sapienza), and University of Sussex. The views expressed in this paper are those of the authors and should not be attributed to the European Bank for Reconstruction and Development (EBRD).

[†]Sapienza University of Rome.

[‡]Michigan State University.

[§]EBRD, KU Leuven and CEPR.

[¶]Michigan State University. Corresponding author: minetti@msu.edu.

Global Banking and Macroeconomic Stability.

Liquidity, Control, and Monitoring

Abstract

We study how the organizational structure of global banks shapes their impact on macroeconomic stability. We develop a two-country dynamic general equilibrium model in which global banks can exert control over the loan monitoring activities of local affiliates and allocate liquidity across their conglomerates. We show that global banks with a centralized business model (loan officers hired centrally by parents and deep internal capital markets) help stabilize the host economy following financial shocks but can amplify the effects of real shocks. The model predictions are consistent with the behavior of a large panel of global bank parents and affiliates.

JEL codes: E32, E44, F23, F36, F65, G21

Keywords: Global banks; Business cycle dynamics; Monitoring; Liquidity.

1 Introduction

The emergence of multinational banking conglomerates is one of the major developments in the international financial landscape in recent decades. In response, a growing literature has started to explore the macroeconomic implications of global banking.¹ Most of this literature, however, appears to neglect the internal decision processes that characterize complex financial institutions. Global banks routinely have to make choices regarding the allocation of funding as well as monitoring resources. These decisions not only have important implications for the lending behavior of these banks' headquarters but also of their local affiliates. Studying the allocation of liquidity and monitoring resources, on the one hand, and multinational banks' lending decisions, on the other hand, is therefore critical to better understand how multinational banks influence local macroeconomic stability. This has become even more important now that multinational bank affiliates hold dominant positions in many emerging markets and developing countries (Claessens and Van Horen, 2014; Claessens, 2017).

¹See, for example, Morgan et al. (2004); Cetorelli and Goldberg (2011, 2012a,b); Morelli et al. (2022).

The aim of this paper is to understand how multinational banks influence the transmission and propagation of local shocks, with a focus on how the organizational structure and business model of global banks shape this relationship. To this end, we conduct both an empirical and a theoretical analysis. We first investigate empirically how the organizational structure of global banks shapes the response of their loan monitoring, liquidity allocation and, ultimately, their lending to aggregate shocks. We leverage rich bank-level data for 30 countries from the Banking Environment and Performance Survey (BEPS), conducted by the European Bank for Construction and Development through face-to-face interviews with the “ultimate bank insiders”, their CEOs. These unique data allow us to construct bank-level variables describing key aspects of global banks’ business models and behavior, in particular whether and how these banks operate internal capital markets and the extent to which they actively shape the monitoring function of individual foreign affiliates. By combining this information with data on affiliate lending, we can verify whether the patterns predicted by our theoretical model, described below, are consistent with those detected in the data.

We document that a large fraction of global banks provide liquidity support to their foreign affiliates and actively engage in the loan monitoring efforts of these affiliates. We then show that, following major financial shocks (crises) in host countries, global banks tend to countercyclically increase their lending, and step up their liquidity and monitoring support of host-country affiliates. This countercyclical response is stronger when global banks feature a tighter, centralized control of affiliates’ monitoring activities and a more centralized management of internal capital markets.

We next develop a two-country dynamic general equilibrium model in which multinational banks operate alongside local banks in the credit market of each country. There are two key components of banks in the model. First, banks perform active monitoring (due diligence) of loans by hiring loan officers. This loan monitoring activity enhances the pledgeability of their loans to bank financiers, enabling banks to relax their capital constraints, gather additional loanable funds, and extend more credit.² Local (domestic) banks always rely on local loan officers for this monitoring activity. Global banks, by contrast, either rely on loan officers hired by local affiliates or instead use loan officers hired and controlled centrally by the bank’s

²Banks routinely perform activities of information acquisition, maintenance and certification of loan portfolios aimed at preserving the viability and pledgeability of loans. Below in the paper, we elaborate on our modelling of bank activities.

headquarters (possibly subject to some inefficiency due to the functional distance between conglomerates and host-country affiliates). Second, global banks transfer liquidity between parents and local affiliates through internal capital markets.

We allow multinational banks to either decentralize their monitoring and liquidity decisions or to operate a centralized model. Under a centralized monitoring model, global banks mostly hire loan officers at the parent level, financing their wage bill through dedicated “strings attached” transfers to affiliates. In contrast, under a decentralized monitoring model, global banks delegate the hiring of loan officers to host-country affiliates. Similarly, under a centralized liquidity model, global banks engage in reallocation of liquidity across their conglomerate through “no strings attached” liquidity transfers, while under a decentralized liquidity model, local affiliates can receive such transfers from parent banks only at a high cost.³

We calibrate the model to the macro- and bank-level data used in our empirical analysis and then ask the following questions: how do global banks affect the transmission and propagation of financial and real shocks? And, especially, under what model of control, monitoring and liquidity allocation, do global banks play a more (de)stabilizing role for the macroeconomy? Is a centralized or a decentralized business model more conducive to macroeconomic stability? And how does the allocation of monitoring resources interact with the allocation of liquidity through internal capital markets, and hence influence the transmission of shocks?

We show that three main forces govern the behavior of global banks following host-country shocks. First, changes in investment returns, which directly drive responses of global bank lending. Second, the tightness of bank liquidity and capital constraints, which drives the allocation of global banks’ monitoring resources and liquidity. Third, changes in loan portfolio quality, which most directly influence loan monitoring incentives.

Together, these forces ensure that following negative shocks originating in the financial sector that hit banks’ net worth, global banks exert a stabilizing influence on host economies.⁴ They do so by supplanting the now scarcer loans of local banks: global banks boost their monitoring in the host country, transfer liquidity to host-country affiliates, and consequently expand their local lending in a countercyclical fashion. Crucially, the influence of global banks

³To effectively capture the degree of control of the global conglomerates over their affiliates, we allow for two different types of liquidity transfers. The first (“strings attached” transfers) entails a formal control of the conglomerate over the affiliate through the hiring of local loan officers. The second (“no strings attached” transfers) merely involves the reallocation of liquidity across the conglomerate.

⁴To a lesser extent, this is also the case following negative shocks to firms’ total factor productivity (TFP).

on macroeconomic stability is less benign after shocks that erode the quality of firms' investments and, through this, loan portfolio quality. Following capital quality shocks, in fact, the monitoring incentive and effort of global banks' affiliates declines, driving down their lending in the host economy in a procyclical fashion.

An important result is that centralization has an ambiguous effect on the (de)stabilizing role of global banks, with clearly distinct roles for liquidity and monitoring centralization. Monitoring centralization tends to amplify the response of global banks' monitoring following shocks. In contrast, liquidity centralization, while easing liquidity transfers within global bank conglomerates, tends to dilute the response of global banks' monitoring. That is, when global banks allocate substantial transfers to host-country affiliates through their internal capital markets, thus directly supporting affiliates' lending capacity, they also undermine the incentives to perform monitoring at these very same affiliates.⁵ In particular, the inflow of liquid funds from the conglomerates mitigates the tightening of the resource and capital constraints of affiliates following shocks, diluting the incentive to relax those constraints through costly monitoring.

As a result of these mechanisms, when monitoring rises countercyclically—such as following shocks to banks' net worth—monitoring centralization will be more conducive to stabilization than liquidity centralization (though both have a stabilizing influence in the end). Indeed, in response to such shocks, monitoring intensity rises substantially more under monitoring centralization while its response is weakened under liquidity centralization. In contrast, when monitoring drops procyclically—such as following capital quality shocks—monitoring centralization exacerbates instability, while liquidity centralization instead exerts a mitigating influence. In this case, in fact, monitoring centralization exacerbates the reduction in monitoring incentives. Liquidity centralization, on the other hand, facilitates the repatriation of global banks' liquidity to parent countries, better sustaining monitoring incentives and the lending response of local affiliates. Overall, the relative benefits of monitoring and liquidity centralization are then reversed after capital quality shocks, relative to bank net worth shocks.

We apply the model to study the implications of global banks and their business models for the business cycle dynamics of Hungary, a country in our empirical sample where global banks have had a large presence following financial sector reforms of the early 1990s. Calibrating the

⁵In the host-country affiliates, there is a negative effect both on the direct hiring of monitoring loan officers by the affiliates and on the hiring of monitoring loan officers by the conglomerates.

host economy to Hungarian data, we perform a quantitative assessment of the (de)stabilizing effects of a centralized business model of global banks. We obtain that in the net, due to the above contrasting forces, following capital quality shocks the influence of liquidity and monitoring centralization on the (de)stabilizing behavior of global banks is significantly smaller than their stabilizing influence following bank net worth shocks.

In the last part of the paper, we investigate how the (de)stabilizing influence of global banks depends on salient organizational characteristics, namely, the degree of balance sheet consolidation (for example, due to the relative importance of branches and subsidiaries in host countries) and the distribution of monitoring skills between parents and affiliates (for example, due to the functional distance between both). The results reveal that, in the aftermath of bank net worth shocks, a more homogeneous distribution of monitoring skills within global bank conglomerates, and a lower balance sheet consolidation, reinforce the stabilizing influence of a centralized liquidity and monitoring business model of global banking.

Related literature. This paper relates to two main strands of the literature. First, our work speaks to a growing literature on the macroeconomic implications of multinational banking (Kollmann et al., 2011; Kalemli-Ozcan et al., 2013; Kollmann, 2013; Morelli et al., 2022; Fillat et al., 2023; Niepmann, 2023, 2015). These studies demonstrate how banking groups operating in multiple countries can propagate shocks across borders but can also allow for diversification in response to shocks. They also show that the balance between these effects of international banking integration can depend on the regulatory framework (e.g., the stringency of capital requirements) and the nature (financial or real) of aggregate shocks.⁶

Our main contribution is to investigate how the organizational structure of global banks shapes the way they transmit and propagate shocks. In particular, we shed new light on the role of the allocation of monitoring resources within global banks and how this interacts with the functioning of internal capital markets in the propagation and transmission of shocks (Houston et al., 1997; Campello, 2002; De Haas and Van Lelyveld, 2010; Cetorelli and Goldberg, 2012b). Fillat et al. (2023) study multinational banks' choice of the branch-subsidiary structure and the

⁶A rich empirical literature documents shock transmission through multinational banking groups, for example Peek and Rosengren (2000); Chava and Purnanandam (2011); Cetorelli and Goldberg (2011); Cetorelli and Goldberg (2012a); Buch and Goldberg (2015); Chor and Manova (2012); Popov and Udell (2012); Schnabl (2012); De Haas and Van Horen (2012); De Haas and Van Horen (2013); Paravisini et al. (2015) and Ongena et al. (2015). For a discussion of policy implications, see, e.g., Portes (2021).

influence of this structure on the impact of capital linkages across global banking conglomerates. [Niepmann \(2023\)](#) focuses on the role of the efficiency distribution of the banking sector in driving multinational banks' entry in host countries and their choice between cross-border lending and a direct presence in host countries. [Bremus et al. \(2018\)](#) and [De Blas and Russ \(2013\)](#) highlight the role of the size structure of the banking sector in the propagation of credit shocks to the aggregate economy.⁷ [Cao et al. \(2021\)](#) study how the presence of multinational banks in a country can help explain the length of recessions and the trade-off between depth and duration of recessions. Apart from a different focus of their analysis, in [Cao et al. \(2021\)](#) global banks only manage liquidity within conglomerates while there is no role for monitoring, which is a core activity of banks ([Diamond, 1984](#); [Diamond and Rajan, 2001](#); [Goodfriend and McCallum, 2007](#)). We show that the way global banks organize their monitoring activity can play a fundamental role in the business cycle dynamics of host countries and interact in nuanced ways with the organization of internal capital markets. Our results indicate that the centralization of internal capital markets can weaken the resilience of global banks' monitoring after negative banking shocks and, hence, has ambiguous effects on the cyclical response of global banks' lending: it enhances the resilience of lending by facilitating affiliates' access to liquidity, but it can undermine such resilience by reducing their monitoring efforts. On the other hand, the centralization of monitoring resources better enhances the resilience of global banks' lending following negative banking shocks, while potentially exacerbating the effects of negative capital quality shocks. Thus, our results imply that the monitoring channel in open economies can significantly widen the asymmetry in the response of host countries to different types of aggregate shocks (financial or real). Accounting for this channel can then be important for informing the actions of policymakers and regulators aimed at strengthening macroeconomic stability.

Our second contribution is to the broad literature on information acquisition and monitoring

⁷For a quantitative model stressing the role of the size structure of the banking sector, see also [Corbae and D'Erasmus \(2021\)](#). On the empirical side, [Cerutti et al. \(2023\)](#), [Cerutti et al. \(2007\)](#) and [Buch et al. \(2014\)](#) study global banks' choice of entry modes in host countries and the implications for the structure of banking conglomerates. More broadly, the empirical literature highlights that global banks can operate through complex organizational structures, which reflect their strategies in distributing and managing risks across divisions and subsidiaries ([Luciano and Wihlborg, 2018](#)). [Cetorelli and Goldberg \(2014\)](#) and [Correa and Goldberg \(2022\)](#) demonstrate that global banks can maintain several non-bank affiliates structured across multiple ownership tiers. [Cetorelli and Prazad \(2024\)](#) show that bank holding companies with substantial nonbank operations may benefit from strategic funding arrangements between banking and nonbank units. More generally, the complexity of global banks' organizational structures may shape liquidity management, particularly during crises ([Goldberg, 2023](#)) and influence the transmission of macroprudential policies ([Buch and Goldberg, 2017](#)).

inside banking organizations, with a focus on the case of internationally active banks. One set of studies investigates the effect of bank information acquisition and monitoring on borrowers' creditworthiness (Manove et al., 2001; Broecker, 1990; Ogura, 2006). From a macroeconomic perspective, some contributions show that banks' incentive to monitor loan portfolios can get diluted during economic expansions (Dell'Ariccia and Marquez, 2006; Gorton and Ordoñez, 2020; Perri and Quadrini, 2018). Our specification broadly follows Goodfriend and McCallum (2007), who develop a dynamic general equilibrium economy in which banks employ labor to produce loans, thus affecting lending returns. It is also in line with the modelling in closed economies of Cao et al. (2022), where banks conduct due diligence of (potential) borrowers and, in doing so, loan officers preserve the viability of loan portfolios, raising their recovery value and pledgeability in markets for liquidity. In the spirit of Scharfstein and Stein (2000), we posit that within global banks contracting about local affiliates' loan monitoring is incomplete.⁸

The paper is organized as follows. Section 2 introduces the inner workings of global banks and presents motivating empirical evidence. Section 3 lays out the model and solves for agents' decisions, after which we discuss the calibration and preview key mechanisms in Section 4. Section 5 presents simulation results and Section 6 concludes. Online Appendices contain more details about our data and model derivations as well as additional results.

2 Empirical Evidence

This section first provides background information on the internal organization of multinational banking groups. It then presents evidence on the lending, loan monitoring and liquidity allocation behavior of such banks using granular data from a large-scale survey of bank CEOs conducted by the European Bank for Reconstruction and Development (EBRD) and Tilburg University. We merge these unique data with bank-level information on annual credit growth and other bank balance sheet variables as well as selected macroeconomic indicators.

⁸However, we do not introduce private benefits of control. In contrast, Scharfstein and Stein (2000) consider a setting where divisional rent-seeking behavior and agency problems can lead to wasteful overinvestment.

2.1 Global banks: A primer

2.1.1 Internal capital markets in global banks

The empirical literature documents the relevance of internal capital markets for global bank branches and subsidiaries. Some authors directly observe financial transactions between parent banks and foreign affiliates, while others infer the occurrence of such transactions from correlational patterns in lending across different parts of the banking conglomerate. [Houston et al. \(1997\)](#) find that loan growth at subsidiaries depends more on parent holding company health than subsidiary-specific conditions. [Dahl et al. \(2002\)](#) and [Ashcraft \(2008\)](#) demonstrate how subsidiary banks benefit from parent bank equity flows and capital injections. [Schnabl \(2012\)](#) documents that global bank subsidiaries in Peru receive financial support from parent banks. [Popov and Udell \(2012\)](#) find that parent bank stress leads to liquidity constraints at their Emerging European subsidiaries. And the debate about liquidity flows between Western European banks' headquarters and emerging market subsidiaries led to the 2009 Vienna Initiative, which further encouraged Western European banks to maintain support for their subsidiaries with capital and liquidity (see, e.g., [European Investment Bank \(2019\)](#) and references therein).

The literature on global banks treats these banks' internal capital markets mostly as a black box. In particular, how banks organize internal capital markets, and whether there is meaningful organizational variation across banks, has not been studied in much detail.⁹ [De Haas and Naaborg \(2006\)](#) conduct semi-structured in-person interviews with a large number of bank CEOs in Central and Eastern Europe. To set the stage for the analysis in the rest of this paper, this section summarizes their evidence on the organization of internal capital markets in global banks.

Global banks can inject equity or provide debt funding to foreign affiliates. In a frictionless world, the redistribution of capital between a parent bank and its affiliates is inconsequential if the bank holding is managed and supervised (by the home-country authority) on a consolidated basis. In reality, global banks do allocate capital to foreign subsidiaries for two main reasons. First, in many settings, global bank subsidiaries need to comply with host-country minimum capital requirements. When their capitalization gets close to these minimum levels, parent banks typically step in to replenish local capital with additional Tier 1 or 2 capital. A second

⁹The practitioners' literature, for example [Matten \(2000\)](#), fills this gap only partially.

reason for global banks to allocate capital to foreign subsidiaries are local large exposure limits. Such limits specify the maximum amounts, expressed as percentages of local capital, that local banks are allowed to lend to an individual counterparty. If a subsidiary is not permitted to lend more than a certain percentage of its own capital to a single client, this will encourage parent banks to increase local capital. This approach to internal capital allocation is regulatory-driven and therefore quite passive. In practice, banks' capital allocation systems lie on a continuum between passive and more active approaches (Matten, 2000, p. 316). As part of a more active approach, global banks also use the internal allocation of scarce capital to measure affiliate performance, compensate managers, and steer business directly.

Global banks can also support foreign affiliates with debt funding, especially to help them achieve credit-growth objectives. Importantly, the level of centralization of treasury activities differs widely among banks. Some banks follow a decentralized approach in which subsidiaries are required to fund themselves with senior debt through their own treasury desks. Such a decentralized approach is more attractive if affiliates' local funding base is sufficiently deep and when parent banks worry that providing cheap central funding would lead to free-riding among minority shareholders of the affiliate. Other banks operate more centralized treasuries in which the parent bank may even be the only provider of non-deposit funding to affiliates. In such an integrated treasury function, affiliates typically estimate their funding requirements for the following year—including subordinated, long-term and short-term debt—and submit this application to the group treasury. Lastly, some banks use a hybrid approach in which affiliates are allowed to partially fund themselves but have otherwise to use the central treasury.

2.1.2 Control and monitoring in global banks

Global banks not only differ in how actively they manage internal capital markets, they also exert influence by more or less directly controlling the loan screening and monitoring practices of their affiliates. There exists wide variation across global banks in how much they control and monitor foreign affiliates in this regard. Banks typically strike a balance between allowing affiliates to be truly local and, at the same time, having sufficient control over their operations.

In terms of the screening of new clients, parent banks can exert an influence in two ways. First, control can take the form of standardizing and centralizing risk-management systems, credit-scoring systems, and IT platforms. Banks may also provide training—sometimes in

the home country, sometimes by way of flying in experts—to implement these standardized systems. Second, some global banks introduce an explicit credit or exposure limit below which local affiliates can independently make lending decisions (in some cases using the standardized credit-scoring systems rolled out throughout the banking conglomerate). In contrast, loans to local clients that exceed the credit limit are pre-screened by local risk officers but will then need to be vetted by the central credit committee of the parent bank. Some other banks take a more decentralized approach, in which loan proposals are screened locally and exposures above a certain threshold only need to be reported to (but not vetted by) the parent bank.

Looking at monitoring practices, some global banks also standardize the way local affiliates monitor their client portfolio. Banks sometimes implement signalling systems that follow customers during the life span of the loan to ensure that certain covenanted financial ratios remain fulfilled. In this way, affiliate exposures can be measured in a standardized manner and hence be included in group-level exposure indicators and risk metrics. Other parent banks, instead, prefer to actively monitor affiliates’ portfolios through local credit committees.

Lastly, in terms of hiring practices, many global banks aim for a combination of, on the one hand, centrally appointed managers and senior loan officers and, on the other hand, locally hired loan officers with an in-depth knowledge of the local market. The latter will be especially important to develop longer-term lending relationships with smaller and less transparent clients (Berger and Udell, 2002; Uchida et al., 2012). When global banks rely on locally hired loan officers to extract soft information from such clients, it is especially important that final lending decisions are made locally as well or that soft information can effectively be “hardened” and processed higher up in the global bank hierarchy (Stein, 2002).

2.2 Data and measurement

2.2.1 The BEPS survey and other data sources

The Banking Environment and Performance Survey (BEPS) covers banks across Central and Eastern Europe, Central Asia, Russia, Türkiye, and the Southeastern Mediterranean region.¹⁰ We draw information from two waves of the survey: the BEPS II (conducted in 2012 in 30 countries with reference to the 2005-2011 period) and the BEPS III (conducted in 2020 in 28

¹⁰See Appendix B for more details about the BEPS survey.

countries with reference to the 2012-2019 period). As part of these unique surveys, in-depth structured interviews were held with bank CEOs and, in the case of BEPS III, also with each bank's Head of Credit. The surveyed banks represent more than 75 percent of all bank assets in the countries covered by BEPS.

The countries in the sample are overall characterized by strongly bank-based financial systems. The role of stock markets and non-bank financial institutions in funding non-financial firms is quite limited. To quantify this, using data from the World Bank Global Financial Development and World Bank Development Indicators Databases ([World Bank, 2023](#)), we computed standard measures of the relevance of the banking sector relative to the equity market. For the countries in our sample, the average ratio of bank credit to stock market capitalization equals 4.66, which is much higher than the average ratio (1.14) for OECD countries. It is also much higher than the ratio observed for countries traditionally viewed as bank-based, such as Japan (1.32) and Germany (1.26). In addition, on average the share of fixed investment expenses covered by bank loans is roughly twice as large as the share of expenses covered by internal equity and shares issues. The limited role of non-bank funding for firms' financing is also confirmed by the very low reliance of the countries in the sample on international debt securities (long-term bonds and notes and money market instruments placed on international markets): this is on average just below 5% as a share of GDP, compared with much higher figures for many OECD countries, such as Spain (66%), Sweden (80%), or the United Kingdom (96%). Appendix Figure B1 provides an illustration of the prominent role of the banking sector for a subset of 11 sample countries in Central and Eastern Europe and the Caucasus. And Appendix B describes various episodes of disruption of the banking sectors of the sample countries that occurred in recent decades.

BEPS survey interviews were conducted by senior consultants with extensive financial sector experience and followed a standardized survey instrument.¹¹ Crucially for our purposes, in case of multinational banks, the BEPS survey treats each subsidiary as an independent (foreign-owned) bank. For example, the Italian bank UniCredit operates subsidiaries in several countries. Rather than interviewing the Italian CEO of UniCredit, the survey team separately interviewed the CEOs of the UniCredit subsidiaries in Bosnia and Herzegovina, Bulgaria, Czech

¹¹The BEPS II surveys were conducted in person whereas the BEPS III surveys were conducted via Zoom or a similar on-line platform.

Republic, Estonia, Latvia, Lithuania, Romania, Serbia, Slovakia, and Slovenia.

The BEPS survey provides detailed data on topics such as banks’ lending and monitoring, including the hiring of loan officers and the centralized implementation of monitoring technologies. For banks that are an affiliate of a multinational bank, the data also contain unique information on how these groups organize their internal capital markets and the extent to which parent banks provide liquidity support through intra-group transfers. Information was also collected about parent banks’ involvement in the hiring of local managers and in the day-to-day business of affiliates. Thus, a crucial feature of the BEPS survey is that it provides us with information on the role played by parent banks as well as the degree of reliance of local affiliates on their parents in their lending, monitoring, and liquidity gathering decisions.

We hand-match the BEPS survey data with Bureau Van Dijk’s BankScope and Orbis databases for bank-level financials and with the Systemic Banking Crises Database II by [Laeven and Valencia \(2020\)](#) on major financial disruptions. In the end, our dataset contains foreign banks that were interviewed as part of the BEPS survey and that were matched with bank financials and systemic crisis data, thus creating a panel dataset for the years 2007–2017.¹²

2.2.2 A first look at the data

Table 1 provides first insights into the sample of global bank subsidiaries (Appendix Table B1 contains all variable definitions).¹³ Average annual nominal credit growth amounts to 14%, banks’ average capital to asset ratio is about 14%, and their net interest margin averages around 4.5%. The median ratio between a bank’s outstanding loan portfolio and its customer deposit base is 112%, although we observe wide variation in banks’ use of non-deposit funding.

We next report summary statistics for a set of variables that characterize the organizational structure and behavior of global banks along our two main dimensions of interest: the degree of control of the subsidiary’s monitoring activities (including the hiring and training of local loan officers) and the degree of liquidity support provided by the parent to the subsidiary (capturing the presence and depth of internal capital markets). Consider first monitoring. About 86% of

¹²In line with the literature, we consider a bank as foreign owned if at least 50% of its equity is owned by a foreign strategic investor ([Claessens and Van Horen, 2014](#), p. 300).

¹³In the table, information on financial variables refers to 208 subsidiaries. The parent banks of these subsidiaries are located in Austria (16%), Italy (13%), Greece (9%), France (9%), Germany (8%), Russia (8%), Türkiye (4%), the United States (3%) and several other countries. The set of banks to which summary statistics on the single variables refer and, hence, the sample size used in the various regressions, is dictated by data availability.

the subsidiaries declare that their parent bank sets targets for them in terms of credit growth, while in 41% of the cases the parent bank sets targets for the local market shares that need to be achieved. Roughly 42% of the subsidiaries declare that the parent bank plays an important role in the credit assessment of borrowers. We observe wide variation in how intensely parent banks and their subsidiaries interact on a day-to-day basis, as measured by the average number of phone calls, conference calls, and video calls the subsidiary’s CEO holds with the management or board of the parent bank on a monthly basis. The average number of such calls is 12 but varies between zero and 110. In more than 85% of all cases, the subsidiaries declare that the parent bank was also involved in the selection and training of local managers.

Next, when considering heterogeneity in the use of internal capital markets, we see that 55% of all foreign bank subsidiaries are part of a global bank that operates a centralized treasury. In many cases, these internal capital markets are an important source of subsidiary funding: 73% of all interviewed CEOs mention that parent banks are a key source of funding in case of an unexpected funding shortfall. Moreover, 70% of the subsidiary CEOs mention that their parent provides them with liquidity and/or capital “on a regular basis”. We also find that 87% of global bank subsidiaries indicate that they have been supported by their parent bank via an internal credit line at least once during the past five years.

2.3 Global banks’ response to shocks

2.3.1 The empirical models

Our dynamic general equilibrium model yields predictions on two fronts: (i) the response of global banks’ lending, monitoring (loan officer employment and usage of other monitoring resources), and liquidity transfers following financial and real shocks; and (ii) how these responses depend on the degree of centralization of global banks (including the degree of control/intervention of global parents’ headquarters into their affiliates’ decisions) and on the degree of inefficiency/distance of parent headquarters relative to local affiliates.

To test these predictions, we estimate two sets of empirical models. The first model uses panel data at the bank-year level over the 2007-2017 period to study the lending behavior of global banks following shocks and how this behavior depends on the degree of centralization of

global banks' liquidity and monitoring:

$$L_{jt} = \alpha_j + \alpha_t + \beta_1 Y_{it} + \beta_2 Y_{kt} + \gamma_1 (X_j \times Y_{it}) + \delta Z_{jt} + \eta L_{jt-1} + \epsilon_{jt}. \quad (1)$$

In estimating equation (1) we focus on major financial shocks (crises) and, in additional tests, extend the analysis to all recessionary shocks. In equation (1), L_{jt} denotes annual credit growth of global bank subsidiary j in year t ; α_j and α_t are bank and time (year) fixed effects, respectively; Y_{it} and Y_{kt} are indicators for the occurrence of a financial crisis in the host country i and parent country k of the bank in year t , respectively;¹⁴ X_j is a set of time-invariant, structural characteristics of the relationship of the bank affiliate with its parent bank, capturing the degree of monitoring or liquidity centralization of the global bank; Z_{jt} is a set of time-varying control variables for global bank affiliate j , including the bank's net interest margin, its leverage, its gross loans to total customer deposits ratio, and its liquid assets to total assets ratio; L_{jt-1} is lagged credit growth; and ϵ_{jt} is the error term.

As described in Appendix B, the key indicators in X_j include two proxies for the degree of control exerted by the parent and, hence, its monitoring centralization: the intensity of the contacts between the global bank parent and the affiliate (the average number of monthly calls between the parent and the affiliate offices), and an indicator for whether the parent bank exerts an important role in the credit assessment of borrowers. They also include an indicator for the centralization of treasury and liquidity management in the global conglomerate.

We estimate equation (1) using a two-step difference Generalized Method of Moments (GMM) estimator. The lag of credit growth, the bank-level controls and the financial crisis dummies for the home and the host countries are treated as endogenous and instrumented with their lags. Standard errors are adjusted for Windmeijer's finite-sample correction for a two-step covariance matrix.

Next, in order to investigate the responsiveness of global banks' liquidity and monitoring to the incidence of aggregate financial shocks (crises) in the host country, we estimate the following cross-sectional empirical models:

$$Liq_j = \alpha' + \beta_1' Y_i + \beta_2' Y_k + \delta' Z_j' + \epsilon_j', \quad (2)$$

¹⁴The financial crisis indicators are dummy variables equal to one if in the host (parent) country there was a systemic banking crisis, currency crisis, sovereign debt crisis or sovereign debt restructuring during the year, zero otherwise. The data are from the Systemic Banking Crisis Database II by [Laeven and Valencia \(2020\)](#).

$$Mon_j = \alpha'' + \beta_1'' Y_i + \beta_2'' Y_k + \delta'' Z_j'' + \epsilon_j'' \quad (3)$$

We estimate these models for the 2007-2017 period (in Appendix B we also verify robustness to using the 2007-2012 subperiod). In equations (2)-(3), Liq_j is a dummy that takes the value of one if the global bank affiliate declares that it received liquidity support from the parent bank through a credit line or transfer during the period and Mon_j is a dummy that takes the value of one if the affiliate declares that the parent directly intervened in training and selecting managers and loan officers during the period. Y_i and Y_k are, respectively, the indicators for the occurrence of any financial crisis in the host and parent country of the bank, averaged over the period (effectively capturing the average incidence of crises); Z_j' and Z_j'' are sets of controls for the bank (annual credit growth; equity to total assets; gross loans to total customer deposits; net interest margin), computed as period averages; and ϵ_j is the error term.

2.3.2 Estimates

Table 2 displays the estimates of equation (1). We find consistent evidence that global banks expand their lending countercyclically during financial crisis episodes in the host country (see columns 1-2).¹⁵ We also find evidence that this countercyclical lending behavior is more pronounced when parents exert a more centralized control over their affiliates, as proxied by a higher frequency of contacts between affiliate and parent offices (columns 3-4) or by the intervention of parent offices in the credit assessment of borrowers (columns 5-6). The estimates further suggest that the centralization of liquidity (as proxied by the presence of a centralized treasury in the global banking conglomerate; columns 7-8) contributes to enhancing the countercyclical lending behavior of global banks.¹⁶ In Appendix Table B2, Panel B, we further document that the countercyclical lending behavior of global banks is specific to host-country financial crises, while we do not detect it for other types of recessionary episodes.

In Table 3, we show the estimates of equations (2)-(3) for the response of global banks' liquidity support and monitoring support to the incidence of crises in host countries.¹⁷ In columns 1-3, we obtain that global banks' parent offices are more likely to provide liquidity support to affiliates when the incidence of financial crises in the host country is higher. In columns 4-6,

¹⁵Appendix Table B2, Panel A, shows robustness to lagging the control variables of the global affiliate.

¹⁶The effects of bank leverage and asset liquidity are estimated imprecisely (see also Appendix Table B2).

¹⁷Appendix Table B3 shows that the results are robust to focusing on the 2007-2012 subperiod.

we instead investigate the response of global banks’ monitoring support, as captured by parent offices’ training of loan officers at affiliates in host countries. We find that global banks are more likely to provide monitoring support when financial crises are more frequent in the host country.¹⁸ As we will discuss below, these empirical patterns are consistent with the predictions of our theoretical model.

3 The Model

Motivated by the empirical evidence, we develop a dynamic general equilibrium model with two countries (“host” and “foreign”). In each country there are three sectors: households, firms (final good producers and capital producers), and banks (global and local banks). Households consume final goods and supply labor to firms and to banks operating in their country. They also hold deposits in banks operating in their country. Final producers use capital and labor in production, financing capital purchases with bank funding.¹⁹ Banks intermediate liquidity between households and firms. They also monitor the loans they extend to firms, using labor (loan officers) as an input in their monitoring. The characterizing feature of our economy is the presence and organizational structure of global banks. In particular, global banks manage liquidity and monitoring resources (loan officers) across their offices in the two countries.

We present agents’ decisions focusing on the host country. The foreign country is symmetric, unless otherwise stated. Variables referring to the foreign country are denoted by an asterisk.

3.1 Households and Firms

Households. For tractability, we posit a representative household in each country. We model households as in [Gertler and Kiyotaki \(2010\)](#) and [Gertler and Karadi \(2011\)](#). Within the household, a fraction $(1 - f)$ of household members consist of workers while a fraction f are bankers. Each banker manages a bank. Each worker can work in final good production or as

¹⁸The estimates also suggest that parent banks’ liquidity support is more likely when global banks have higher liquidity centralization (a centralized treasury department) (column 3). Moreover, the probability of monitoring support is higher when there is a stronger monitoring centralization, as captured by a higher frequency of contacts between parent and affiliate offices (column 6).

¹⁹We abstract from firms’ direct financing through equity or bond markets. This is consistent with the highly bank-based nature of the countries in our empirical sample, as illustrated in Section 2. We also note that for a large part of the corporate sector, the issuance of equity or bonds to international investors for direct financing may constitute a very limited substitute for the credit of local banks and foreign banks’ affiliates, especially in countries like those in our empirical sample.

a loan officer for bankers. There is perfect consumption insurance within the household. As in [Gertler and Kiyotaki \(2010\)](#) and [Gertler and Karadi \(2011\)](#), an exogenous turnover between bankers and workers limits bankers' ability to save to overcome financial constraints.²⁰ In every period, bankers exit with an i.i.d. probability $(1 - \sigma)$, in which case they transfer retained earnings to the household.²¹ In turn, in each period a mass of $(1 - \sigma)f$ workers randomly become bankers. Each new banker receives a transfer from the household, equal to a small, exogenous fraction ς of the total assets of exiting bankers.

Households choose consumption C_t , deposits D_t at local banks, deposits D_t^g at host-country affiliates of global banks, and their labor supply to final producers (H_t), to local banks (L_t), and to global bank affiliates (L_t^g). They maximize their expected lifetime utility

$$\max_{\{C_t, D_t, D_t^g, H_t, L_t, L_t^g\}_{t \geq 0}} E_0 \sum_{t=0}^{\infty} \beta^t U(C_t, H_t, L_t, L_t^g)$$

$$\text{s.t.} \quad C_t + D_t + D_t^g = R_{t-1}^D D_{t-1} + R_{t-1}^{D,g} D_{t-1}^g + W_t^H H_t + W_t^L L_t + W_t^{L,g} L_t^g + \Pi_t, \quad (4)$$

where β is the discount factor, W_t^H is the wage rate in the goods sector, W_t^L ($W_t^{L,g}$) is the wage rate at local (global) banks, R_{t-1}^D ($R_{t-1}^{D,g}$) is the gross deposit rate on deposits held at local (global) banks, and Π_t are profits earned from owning firms and banks.²²

Final good producers. There is a unit continuum of final good producers that use physical capital and labor to produce final goods. Capital and labor are not mobile across countries. To finance capital purchases, final good producers can issue state-contingent securities X_t , at a market price Q_t , and sell them to banks operating in the country (whether local banks or global banks' affiliates).²³ Their constant-returns-to-scale technology reads

$$Y_t = A_t (\kappa_t K_{t-1})^\alpha H_t^{1-\alpha}, \quad (5)$$

where Y_t is output, K_t is capital, κ_t is an exogenous capital quality shock, and A_t is total factor productivity (TFP). Both TFP and the capital quality shock follow $AR(1)$ processes.

²⁰More specifically, the turnover between bankers and workers makes bankers relatively impatient, creating an incentive for them to borrow from households through deposits. This feature allows to introduce a separate banking sector while maintaining the representative household structure.

²¹The exit probability ensures that bankers cannot grow out of collateral constraints. Since capital constraints bind around the steady state, bankers retain earnings while in business and pay dividends when exiting.

²²The optimizing conditions for households and firms are standard and we relegate them to Appendix A.

²³We abstract from cross-border banking in our setting. Observe that, as in [Gertler and Kiyotaki \(2010\)](#) and [Gertler and Karadi \(2011\)](#), firms issue state-contingent securities to banks, implying that one can abstract away from frictions between firms and banks.

Letting δ be the depreciation rate and I_t denote investment, the law of motion of capital is

$$K_t = I_t + (1 - \delta)\kappa_t K_{t-1}. \quad (6)$$

Capital producers. A capital producer can invest in I_t units of capital goods, which cost $\left[1 + F\left(\frac{I_t}{I_{t-1}}\right)\right] I_t$ units of consumption goods. $F(\cdot)$ captures the adjustment cost in the capital producing technology, and satisfies $F(1) = F'(1) = 0$, and $F''(1) > 0$.

A capital producer chooses investment to maximize the expected present value of profits

$$\max_{\{I_t\}_{t \geq 0}} E_0 \sum_{t=0}^{\infty} \Lambda_{0,t} \left\{ Q_t I_t - \left[1 + F\left(\frac{I_t}{I_{t-1}}\right)\right] I_t \right\}, \quad (7)$$

where Q_t is the price of capital when sold to final good producers.

3.2 Banks

There are two types of banks. The first is a local bank that gathers deposits from host-country households and acquires shares issued by host-country firms (and analogously for a local bank in the foreign country). A local bank is run by a banker in the same country where the bank resides. The second type of bank is global. This conglomerate consists of a parent bank (variables of which are denoted by superscript g^*) that gathers deposits from foreign households and acquires shares issued by foreign firms in the foreign country, and an affiliate (denoted by superscript g) that gathers deposits from host-country households and acquires shares issued by firms in the host country. A global bank is run by a pair of bankers from the foreign country household. When the bankers exit, both the parent and the affiliate terminate their business.

3.2.1 Liquidity and control in the banking sector

Similar to, for example, [Gertler and Kiyotaki \(2010\)](#) and [Gertler and Karadi \(2011\)](#), bankers can engage in strategic default and renege on the repayment of their liabilities. When a banker defaults, the financiers can trigger liquidation and seize a fraction of the liquidation value of the banker's assets. Due to this risk of strategic default, the access to liquidity of all banks is subject to a collateral (capital) constraint: the value of their liabilities cannot exceed the pledgeable value of their assets. By hiring loan officers, banks perform monitoring (due diligence) of loans,

raising their recovery value in case of default and, hence, their pledgeable value to financiers.²⁴

A global bank can manage liquidity and monitoring resources (loan officers) within its conglomerate. In particular, it can transfer funds between the parent and the affiliate through internal capital markets (liquidity management). It can also engage in control over the hiring of loan officers in its parent and affiliate offices. In particular, loan officers employed in the affiliate office comprise those autonomously hired by the affiliate and those hired by the conglomerate.

Events in a period t unfold as follows. Aggregate shocks are realized. Then, production takes place. Thereafter, banks learn whether they exit and new banks enter. Finally, surviving banks gather deposits, receive transfers, hire loan officers, and purchase shares issued by firms.

3.2.2 Local banks

Local banks in the host country choose their deposit taking D_t from host-country households, purchases of shares X_t issued by host-country firms, and hiring of loan officers L_t , to maximize the expected discounted sum of dividends they distribute to the host-country household

$$V_t \equiv \max_{\{X_{t+j}, D_{t+j}, L_{t+j}\}_{j \geq 0}} E_t \sum_{j=0}^{\infty} (1 - \sigma)^j \Lambda_{t,t+j+1} N_{t+j+1}, \quad (8)$$

$$\text{s.t.} \quad Q_t X_t = N_t + D_t - W_t^L L_t, \quad [\lambda_t] \quad (9)$$

$$R_t^D D_t \leq \xi^L \mathcal{P}(Q_t X_t, L_t) Q_t X_t, \quad [\mu_t] \quad (10)$$

where N_t is the local bank's net worth and $\mathcal{P}(\cdot)Q_t X_t$ is the pledgeable, recovery value of firm shares in case of strategic default of the bank. This pledgeable value is a function of the intensity of monitoring (due diligence) performed by the local bank, as determined by the number of loan officers L_t it employs.²⁵ We can equivalently interpret $[1 - \mathcal{P}(\cdot)]Q_t X_t$ as the haircut applied to the market value of the portfolio of firm shares. λ_t and μ_t denote the Lagrange multipliers for

²⁴By monitoring loans, banks preserve the viability of loan portfolios and certify it to investors. For example, banks that default strategically need to identify buyers of project loans in the liquidation market. Loan monitoring and assessment enhances this ability, raising the recovery value of loans and, hence, the loan value pledgeable to investors. There is extensive evidence on the effects of banks' monitoring on banks' access to liquidity (see, e.g., [King, 2008](#); [BIS, 2015](#), and references therein). Note that, following [Gertler and Karadi \(2011\)](#), and as in a broad class of models (e.g., [Kiyotaki and Moore, 1997](#)), bankers' moral hazard that underlies collateral (capital) constraints is an off-equilibrium phenomenon. Thus, it causes the emergence of capital constraints but does not lead to realized losses in banks' balance sheets. Consistent with this, monitoring also affects the tightness of capital constraints, thereby impacting banks' lending capacity and, indirectly, banks' net worth.

²⁵A broad literature in banking documents the fundamental role of loan officers in performing monitoring of loans. A critical component of banks' information consists of information acquired by loan officers over the course of their interactions with borrowers (see, e.g., [Petersen and Rajan, 1994](#); [Berger and Udell, 2002](#); [Goedde-Menke and Ingermann, 2024](#); [Drexler and Schoar, 2014](#)). And loan officers also serve as a fundamental input in the activity of collection of codified information ([Berger and Udell, 2002](#)).

the resource constraint and the collateral constraint of the local bank, respectively.

The local bank's net worth at time t is the gross payoff from assets net of borrowing costs:

$$N_t = \left[R_t^k + (1 - \delta)\kappa_t Q_t \right] X_{t-1} - R_{t-1}^D D_{t-1} + nw_t, \quad (11)$$

where R_t^k denotes the return to capital and nw_t is an exogenous shock to the local bank's net worth following an $AR(1)$ process.

Equation (9) is the resource constraint: net worth and deposits are used to invest in firm shares and to pay loan officers' wages. Equation (10) is the collateral (capital) constraint which requires that the value of the local bank's liabilities (deposits) cannot exceed a fraction of the pledgeable value of assets. The parameter ξ^L is governed by market-based and regulatory-based capital requirements. We specify the recoverable portion of the portfolio of firm shares as:

$$\mathcal{P}(Q_t X_t, L_t) = \left(\frac{L_t}{Q_t X_t} \right)^{1-\phi}. \quad (12)$$

This is an increasing and concave function of the labor of loan officers, per unit of firm shares held by the bank. Using (12), we obtain the recovery value of firm shares:²⁶

$$\mathcal{P}(Q_t X_t, L_t) Q_t X_t = (Q_t X_t)^\phi (L_t)^{1-\phi}. \quad (13)$$

Taking the FOCs for X_t , D_t , L_t , and combining them with the envelope conditions, we obtain:

$$\begin{aligned} [\partial X_t]: \quad & -\lambda_t Q_t + \mu_t \xi^L \phi (L_t)^{1-\phi} (Q_t)^\phi (X_t)^{\phi-1} \\ & + E_t \Lambda_{t,t+1} \left[R_{t+1}^k + (1 - \delta)\kappa_{t+1} Q_{t+1} \right] (1 - \sigma + \sigma \lambda_{t+1}) = 0, \end{aligned} \quad (14)$$

$$[\partial D_t]: \quad \lambda_t - \mu_t R_t^D - E_t \Lambda_{t,t+1} (1 - \sigma + \sigma \lambda_{t+1}) R_t^D = 0, \quad (15)$$

$$[\partial L_t]: \quad -\lambda_t W_t^L + \mu_t \xi^L (1 - \phi) (L_t)^{-\phi} (Q_t X_t)^\phi = 0. \quad (16)$$

Consider (14) for example. Acquiring firm shares tightens the current resource constraint (λ_t) of the local bank, but relaxes its current capital constraint (μ_t) and the future resource constraint (λ_{t+1}). The relaxation of the current capital constraint depends on the intensity of monitoring performed by loan officers (L_t). Consider next (16). By hiring loan officers, the local bank tightens its current resource constraint (λ_t) but raises its loan monitoring and the pledgeable value of its assets, thus relaxing its collateral (capital) constraint (μ_t).

²⁶The constant return to scale function in (13) allows us to aggregate across banks without keeping track of the distribution of net worth across them.

3.2.3 Global banks: affiliates and parents

Global affiliates. The global bank affiliate chooses shares X_t^g to purchase in the host country, deposits D_t^g to gather from host-country households, and the number of loan officers L_t^a to hire, to maximize the expected discounted sum of the dividends distributed to the foreign household:

$$V_t^g \equiv \max_{\{X_{t+j}^g, D_{t+j}^g, L_{t+j}^a\}_{j \geq 0}} E_t \sum_{j=0}^{\infty} (1-\sigma)\sigma^j \Lambda_{t,t+j+1}^* N_{t+j+1}^g, \quad (17)$$

$$\text{s.t. } Q_t X_t^g = N_t^g + D_t^g - W_t^{L,g} L_t^g + \mathcal{Z}_t^g, \quad [\lambda_t^g] \quad (18)$$

$$R_t^D D_t^g + \theta R_t^D \mathcal{Z}_t^g \leq \xi \left[(1-\eta) \mathcal{P}^g(\cdot) Q_t X_t^g + \eta \mathcal{P}^{g^*}(\cdot) Q_t^* X_t^{g^*} \right], \quad [\mu_t^g] \quad (19)$$

$$L_t^g = L_t^a + L_t^c, \quad (20)$$

where $\mathcal{P}^g(\cdot) = \mathcal{P}^g(Q_t X_t^g, L_t^a, L_t^c)$ and $\mathcal{P}^{g^*}(\cdot) = \mathcal{P}^{g^*}(Q_t^* X_t^{g^*}, L_t^{a^*}, L_t^{c^*})$. The net worth is

$$N_t^g = \left[R_t^k + (1-\delta)\kappa_t Q_t \right] X_{t-1}^g - R_{t-1}^D D_{t-1}^g - \theta R_{t-1}^D \mathcal{Z}_{t-1}^g. \quad (21)$$

$\Lambda_{t,t+j+1}^*$ is the foreign country stochastic discount factor, $L_t^g = L_t^a + L_t^c$ is the total number of host-country loan officers employed in monitoring (due diligence) activities by the global affiliate, L_t^a denotes the number of loan officers autonomously hired by the affiliate, and L_t^c is the number of loan officers directly hired (or managed) by the global bank conglomerate.²⁷ In (19), $L_t^{a^*}$ and $L_t^{c^*}$ denote the loan officers of the parent bank in the foreign country.

In the affiliate's resource constraint (18), \mathcal{Z}_t^g is the total liquidity transfer from the conglomerate. This takes the form of a mix of an intra-group loan, possibly extended at a reduced interest rate, and an equity injection. The gross cost per unit of transfer is θR_t^D , where $(1-\theta) < 1$ governs the per-unit cost saving of the transfer relative to deposits gathered in the host country.²⁸ λ_t^g denotes the Lagrange multiplier for the resource constraint. The affiliate takes as given the parent's portfolio choice. In addition, it takes as given the number of loan officers directly chosen by the conglomerate (L_t^c) and the intra-group transfer \mathcal{Z}_t^g from the parent (or to the parent, if $\mathcal{Z}_t^g < 0$), which is determined at the conglomerate level.

Equation (19) is the collateral constraint (with Lagrangian multiplier given by μ_t^g). The collateral constraint consolidates the assets of the affiliate and the parent bank. In particular,

²⁷Our specification is close to a setting in which global banks directly send loan officers from headquarter offices. The main difference is the country where loan officers are hired, which matters primarily for the determination of wages in general equilibrium.

²⁸This per-unit cost saving may partly reflect an interest rate discount, in case of intra-group loans, and partly reflect an equity injection component.

the right-hand side of (19) is the weighted sum of $\mathcal{P}^g(Q_t X_t^g, L_t^a, L_t^c) Q_t X_t^g$, the recovery value of the firm shares held by the affiliate, and $\mathcal{P}^{g*}(Q_t^* X_t^{g*}, L_t^{a*}, L_t^{c*}) Q_t^* X_t^{g*}$, the recovery value of the firm shares held by the parent. The weight on the parent, η , determines the degree of consolidation of the affiliate's and parent's balance sheets. For example, a higher share of branches will entail a higher consolidation of balance sheets across the global conglomerate. A value of $\eta = 0$ implies complete separation, whereas $\eta = 0.5$ implies full consolidation.

The recoverable portion of the assets held by the affiliate bank depends on the monitoring performed by loan officers hired autonomously (L_t^a) and by loan officers managed by the conglomerate (L_t^c) according to the following due diligence function

$$\mathcal{P}^g(Q_t X_t^g, L_t^a, L_t^c) = \left(\frac{\mathcal{L}_t}{Q_t X_t^g} \right)^{1-\phi}. \quad (22)$$

Taking a leaf from a broad literature in labor, we posit a CES aggregator of loan officers²⁹ (\mathcal{L}_t)

$$\mathcal{L}_t = \left[(1-\chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau}{\tau-1}}. \quad (23)$$

τ denotes the elasticity of substitution between loan officers controlled by the affiliate and loan officers controlled by the conglomerate, while χ governs the productivity weights on the two categories of loan officers. Using (22), the recovery value of the affiliate's assets is³⁰

$$\mathcal{P}^g(Q_t X_t^g, L_t^a, L_t^c) Q_t X_t^g = (Q_t X_t^g)^\phi (\mathcal{L}_t)^{1-\phi}. \quad (24)$$

Combining the FOCs for X_t^g , D_t^g , L_t^a with the corresponding envelope conditions, we obtain the optimizing conditions for the loans extended by the global bank affiliate in the host economy

$$\begin{aligned} [\partial X_t^g]: \quad & -\lambda_t^g Q_t + \mu_t^g \xi (1-\eta) \phi \left[(1-\chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau(1-\phi)}{\tau-1}} (Q_t)^\phi (X_t^g)^{\phi-1} \\ & + E_t \Lambda_{t,t+1}^* \left[R_{t+1}^k + (1-\delta) \kappa_{t+1} Q_{t+1} \right] (1-\sigma + \sigma \lambda_{t+1}^g) = 0, \end{aligned} \quad (25)$$

for the deposits gathered in the host economy

$$[\partial D_t^g]: \quad \lambda_t^g - \mu_t^g R_t^D - E_t \Lambda_{t,t+1}^* (1-\sigma + \sigma \lambda_{t+1}^g) R_t^D = 0, \quad (26)$$

²⁹Similar to a large class of studies in labor, the CES specification captures in a natural way the imperfect substitutability between the two categories of loan officers (e.g., reflecting the imperfect substitutability of their knowledge, experience, and skills).

³⁰Positing a due diligence function analogous to that of local banks and global banks' affiliates, the recovery value of assets for the parent bank operating in the foreign country is given by $\mathcal{P}^{g*}(Q_t^* X_t^{g*}, L_t^{a*}, L_t^{c*}) Q_t^* X_t^{g*} = (Q_t^* X_t^{g*})^\phi (\mathcal{L}_t^*)^{1-\phi}$, where $\mathcal{L}_t^* = \left[(1-\chi) (L_t^{a*})^{\frac{\tau-1}{\tau}} + \chi (L_t^{c*})^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau}{\tau-1}}$.

and for the loan officers hired in autonomy by the local affiliate

$$\begin{aligned}
[\partial L_t^a] : \quad & -\lambda_t^g W_t^{L,g} + \mu_t^g \xi (1-\eta)(1-\phi) \left[(1-\chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \\
& \times (1-\chi) (L_t^a)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi = 0.
\end{aligned} \tag{27}$$

Observe (25). Acquiring firm shares tightens the current resources constraint (λ_t^g) of the global affiliate, but relaxes its current capital constraint (μ_t^g) and future resource constraint (λ_{t+1}^g). The relaxation of the current capital constraint depends on the intensity of monitoring performed by loan officers employed at the affiliate. Consider next (27). From the perspective of the affiliate, hiring more loan officers tightens its current resource constraint (λ_t^g) but relaxes its capital constraint (μ_t^g). The latter effect depends on the productivity of loan officers hired by the affiliate ($1-\chi$) and on the degree of consolidation between affiliate and parent ($1-\eta$).

Global parents. The parent bank in the foreign country solves a problem similar to that of the affiliate, taking as given the transfer (intra-group loan or equity injection) Z_t^{g*} and the level of monitoring L_t^{g*} , which are decided at the conglomerate level. Given the similarity with the affiliate’s problem, we present the parent’s optimizing conditions in Appendix A.

3.2.4 Management of liquidity and monitoring in global bank conglomerates

Global banks can operate liquidity transfers between the parent and the affiliate through internal capital markets, subject to implementation costs. These transfers are decided at the conglomerate level. In addition to managing liquidity through internal capital markets, global banks can also manage monitoring resources. In particular, they can exert partial control over the monitoring activities of their affiliates by being involved in the hiring of loan officers.

To better understand the comparison of our economy with alternative economies later in the analysis, it is useful to think of intra-group transfers as comprising two components. One component has “no strings attached”, that is, it does not entail any control of the conglomerate over the monitoring decisions of the affiliate or the parent. The second component, instead, has “strings attached”, as it serves to finance the wage bill of loan officers hired by the banking

conglomerate in the host country or the foreign country. Formally,

$$Z_t^g = Z_t^g + W_t^{L,g} L_t^c, \quad (28)$$

$$Z_t^{g*} = Z_t^{g*} + W_t^{L,g,*} L_t^{c*}, \quad (29)$$

where Z_t^g denotes the total intra-group transfer, Z_t^g is the “no strings attached” component of the transfer, and $W_t^{L,g} L_t^c$ is the wage bill of the host-country loan officers hired by the conglomerate (recall that the affiliate also hires L_t^a in autonomy).

The conglomerate thus decides the intra-group transfer (Z_t^g and Z_t^{g*}), the affiliate’s loan officers L_t^c to hire in the host country, and the parent’s loan officers L_t^{c*} to hire in the foreign country solving the following optimization problem:

$$\max_{Z_t^g, Z_t^{g*}, L_t^c, L_t^{c*}} V_t^g + V_t^{g*} \quad (30)$$

$$\text{s.t.} \quad \underbrace{(Z_t^g + W_t^{L,g} L_t^c)}_{Z_t^g} + \underbrace{(Z_t^{g*} + W_t^{L,g,*} L_t^{c*})}_{Z_t^{g*}} + \frac{\psi_1}{2} (Z_t^{g*} - \bar{Z}^{g*})^2 + \frac{\psi_2}{2} (W_t^{L,g} L_t^c - \bar{W}^{L,g} \bar{L}^c)^2 = 0. \quad (31)$$

Intra-group transfers between the parent and the affiliate incur quadratic implementation costs as in the resource constraint, where \bar{Z}^{g*} is the steady state value of the intra-group no strings attached transfers, and $\bar{W}^{L,g} \bar{L}^c$ is the steady state value of the strings attached transfers. The parameters ψ_1 and ψ_2 govern the size of the costs for making intra-group no strings attached transfers and strings attached transfers, as determined by the degree of centralization of liquidity and monitoring resources within the conglomerate, for instance.³¹

The FOC for the no strings attached transfers equalizes their marginal values at the parent $\left(\frac{\partial V_t^{g*}}{\partial Z_t^{g*}}\right)$ and the affiliate $\left(\frac{\partial V_t^g}{\partial Z_t^g}\right)$, adjusted for the implementation cost. For the affiliate,

$$\frac{\partial V_t^g}{\partial Z_t^g} = \lambda_t^g - \theta R_t^D \mu_t^g - \theta E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) R_t^D. \quad (32)$$

The liquidity transfer relaxes the current resource constraint of the affiliate (λ_t^g), but it tightens its current capital constraint (μ_t^g) and future resource constraint (λ_{t+1}^g). For the parent,

$$\frac{\partial V_t^{g*}}{\partial Z_t^{g*}} = \lambda_t^{g*} - \theta R_t^D \mu_t^{g*} - \theta E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^{g*}) R_t^D. \quad (33)$$

³¹These costs capture any form of resources that banks need to use to arrange, implement and supervise transfers across their conglomerates. They echo the portfolio adjustment costs introduced by a large class of models in international finance.

Using (32) and (33), the conglomerate's optimal choice yields

$$\begin{aligned} & [\lambda_t^g - \theta R_t^D \mu_t^g - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) \theta R_t^D] [1 - \psi_1 (Z_t^{g*} - \bar{Z}^{g*})] \\ & = \lambda_t^{g*} - \theta R_t^D \mu_t^{g*} - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^{g*}) \theta R_t^D. \end{aligned} \quad (34)$$

When choosing the no strings attached transfers, the conglomerate thus takes into account their impact on the resource and capital constraints of parent and affiliate, as well as the implementation cost.

In turn, the first-order condition for the conglomerate's hiring of loan officers at the affiliate level (L_t^c) (and, hence, for the strings attached intra-group transfers) reads

$$\begin{aligned} [\partial L_t^c]: \quad & \xi(1 - \phi) \left[\mu_t^g (1 - \eta) + \mu_t^{g*} \eta \right] \left[(1 - \chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \chi (L_t^c)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi \\ & - \theta \mu_t^g R_t^D W_t^{L,g} - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) \theta R_t^D W_t^{L,g} \\ & = W_t^{L,g} \left[1 + \psi_2 \left(W_t^{L,g} L_t^c - \bar{W}^{L,g} \bar{L}^c \right) \right] \left[\lambda_t^g - \theta R_t^D \mu_t^g - \theta E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) R_t^D \right]. \end{aligned} \quad (35)$$

Hiring loan officers in the host economy relaxes both the affiliate's capital constraint (μ_t^g) and the parent's capital constraint (μ_t^{g*}), due to the consolidation of balance sheets across the conglomerate. However, it entails resource and implementation costs, as suggested by the right-hand-side of (35). We will come back to the interaction mechanisms between liquidity management in internal capital markets and the control of monitoring resources by global banks.

3.3 Market clearing

The market clearing conditions of the labor market and deposit market of the host economy are already embedded in the definition of the corresponding variables. In the loan market

$$K_t = X_t + X_t^g. \quad (36)$$

That is, the total firm shares held by local banks and global banks' affiliates must equal the total capital stock of firms. Analogous conditions hold in the foreign economy. In equilibrium the global social resource constraint will also hold.

4 Calibration and Preview of Mechanisms

This section provides details on the calibration and previews key mechanisms of the model.

4.1 Calibration

We solve the model numerically by linearly approximating it around the non-stochastic steady state. In the baseline calibration, we posit symmetric countries and calibrate the model parameters to data moments from a broad set of economies in our sample.³² Parameters are shown in Table 4. In total there are 19 parameters to calibrate, seven referring to the household sector, three to the firm sector, and the remaining nine to the banking sector.

Parameters regarding the representative households and representative firms are set to standard values in the literature. For households, we posit a GHH utility function

$$U_t = \frac{\left(C_t - hC_{t-1} - v_H \frac{H_t^{1+\varphi}}{1+\varphi} - v_L \frac{L_t^{1+\gamma}}{1+\gamma} - v_{L,g} \frac{L_t^{g^{1+\gamma}}}{1+\gamma} \right)^{1-\sigma_c} - 1}{1 - \sigma_c}, \quad (37)$$

where h denotes external consumption habits. φ and γ are the inverse of the Frisch elasticity for workers employed in final good production and as loan officers, respectively; v_H and v_L ($v_{L,g}$) govern the labor disutility in the final good sector and at local (global) banks, respectively. The household discount factor β is set to 0.99, and the Frisch elasticity of labor supply for producing final goods and for monitoring at both types of banks is set to 1. This choice is in line with the recommendation of [Chetty et al. \(2011\)](#) and is appropriate for our model since it does not distinguish between the intensive and extensive margins of employment. Households' habit in consumption h is set to 0.5, in line with a broad class of macroeconomic models. As for the final good producing firms, the effective share and depreciation rate of capital are set to the standard values of $\alpha = 0.33$ and $\delta = 0.025$, respectively. These imply a labor share of 67% and an annual capital depreciation rate of 10%. The inverse elasticity of investment to the price of capital in steady state is set to 1.73, in line with [Gertler and Karadi \(2011\)](#).

For the banking sector, we fix three parameters to values borrowed from the literature or directly calculated from external data: η , the parameter that governs the consolidation of global banks' balance sheets; θ , the weight of transfers in the bank capital constraint; and σ , the

³²Later in the paper, in Section 5.4, we will consider the case of two asymmetric countries and calibrate the host economy specifically to Hungary.

bankers' survival rate. Typically branches are consolidated and subsidiaries are not. We then set η to 0.1 in the baseline calibration, reflecting the share of foreign-bank assets accounted for by branches, as documented by [Allen et al. \(2013\)](#) for a large set of advanced and middle-income countries. θ is determined by market and regulatory requirements and by the composition of flows in internal capital markets. In line with other studies on the composition of such flows, [Allen et al. \(2013\)](#) report that in 2007–2009 for UniCredit and Citigroup, banks with large global networks of affiliates, the flows between foreign affiliates and parent banks consisted for 60% of intra-group loans and other non-equity flows.³³ We set θ to 0.6. In line with [Gertler and Karadi \(2011\)](#), we set bankers' survival rate σ to 0.9.

We next calibrate six banking sector parameters to fit data moments: the proportional transfer to entering bankers ς ; the pledgeability of local bank loans ξ^L ; the productivity weight on locally-hired loan officers χ ; the pledgeability of global bank loans ξ ; the parameter ϕ in banks' due diligence function; and the elasticity of substitution between locally-hired loan officers and loan officers hired by banking conglomerates τ . To this end, we match six targets, predominantly based on the data in our sample. The global bank annual loan interest rate spread is set to 3%, in the ballpark of what is documented by studies on foreign bank lending. Global banks' leverage ratio is set to 7, as implied by our sample of global bank affiliates. The ratio of global banks' wage bill for loan officers over bank assets is set to 1.45%, in line with the annual expenses on salaries and employee benefits over assets of foreign banks observed in the balance sheet data of our sample (and consistent also with banks' reports for the euro area). We target a ratio of global bank loans over total bank loans close to 25%, which is around the average global banks' loan ratio observed in our sample of countries. Accounting for this, and targeting a labor intensity (loan officers over assets) at local banks analogous to the labor intensity at global banks' affiliates, we set the monitoring (loan officers) at local banks over total monitoring $L/(L^g + L)$ to 0.7. Finally, our last target is the ratio of loan officers hired by banking conglomerates over loan officers hired by affiliates (L^c/L^a). In our data, approximately 85% of local affiliates declare an involvement of parent offices in the hiring and training of their loan officers. However, as noted, only the hiring of a fraction of loan officers at an affiliate will

³³Our data do not provide details on the relative share of intra-group loans and equity flows. However, consistent with the calibrated value of θ , in our data the frequency with which parent banks support affiliates through loans is roughly 25% larger than the frequency with which parents decide not to repatriate dividends from affiliates (a primary form of equity injection into affiliates).

eventually be influenced directly by parent offices. Our calibration implies that slightly more than 50% of loan officers at an affiliate is ultimately selected by parent offices.³⁴

4.2 A preview of key mechanisms

Inspection of banks' decisions reveals the key trade-offs that we expect to shape banks' response to aggregate shocks and, hence, the transmission of shocks to the macroeconomy.

Monitoring. Consider first the monitoring decision (hiring of loan officers at the affiliate level) made by global banking conglomerates (35), reported again here for convenience

$$\begin{aligned}
[\partial L_t^c]: \quad & \xi(1-\phi) \left[\mu_t^g(1-\eta) + \mu_t^{g*} \eta \right] \left[(1-\chi)(L_t^a)^{\frac{\tau-1}{\tau}} + \chi(L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \chi(L_t^c)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi \\
& - \theta \mu_t^g R_t^D W_t^{L,g} - E_t \Lambda_{t,t+1}^* (1-\sigma + \sigma \lambda_{t+1}^g) \theta R_t^D W_t^{L,g} \\
& = W_t^{L,g} \left[1 + \psi_2 \left(W_t^{L,g} L_t^c - \bar{W}^{L,g} \bar{L}^c \right) \right] \left[\lambda_t^g - \theta R_t^D \mu_t^g - \theta E_t \Lambda_{t,t+1}^* (1-\sigma + \sigma \lambda_{t+1}^g) R_t^D \right].
\end{aligned} \tag{38}$$

For illustrative purposes, we also report its simplified version when $\psi_1 = \psi_2 = 0$:

$$\begin{aligned}
& \xi(1-\phi) \left[\mu_t^g(1-\eta) + \mu_t^{g*} \eta \right] \left[(1-\chi)(L_t^a)^{\frac{\tau-1}{\tau}} + \chi(L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \chi(L_t^c)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi \\
& = W_t^{L,g} \lambda_t^g.
\end{aligned} \tag{39}$$

The monitoring decision of global banking conglomerates is primarily driven by the tightness of the capital constraint in the host country and, through consolidation, in the foreign country, as captured by the Lagrange multipliers μ_t^g and μ_t^{g*} . Bank monitoring, in fact, enhances the pledgeability of banks' assets and allows to relax banks' capital constraint. Thus, the incentive to monitor is larger, the tighter the constraint. The monitoring decision is also governed by the value (quality) of bank loan portfolios, as captured by $Q_t X_t^g$. The larger this value, the higher the marginal productivity of bank monitoring and, hence, the incentive to monitor.

The monitoring decision of global banking conglomerates is also directly affected by their structural characteristics: the degree of centralization of monitoring resources (as reflected in the cost ψ_2 of making strings attached transfers for hiring monitoring loan officers in the host country), the efficiency of affiliates relative to conglomerate headquarters (χ), and the degree of

³⁴In Appendix C, we conduct several robustness and sensitivity exercises on the baseline calibration. We examine the informativeness of the calibrated banking parameters. Moreover, we show that the insights of the analysis remain unchanged when altering the parameters around the preferred values.

consolidation of conglomerates' balance sheets (η). Consider first the influence of the degree of centralization of monitoring resources, as captured (inversely) by the cost ψ_2 of making strings attached transfers. The higher such centralization (that is, the lower ψ_2 is), the stronger the incentive to monitor. The relative efficiency of conglomerate headquarters also shapes directly the monitoring incentives at the affiliate level: the higher the value of χ , the larger the incentive of a conglomerate to hire loan officers at affiliate offices. Finally, consider the role of balance sheet consolidation. When the conglomerate of a global bank makes decisions about loan monitoring at the affiliate level (choosing L_t^c), it takes into account the effect that loan officers have also on the pledgeability of loans for foreign lending, in the parent offices, while it takes correspondingly less into account the pledgeability of loans in the host country.

Liquidity. Internal capital markets allow global banks to make no strings attached transfers. The choice of such transfers is governed by equation (34), reported again here for convenience:

$$\begin{aligned} & [\lambda_t^g - \theta R_t^D \mu_t^g - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) \theta R_t^D] \left[1 - \psi_1 \left(Z_t^{g*} - \bar{Z}^{g*} \right) \right] \\ & = \lambda_t^{g*} - \theta R_t^D \mu_t^{g*} - E_t \Lambda_{t,t+1}^* \left(1 - \sigma + \sigma \lambda_{t+1}^{g*} \right) \theta R_t^D. \end{aligned} \quad (40)$$

The usage of internal capital markets is easier, the lower is the cost ψ_1 . The provision of transfers affects the availability of liquidity for global bank affiliates. Crucially, it also has implications for monitoring activities: the provision of no strings attached liquidity (Z_t^g) can dilute the monitoring incentive of affiliates by making liquidity constraints less tight. Recall, from the FOC of loan officers L^c in (35), that the incentive to monitor is related to the tightness of the capital constraint, as captured by μ_t^g . To the extent that cheap intra-group transfers replace more costly retail deposits, the tightness of the capital constraint will be reduced too, diluting the incentive to perform loan monitoring.

5 Model Analysis

We investigate the response of the economy to financial and real shocks. In particular, we consider shocks originating in the banking sector that erode banks' net worth (nw); shocks that reduce the quality of firms' investments (capital quality) (κ); and shocks to firms' productivity (A). To gain insights into the mechanisms, we compare our economy with two alternative economies. The first comparison economy is a "decentralized monitoring" economy, in which

global banks can implement the no strings attached liquidity transfers, but cannot influence the hiring of loan officers by their affiliates. Formally, in this first comparison economy we posit an infinitely high cost ψ_2 for implementing strings attached transfers. The second comparison economy is a “decentralized liquidity” economy, in which global banks can influence the hiring of loan officers by their affiliates and implement strings attached transfers to finance the associated wage bill, but cannot implement no strings attached liquidity transfers. In this second comparison economy, we posit an infinitely high cost ψ_1 for implementing no strings attached transfers. In the baseline economy, both ψ_1 and ψ_2 are set at a very small number, capturing a scenario with relatively centralized liquidity and monitoring ($\psi_1 = \psi_2 = 0.1$).³⁵

After studying the influence of monitoring centralization and liquidity centralization, we revisit their influence in a scenario in which loan officers hired centrally by global bank conglomerates have significantly lower productivity than those hired by affiliates ($\chi = 0.1$). We also consider a scenario in which there is no consolidation of global banks’ balance sheets ($\eta = 0$). Table 5 provides an overview of the results.

5.1 Bank net worth shocks

We first study the impact of shocks originating in the financial sector that erode banks’ net worth. These can especially capture drops in banks’ capitalization due to crises in asset markets in which banks have significant involvement, such as markets for sovereign debt and for real estate related securities. They can also capture drops in banks’ capitalization due to the siphoning off of resources from local banks induced by political interference and bank managers’ misbehavior. Thus, these shocks are the closest to the kind of financial shocks considered in the empirical analysis (and also described in Appendix B). As we illustrate below, the results suggest that the stabilizing or propagating effects of global banks are heavily influenced by the functioning of internal capital markets (liquidity centralization) and by the loan monitoring control exerted by parent offices vis-à-vis their affiliates (monitoring centralization). That is, not only the presence but also the organizational structure of global banks matter.

Following a negative shock to the net worth of both local banks and global banks’ affiliates, in spite of the reduction of their net worth, global banks expand countercyclically their

³⁵In Appendix C, we also compare our baseline economy with an economy where effectively all banks operate locally.

lending to firms in the host economy, unlike local banks which instead contract their loans. This countercyclical, and potentially stabilizing, lending behavior reflects the countercyclical behavior of global banks' loan monitoring intensity, financed by substantial liquidity support (strings attached transfers) from parent offices.

Figure 1 displays the impulse responses following a 1% negative shock to the net worth of local banks in the host country (solid black lines).³⁶ Observe that, in spite of the shock hitting directly only local banks, net worth drops both at local banks and global banks' affiliates, as a result of the endogenous fall of investment returns and, hence, of asset prices (Q_t) in the host economy. This erodes the loan portfolio values of both types of banks, shrinking their net worth.³⁷ Following the shock, global banks' parent offices transfer liquidity to their affiliates in the host economy, both in the form of strings attached transfers ($W_t^{L,g} L_t^c$) and of no strings attached transfers (Z_t^g). As suggested by the fourth row of Figure 1, the increase in no strings attached transfers stems from the stronger tightening of liquidity constraints in the host economy, as captured by the larger increase of the Lagrangian multiplier associated with banks' resource constraint in the host country (λ_t^g), relative to the increase of the same multiplier in the foreign country (λ_t^{g*}). On the other hand, the increase of strings attached transfers reflects the rise of conglomerates' hiring of monitoring loan officers (L_t^c) at the affiliate level, which is primarily driven by the tightening of the capital constraint in the host economy (observe the increase of the Lagrangian multiplier μ_t^g).³⁸

Due also to the complementarity between loan officers hired by conglomerates and those autonomously hired by affiliates, the loan monitoring of global bank affiliates (\mathcal{L}_t) rises sub-

³⁶For all shocks, we set the persistence to 0.7. In all figures, impulse responses are percentage deviations from the steady state; responses of no string attached transfers (Z^g) and total transfers (Z^g) are scaled by steady-state deposits of the affiliates.

³⁷The results are robust to allowing the shock to also influence directly the net worth of global bank affiliates. The specification of the shock can capture the significant heterogeneity between the sectorial exposures of local and global banks. Local banks tend to focus on non-tradeable industries (e.g., real estate). They also hold significant amounts of domestic sovereign debt. Using data from the IMF Sovereign Debt Investor Base, we obtained that for the median (average) country in our empirical sample for which data are available the share of sovereign debt held by domestic banks is three times (twice) larger than the share of foreign banks, ranging from 1.4 times for Slovenia to more than 10 times for Estonia. And data from Altavilla et al. (2017) reveal that for several countries, domestic sovereign bonds account for roughly 10% of the portfolio of domestic banks. These features can disproportionately expose local banks to shocks to non-tradeable industries and to sovereign bond values. In several countries, local banks also engage in an intense support of government-controlled businesses, providing subsidized finance at reduced costs, and are subject to political interference. In Appendix B, we review several cases in which this exposed local banks to shocks, including the siphoning off of resources. In addition, as discussed in Appendix B, in the countries in our sample local banks are often vulnerable to currency shocks, while global banks can frequently hedge against such shocks.

³⁸The capital constraint also tightens in the foreign country. Under partial balance sheet consolidation this also incentivizes global banks' monitoring in the host economy. We will return to this point below.

stantially in the host country overall, facilitated by the expansion of strings attached transfers. As a result of the substantial boost to loan monitoring and of the inflow of transfers from parent offices, global bank affiliates can increase their loan supply in a countercyclical fashion. Conversely, while expanding somewhat their loan monitoring and deposit gathering, local banks shrink their credit supply.³⁹

In the aggregate, overall credit in the host economy shrinks, indicating that the countercyclical response of global banks' loans only partially offsets the credit crunch of local banks. Investment (I_t), capital accumulation (K_t), and production (Y_t) drop, as shown in Figure 2. However, the countercyclical lending response of global banks helps to mitigate this contraction. In what follows, we investigate how the organizational structure of global banks shapes the above effects.

5.1.1 Global banks' centralization

We consider two dimensions of global banks' centralization. The first ("liquidity centralization") relates to (the lack of) frictions in global banks' internal capital markets, as reflected in the ψ_1 cost of making no strings attached liquidity transfers within banking conglomerates. The second ("monitoring centralization") relates instead to the ability of global banks to implement strings attached transfers within their global conglomerates, and, hence, to affect the hiring of monitoring labor in host-country affiliates. We capture this through the cost ψ_2 associated with the payment of host country loan officers' wage bill by banking conglomerates.

To examine the implications of centralization, Figure 1 compares the impulse responses following a negative bank net worth shock in our baseline economy and in the two alternative settings: an economy lacking liquidity centralization ($\psi_1 = \infty$, dashed blue lines) and an economy lacking monitoring centralization ($\psi_2 = \infty$, dashed-dotted red lines).

Monitoring centralization. The centralization of monitoring triggers a stronger intervention of banking conglomerates, in terms of larger strings attached transfers and a more pronounced countercyclical response of loan monitoring by affiliates in the host country (compare the response of L^c in our baseline economy to the alternative economy with $\psi_2 = \infty$). As a result of the larger influx of strings attached liquidity, and of the sharper countercyclical boost

³⁹Local banks also raise their loan monitoring to relax their capital constraint. Both global bank affiliates and local banks also increase their deposit taking.

to monitoring, the response of global bank loans is countercyclical in our baseline setting with monitoring centralization, while it is procyclical in the alternative setting with decentralized monitoring.

More specifically, as Figure 1 shows, there are almost no differences in the net worth responses of local and global banks between the two settings. But in the baseline, the overall hiring of loan officers by global bank affiliates (\mathcal{L}_t) rises significantly more than in the alternative setting (where, nonetheless, loan monitoring slightly rises, driven by the autonomous hiring decisions of local affiliates). Interestingly, the overall liquidity transfers (Z_t^g) behave similarly in the two settings: indeed, in the alternative economy, the global bank conglomerate reshuffles liquidity transfers from the strings attached type to the (much less costly) no strings attached type. As shown in the figure, global bank loans in the host economy increase countercyclically in our baseline setting, while, when $\psi_2 = \infty$, they instead drop. The much stronger loan monitoring response appears to be a key driver of the countercyclicity of global bank loans under monitoring centralization.

Liquidity centralization. Liquidity centralization has quite different consequences for the transmission of bank net worth shocks (compare the baseline economy with the $\psi_1 = \infty$ alternative setting in Figure 1). Under liquidity centralization, we observe a larger inflow of no strings attached transfers (Z_t^g) than in the alternative setting but, remarkably, a less countercyclical response of the hiring of loan monitoring officers by parent banks (L_t^c). Intuitively, the inflow of liquid funds from the conglomerates mitigates the tightening of the resource and capital constraints of affiliates, as revealed by the smaller increase of the multipliers λ_t^g and μ_t^g . This dilutes global banks' incentive to boost monitoring in the host economy. The overall influence of liquidity centralization on the behavior of global bank loans (X_t^g) is thus ambiguous a priori: there is a smaller increase in loan monitoring and hence in the pledgeability of affiliates' loan portfolio assets, but also more liquidity support. As shown in Figure 1, on balance, liquidity centralization contributes to the countercyclicity of global bank loans. Indeed, while increasing in our baseline economy, global bank loans decline in the setting with $\psi_1 = \infty$.

On the other hand, as revealed by the figure, the gap in global banks' loan response between the baseline economy and the economy with decentralized liquidity is smaller than the gap between the baseline and the decentralized monitoring economy. This points to a more

pronounced influence of monitoring centralization on global bank loans' countercyclicality following bank net worth shocks relative to the influence of liquidity centralization (see Table 5, Panel A, for a summary).

Macroeconomic implications. The countercyclical lending of global banks can help supplant the drop in local bank lending.⁴⁰ Figure 2 shows that both in the case of liquidity and monitoring centralization, the overall macroeconomic effects are beneficial to the host economy, in terms of stabilization of capital accumulation and output. In fact, as shown in the figure, under both types of global banks' centralization the host economy suffers a smaller drop in investment, capital, and production.

5.1.2 Centralization and other characteristics of global banks

Global banks' skills and centralization: A case of complementarity. The impact of global banks' centralization of monitoring and liquidity may differ depending on the distribution of monitoring skills between the parent bank and the affiliate offices. Figure 3a reassesses centralization under different values of the parameter χ .⁴¹ In particular, the figure displays differences in the impulse responses between the baseline economy and the above two comparison economies ($\psi_1 = \infty$ and $\psi_2 = \infty$) following a bank net worth shock separately for the baseline scenario ($\chi = 0.5$; dashed red line) and for a scenario in which loan officers hired by conglomerates are significantly less skilled in monitoring than those hired by affiliates ($\chi = 0.1$; solid blue line). When managing loan officers in the host country, conglomerates may in fact have worse local knowledge than affiliates, and hence the monitoring of the loan officers they control could be less effective than that of the loan officers hired by affiliates.⁴²

When comparing the baseline and the $\psi_2 = \infty$ economy, Figure 3a clearly shows that the countercyclical lending behavior of global banks under monitoring centralization is especially pronounced when, as in the baseline calibration, global banks' conglomerates have relative large efficiency in hiring loan officers. In particular, in the baseline economy global banks make

⁴⁰Due to the competition from global banks in the deposit and loan markets, local banks can suffer from some crowding out by global banks, besides suffering from the direct effect of the net worth shock. More specifically, rising deposit rates and lower loan returns can depress their credit supply.

⁴¹In the figures presented in this section, we focus on the impulse responses of selected variables. The full sets of impulse responses are displayed in Appendix Figures C1-C4.

⁴²For instance, a conglomerate could have a limited understanding of the local market for bank managers and officers, and hence end up hiring less suitable loan officers.

more transfers to their affiliates (especially strings attached transfers), and their monitoring (L_t^c) and loans (X_t^g) increase by more. One intuition is that the intervention of parent offices is expected to have a larger beneficial impact on the pledgeability of loans when χ is higher.

Figure 3b shows how the effects of liquidity centralization (difference between the baseline and the $\psi_1 = \infty$ economy) depend on χ . For a higher χ (indicating a relatively high efficiency of global conglomerates in hiring loan officers), the difference in the overall liquidity transfers Z_t^g between the baseline and the $\psi_1 = \infty$ comparison setting is larger. This is especially driven by more inflows of no strings attached transfers. These liquidity inflows lead to even greater “laziness” of conglomerate banks in performing loan monitoring relative to the case with heterogeneous monitoring skills (lower χ). On the other hand, due to the boost to liquidity inflows, the greater countercyclicality of global bank lending X_t^g becomes more pronounced.

In conclusion, though for different reasons, the stabilizing role of both monitoring and liquidity centralization is more accentuated when global banks feature a more homogeneous distribution of skills between parent and affiliates. We can refer to this as a complementarity between global banks’ centralization and the sophistication of their monitoring skills.

Global banks’ consolidation and centralization: A case of substitutability. We next study how the degree of balance sheet consolidation of global banks influences the effects of monitoring or liquidity centralization. This amounts to studying how the effects of ψ_1 and ψ_2 on the responses of the host economy depend on the value of η , with a lower η implying less balance sheet consolidation. To grasp the forces at work, it is useful to compare the monitoring decisions (loan officer hiring) of a global bank headquarter (L_t^c) and of its affiliate (L_t^a):

$$\begin{aligned} \left(\frac{L_t^c}{L_t^a}\right)^{-\frac{1}{\tau}} &= \underbrace{\frac{\lambda_t^g + \psi_2 \left(W_t^{L,g} L_t^c - \bar{W}^{L,g} \bar{L}^c\right) \left[\lambda_t^g - \theta R_t^D \mu_t^g - \theta E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) R_t^D\right]}{\lambda_t^g}}_{\text{Cost of Liquidity}} \\ &\times \underbrace{\frac{1 - \chi}{\chi}}_{\text{Efficiency}} \underbrace{\frac{\mu_t^g (1 - \eta)}{\mu_t^g (1 - \eta) + \mu_t^{g*} \eta}}_{\text{Externality}} \end{aligned} \quad (41)$$

When the implementation cost $\psi_2 = 0$, this ratio reduces to

$$\left(\frac{L_t^c}{L_t^a}\right)^{-\frac{1}{\tau}} = \frac{1 - \chi}{\chi} \underbrace{\frac{\mu_t^g (1 - \eta)}{\mu_t^g (1 - \eta) + \mu_t^{g*} \eta}}_{\text{Externality}}. \quad (42)$$

As equation (42) shows, the larger is the degree of consolidation, and hence the larger the external effects of due diligence, the higher will be L_t^c relative to L_t^a . In fact, headquarter offices internalize a large effect of their monitoring on the conglomerate. This is especially true when the capital constraint on parent banks is tighter (μ_t^{g*} is higher).

Figures 4a-4b show that the effects of global bank centralization (low ψ_1 or ψ_2) are more pronounced when global banks' balance sheets are not consolidated ($\eta = 0$). This is for two reasons. First, under consolidation, global banks consider conditions in the foreign country when hiring loan officers for the host country affiliates. To the extent that conditions in the foreign country worsen less than in the host country after the bank net worth shock, this dilutes global banks' incentive to step up monitoring in the host economy. Second, when balance sheets are more consolidated, the response of loans in the host economy tends to be weaker. This, in turn, weakens the monitoring and liquidity transfer response of global conglomerates.

In a nutshell, when η is high (more consolidation), parent banks put a smaller weight on the contracting host economy and a larger weight on the foreign economy (which is contracting less, as revealed also by the multiplier μ_t^{g*} in the foreign country shooting up significantly less than μ_t^g). Our results therefore point to a substitutability between global banks' centralization and balance sheet consolidation in driving their countercyclical lending in the host country.

5.2 Capital quality shocks

The above analysis points to an overall stabilizing influence of global banks following shocks to banks' net worth. Such a stabilizing influence is more pronounced when global banks centralize monitoring resources and, to a lesser extent, liquid resources. This is especially the case when monitoring skills are more homogeneous within banking conglomerates and when balance sheet consolidation is lower.

The influence of global banks and of their organizational structure is more nuanced following negative capital quality shocks in the host country. Such shocks can capture deteriorations in the quality of firms' investments that result into deteriorations in the quality of banks' loan portfolios (in the form of spikes in non-performing loans and loan defaults). Portfolio returns and portfolio quality effects play a large role in shaping the transmission of such shocks. In the aftermath of negative capital quality shocks, the centralization of global banks' monitoring is less relevant, and possibly less beneficial, relative to the centralization of liquidity. In fact, in

some circumstances the centralization of monitoring resources can even become destabilizing. Intuitively, a negative capital quality shock hurts the quality of loan portfolios and this can depress global banks' incentive to monitor loans (recall the discussion in Section 4.2). This can be seen in Figure 5, which displays the impulse responses to a 1% negative capital quality shock in the host country. In our baseline economy, while increasing in the immediate aftermath of the shock, global banks' monitoring drops below the initial steady state level after a few periods.⁴³ Accordingly, strings attached liquidity transfers also become negative, driving down total transfers from parents to affiliates. Global bank loans fall too in the host country, thus exhibiting a procyclical behavior, and they only recover once the effects of the shock fade away.

In this scenario global banks can take on a destabilizing role. Interestingly, this occurs especially when these banks deploy a centralized monitoring structure (in Figure 5, compare the impulse responses in the baseline economy with those in the alternative economy with $\psi_2 = \infty$). In fact, we obtain that in the first few periods after the capital quality shock, the temporary increase in monitoring is stronger under monitoring centralization. Yet, in later periods, decentralization (i.e. the alternative economy) is associated with a lesser decline in monitoring. Intuitively, under monitoring centralization, global banks are more sensitive to the drop in investment and loan portfolio quality triggered by the capital quality shock. Their monitoring incentives therefore weaken more. This also implies that, while under a centralized monitoring structure the decline in global bank lending is initially milder, the subsequent recovery of lending is slower than in the alternative economy with decentralized monitoring.

While monitoring centralization now exacerbates the destabilizing influence of global banks, liquidity centralization retains some stabilizing influence (in Figure 5, compare the baseline economy with the alternative economy with $\psi_1 = \infty$). In fact, liquidity centralization of global banks is uniformly associated with a stronger response of their loan monitoring, a larger inflow of transfers and—except in the immediate aftermath of the shock—a countercyclical (rather than procyclical) response of global bank lending. Intuitively, as shown in the figure, when strings attached liquidity transfers are feasible, there is a larger repatriation of liquidity from global bank affiliates to parent offices. Thus, the bank resource and capital constraints in the host country become tighter, enhancing global banks' incentive to monitor. As a result, the

⁴³We computed the average response of global banks' monitoring over the span of the simulation and this turns out to be negative.

economy with liquidity centralization exhibits a less procyclical response of global bank lending.

Overall, centralization has an ambiguous impact on the stability of global bank lending after capital quality shocks: it boosts stability in the case of liquidity centralization but undermines it in the case of monitoring centralization (see Table 5, Panel B, for a summary). Interestingly, these differential effects of monitoring and liquidity centralization contrast with those seen after bank net worth shocks, where monitoring centralization acted as a better stabilizer than liquidity centralization. Nonetheless, as revealed by Figure 6, due to the contrasting forces at work, even in the case of liquidity centralization, the overall benefits for macroeconomic stabilization are clearly more modest than what we observed after shocks to banks' net worth.

5.3 TFP shocks

In Figure 7, we study the effects of a 1% negative shock to firms' total factor productivity. A reduction in TFP directly erodes global banks' incentives to extend loans in the host country. This is captured by a drop in the return to investments R^k . The shock also causes a tightening of affiliates' resource and capital constraints, as indicated by the increase in the Lagrangian multipliers associated with those constraints (though this tightening is less pronounced than following bank net worth shocks). The tightening of affiliates' capital constraint, in turn, incentivizes global banks to increase their loan monitoring, and to finance the additional hiring of loan officers in the host country via strings attached transfers. This tends to boost global banks' lending in the host country. The cyclical behavior of global banks' loans depends on whether the former or the latter effect dominates. In our simulations, as revealed by Figure 7, the rise in bank monitoring moderates, but does not outweigh, the reduced incentive to grant loans. Global banks' lending in the host country consequently falls after a negative TFP shock.

The organizational structure of global banks influences the balance between the above opposite forces (in Figure 7, compare the baseline economy with the alternative economies with $\psi_1 = \infty$ and $\psi_2 = \infty$). We obtain that when global banks exert centralized control over affiliates' monitoring decisions (baseline economy with ψ_2 finite and low), their countercyclical monitoring gains strength relative to the direct impact of lower productivity and loan returns. This leads to a smaller drop in the loans of global bank affiliates following the TFP shock.

In contrast, the influence of liquidity centralization is less clear here. Since the tightening of resource constraints is much less pronounced, the difference between the baseline economy and

the economy with decentralized liquidity is modest. In a sense, while following capital quality shocks, liquidity centralization was more beneficial than monitoring centralization, here, similar to the case of bank net worth shocks, it is monitoring centralization that stabilizes global bank lending most (see Table 5, Panel C, for a summary). In the real sector, as shown in Figure 8, the host economy suffers from a bigger drop in investment, capital, and production in the absence of monitoring or liquidity centralization.

5.4 Global banks' business models and business cycles in Hungary

We quantitatively assess the implications of global banks' business models for the business cycle dynamics of Hungary. This is a country in our empirical sample that has been characterized by a significant presence of multinational banks since its banking reforms of the early 1990s. These have included affiliates of Austrian, French, and Italian banks, among others. To conduct a quantitative assessment, we adapt our calibration to a scenario with two asymmetric countries, treating Hungary as the host economy and the rest of the world as the foreign economy. We here summarize methods and key results, relegating details to Appendix C.

For each of the two countries, the re-calibrated parameters include the transfer to entering bankers ς ; the pledgeability of local bank loans ξ^L and global bank loans ξ ; the productivity weight on locally-hired loan officers χ ; the parameter ϕ in banks' due diligence function; and the elasticity of substitution between locally-hired loan officers and loan officers hired by conglomerates τ . The bottom panel of Table 4 reports the parameter values. Using Hungarian data, we estimated AR(1) processes for the three model shocks (bank net worth, capital quality, and TFP). Additionally, using Bayesian techniques, we estimated the transfer implementation costs for global banks operating in Hungary. The quantitative exercise involved 3,000 stochastic simulations, identifying recession episodes using the [Abiad et al. \(2011\)](#) methodology.

The simulations reveal that global banks' centralization has a stabilizing effect during bank net worth-driven recessions, with smaller average investment declines than in scenarios without monitoring or liquidity centralization. Further, this stabilizing influence of global banks' centralization is somewhat more pronounced in the case of monitoring centralization than in the case of liquidity centralization. The effects are much more nuanced during capital quality-driven recessions, with average investment declines slightly smaller in scenarios without monitoring centralization. This is due to the decline in global banks' monitoring in the baseline economy,

which tends to be muted when monitoring is decentralized.⁴⁴

Some countries, such as Hungary, propose policies aimed at rebalancing the composition of the banking sector between multinational and domestic banks. The quantitative exercise also yields insights into the impact of these policies. To mimic a regulation aimed at rebalancing credit market shares from global to domestic banks, we posit a collateral (capital) requirement on global banks higher than the baseline. The results indicate that such a policy reduces the countercyclicality of global banks' lending and increases the procyclicality of investment during recessions, with stronger effects under decentralized banking structures. In particular, for bank net worth-driven recessions, the average response of global bank loans and investment is significantly more negative in the absence of monitoring or liquidity centralization. A conclusion we draw is that, while in general policymakers put emphasis on banks' credit market shares when designing policies, understanding the effects of regulatory policies on global banks cannot abstract from accounting also for global banks' organizational structures and business models.

6 Conclusion

Global banks constitute complex financial institutions with articulated internal decision processes and organizational structures. We have studied the effects of global banking and global banks' organizational structure on macroeconomic stability. Motivated by micro-level evidence from a large set of multinational banks, we highlight two key dimensions of global banks' structure: their control of monitoring decisions across their affiliates and their management of internal capital markets. The results reveal that more centralized global banks can mitigate the credit market effects of negative financial (bank net worth) shocks by facilitating loan monitoring interventions by global parents and a larger infusion of liquidity across banking conglomerates. This loan stabilizing effect of global banks is especially pronounced when these banks feature a higher degree of sophistication of due diligence skills in host countries. In contrast, we obtain that global banks can be destabilizing following capital quality shocks that impair the quality of firm investments and loan portfolios. Such a destabilizing effect is more pronounced when global banks adopt a centralized business model of tight monitoring control. Liquidity centralization, on the other hand, contributes to mitigating this destabilizing effect.

⁴⁴The patterns in the average TFP-driven recession are closer to those in the average bank net worth-driven recession, though the effects of global banks' business models are generally less pronounced.

The analysis shows, nonetheless, that following capital quality shocks the influence of liquidity and monitoring centralization on the (de)stabilizing behavior of global banks tends to be significantly smaller than their stabilizing influence following bank net worth shocks.

The paper leaves questions open for future research. In the analysis, we have treated the structure of global banks as a given. However, the configuration of internal capital markets and the control of monitoring decisions within global banking conglomerates likely interact with the network formation decisions of these banks. Exploring this interplay could yield important insights into the macroeconomic implications of global banking. We leave these and other related issues to future research.

References

- Abiad, A., Dell’Ariccia, G., and Li, B. (2011). Creditless recoveries. IMF Working Papers 11/58, International Monetary Fund.
- Allen, F., Gu, X., and Kowalewski, O. (2013). Corporate Governance and Intra-Group Transactions in European Bank Holding Companies During the Crisis. In *Global Banking, Financial Markets and Crises*, pages 365–431. Emerald Group Publishing Limited.
- Altavilla, C., Pagano, M., and Simonelli, S. (2017). Bank exposures and sovereign stress transmission. *Review of Finance*, 21(6):2103–2139.
- Ashcraft, A. B. (2008). Are Bank Holding Companies a Source of Strength to Their Banking Subsidiaries? *Journal of Money, Credit and Banking*, 40:273–294.
- Berger, A. N. and Udell, G. F. (2002). Small Business Credit Availability and Relationship Lending: The Importance of Bank Organisational Structure. *Economic Journal*, 112(477):F32–F53.
- BIS (2015). Guidelines for identifying and dealing with weak banks. *Bank for International Settlements, Basel*.
- Bremus, F., Buch, C. M., Russ, K. N., and Schnitzer, M. (2018). Big Banks and Macroeconomic Outcomes: Theory and Cross-Country Evidence of Granularity. *Journal of Money, Credit and Banking*, 50(8):1785–1825.
- Broecker, T. (1990). Credit-Worthiness Tests and Interbank Competition. *Econometrica*, 58(2):429–452.
- Buch, C. M. and Goldberg, L. S. (2015). International Banking and Liquidity Risk Transmission: Lessons from Across Countries. *IMF Economic Review*, 63(3):377–410.
- Buch, C. M. and Goldberg, L. S. (2017). Cross-Border Prudential Policy Spillovers: How Much? How Important? Evidence from the International Banking Research Network. *International Journal of Central Banking*, pages 505–558.
- Buch, C. M., Koch, C. T., and Koetter, M. (2014). Should I stay or should I go? Bank productivity and internationalization decisions. *Journal of Banking & Finance*, 42:266–282.

- Campello, M. (2002). Internal Capital Markets in Financial Conglomerates: Evidence from Small Bank Responses to Monetary Policy. *Journal of Finance*, 57(6):2773–2805.
- Cao, Q., Di Pietro, M., Kokas, S., and Minetti, R. (2022). Liquidity and Discipline. Bank due Diligence Over the Business Cycle. *Journal of the European Economic Association*, 20(5):2136–2180.
- Cao, Q., Minetti, R., Olivero, M. P., and Romanini, G. (2021). Recessions and recoveries: Multinational banks in the business cycle. *Journal of Monetary Economics*, 117:203–219.
- Cerutti, E., Casanova, C., and Pradhan, S. K. (2023). Banking across borders: Are Chinese banks different? *Journal of Banking & Finance*, 154:106920.
- Cerutti, E., Dell’Ariccia, G., and Peria, M. S. M. (2007). How banks go abroad: Branches or subsidiaries? *Journal of Banking & Finance*, 31(6):1669–1692.
- Cetorelli, N. and Goldberg, L. S. (2011). Global Banks and International Shock Transmission: Evidence from the Crisis. *IMF Economic Review*, 59(1):41–76.
- Cetorelli, N. and Goldberg, L. S. (2012a). Banking Globalization and Monetary Transmission. *Journal of Finance*, 67(5):1811–1843.
- Cetorelli, N. and Goldberg, L. S. (2012b). Liquidity Management of US Global Banks: Internal Capital Markets in the Great Recession. *Journal of International Economics*, 88(2):299–311.
- Cetorelli, N. and Goldberg, L. S. (2014). Measures of Global Bank Complexity. *FRRBNY Economic Policy Review*, pages 107–126.
- Cetorelli, N. and Prazad, S. (2024). The Nonbank Footprint of Banks. Staff Reports 1118, Federal Reserve Bank of New York.
- Chava, S. and Purnanandam, A. (2011). The Effect of Banking Crisis on Bank-Dependent Borrowers. *Journal of Financial Economics*, 99(1):116–135.
- Chetty, R., Guren, A., Manoli, D., and Weber, A. (2011). Are Micro and Macro Labor Supply Elasticities Consistent? A Review of Evidence on the Intensive and Extensive Margins. *American Economic Review*, 101(3):471–475.
- Chor, D. and Manova, K. (2012). Off the Cliff and Back? Credit Conditions and International Trade During the Global Financial Crisis. *Journal of International Economics*, 87(1):117–133.
- Claessens, S. (2017). Global Banking: Recent Developments and Insights from Research. *Review of Finance*, 21(4):1513–1555.
- Claessens, S. and Van Horen, N. (2014). Foreign banks: Trends and Impacts. *Journal of Money, Credit, and Banking*, 46(1):295–326.
- Corbae, D. and D’Erasmus, P. (2021). Capital Buffers in a Quantitative Model of Banking Industry Dynamics. *Econometrica*, 89(6):2975–3023.
- Correa, R. and Goldberg, L. S. (2022). Bank Complexity, Governance, and Risk. *Journal of Banking & Finance*, 134:106013.
- Dahl, D., Shrieves, R. E., and Spivey, M. F. (2002). Financing Loan Growth at Banks. *Journal of Financial Services Research*, 22:189–202.
- De Blas, B. and Russ, K. (2013). All banks great, small, and global: Loan pricing and foreign competition. *International Review of Economics & Finance*, 26(C):4–24.
- De Haas, R. and Naaborg, I. (2006). Foreign Banks in Transition Countries: To Whom Do

- They Lend and How Are They Financed? *Financial Markets, Institutions & Instruments*, 15(4):159–199.
- De Haas, R. and Van Horen, N. (2012). International Shock Transmission After the Lehman Brothers Collapse: Evidence from Syndicated Lending. *American Economic Review Papers & Proceedings*, 102(3):231–37.
- De Haas, R. and Van Horen, N. (2013). Running for the Exit? International Bank Lending During a Financial Crisis. *Review of Financial Studies*, 26(1):244–285.
- De Haas, R. and Van Lelyveld, I. (2010). Internal Capital Markets and Lending by Multinational Bank Subsidiaries. *Journal of Financial Intermediation*, 19(1):1–25.
- Dell’Ariccia, G. and Marquez, R. (2006). Lending Booms and Lending Standards. *Journal of Finance*, 61(5):2511–2546.
- Diamond, D. W. (1984). Financial intermediation and delegated monitoring. *The Review of Economic Studies*, 51(3):393–414.
- Diamond, D. W. and Rajan, R. G. (2001). Liquidity risk, liquidity creation, and financial fragility: A theory of banking. *Journal of Political Economy*, 109(2):287–327.
- Drexler, A. and Schoar, A. (2014). Do relationships matter? evidence from loan officer turnover. *Management Science*, 60(11):2722–2736.
- European Investment Bank (2019). *Ten Years of the Vienna Initiative 2009-2019*. European Investment Bank, Luxembourg.
- Fernald, J. (2014). A Quarterly, Utilization-Adjusted Series on Total Factor Productivity. Federal Reserve Bank of San Francisco Working Paper Series.
- Fillat, J. L., Garetto, S., and Corea-Smith, A. V. (2023). Global Banking and the International Transmission of Shocks: A Quantitative Analysis. *Journal of International Economics*, 145:103808.
- Gertler, M. and Karadi, P. (2011). A Model of Unconventional Monetary Policy. *Journal of Monetary Economics*, 58(1):17–34.
- Gertler, M. and Kiyotaki, N. (2010). Financial Intermediation and Credit Policy in Business Cycle Analysis. In *Handbook of Monetary Economics*, volume 3, pages 547–599. Elsevier.
- Goedde-Menke, M. and Ingermann, P.-H. (2024). Loan officer specialization and credit defaults. *Journal of Banking & Finance*, 161:107077.
- Goldberg, L. S. (2023). Global Liquidity: Drivers, Volatility and Toolkits. Staff Reports 1064, Federal Reserve Bank of New York.
- Goodfriend, M. and McCallum, B. T. (2007). Banking and Interest Rates in Monetary Policy Analysis: A Quantitative Exploration. *Journal of Monetary Economics*, 54(5):1480–1507.
- Gorton, G. and Ordoñez, G. (2020). Good Booms, Bad Booms. *Journal of the European Economic Association*, 18(2):618–665.
- Houston, J., James, C., and Marcus, D. (1997). Capital Market Frictions and the Role of Internal Capital Markets in Banking. *Journal of Financial Economics*, 46(2):135–164.
- Kalemli-Ozcan, S., Papaioannou, E., and Perri, F. (2013). Global Banks and Crisis Transmission. *Journal of International Economics*, 89(2):495–510.
- King, T. B. (2008). Discipline and liquidity in the interbank market. *Journal of Money, Credit and Banking*, 40(2-3):295–317.

- Kiyotaki, N. and Moore, J. (1997). Credit cycles. *Journal of Political Economy*, 105(2):211–248.
- Kollmann, R. (2013). Global Banks, Financial shocks, and International Business Cycles: Evidence from an Estimated Model. *Journal of Money, Credit and Banking*, 45(s2):159–195.
- Kollmann, R., Enders, Z., and Müller, G. J. (2011). Global Banking and International Business Cycles. *European Economic Review*, 55(3):407–426.
- Laeven, L. and Valencia, F. (2020). Systemic Banking Crises Database II. *IMF Economic Review*, 68:307–361.
- Luciano, E. and Wihlborg, C. (2018). Financial Synergies and Systemic Risk in the Organization of Bank Affiliates. *Journal of Banking & Finance*, 88:208–224.
- Manove, M., Padilla, A. J., and Pagano, M. (2001). Collateral versus Project Screening: A model of Lazy Banks. *Rand Journal of Economics*, pages 726–744.
- Matten, C. (2000). *Managing Bank Capital: Capital Allocation and Performance Measurement*. Wiley.
- Morelli, J. M., Ottonello, P., and Perez, D. J. (2022). Global Banks and Systemic Debt Crises. *Econometrica*, 90(2):749–798.
- Morgan, D. P., Rime, B., and Strahan, P. E. (2004). Bank Integration and State Business Cycles. *Quarterly Journal of Economics*, 119(4):1555–1584.
- Niepmann, F. (2015). Banking across borders. *Journal of International Economics*, 96(2):244–265.
- Niepmann, F. (2023). Banking Across Borders with Heterogeneous Banks. *Journal of International Economics*, 142:103748.
- Ogura, Y. (2006). Learning from a Rival Bank and Lending Boom. *Journal of Financial Intermediation*, 15(4):535–555.
- Ongena, S., Peydró, J.-L., and Van Horen, N. (2015). Shocks Abroad, Pain at Home? Bank-Firm-Level Evidence on the International Transmission of Financial Shocks. *IMF Economic Review*, 63(4):698–750.
- Paravisini, D., Rappoport, V., Schnabl, P., and Wolfenzon, D. (2015). Dissecting the Effect of Credit Supply on Trade: Evidence from Matched Credit-Export Data. *Review of Economic Studies*, 82(1):333–359.
- Peek, J. and Rosengren, E. S. (2000). Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States. *American Economic Review*, 90(1):30–45.
- Perri, F. and Quadrini, V. (2018). International Recessions. *American Economic Review*, 108:935–984.
- Petersen, M. A. and Rajan, R. G. (1994). The benefits of lending relationships: Evidence from small business data. *Journal of Finance*, 49(1):3–37.
- Popov, A. and Udell, G. F. (2012). Cross-Border Banking, Credit Access, and the Financial Crisis. *Journal of International Economics*, 87(1):147–161.
- Portes, R. (2021). The European Systemic Risk Board in “Crisis Mode”. *Financial Stability Review*, page 39.
- Scharfstein, D. S. and Stein, J. C. (2000). The Dark Side of Internal Capital Markets: Divisional Rent-Seeking and Inefficient Investment. *Journal of Finance*, 55(6):2537–2564.

- Schnabl, P. (2012). The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market. *Journal of Finance*, 67(3):897–932.
- Stein, J. C. (2002). Information Production and Capital Allocation: Decentralized versus Hierarchical Firms. *Journal of Finance*, 57(5):1891–1921.
- Uchida, H., Udell, G. F., and Yamori, N. (2012). Loan Officers and Relationship Lending to SMEs. *Journal of Financial Intermediation*, 21(1):97–122.
- World Bank (2023). *Global Financial Development Database*. World Bank Group, Washington, DC.

Table 1: Summary Statistics

	Mean	Median	SD
<i>Bank financial characteristics</i>			
Annual credit growth	13.61	5.61	51.37
Equity/Total assets (%)	13.65	12.29	6.70
Gross loans/Total customer deposits (%)	635.45	112.10	8656.23
Net Interest Margin	4.52	3.99	2.50
<i>Subsidiary lending behaviour</i>			
SME lending	0.95	1	0.22
Relationship is important (SME)	0.89	1	0.32
<i>Global bank monitoring</i>			
Parent targets credit growth	0.86	1	0.35
Parent targets market share	0.41	0	0.49
Parent important in credit assessment of clients	0.42	0	0.49
No. of calls of subsidiary with parent	11.96	6	16.59
Parent provided monitoring support	0.91	1	0.29
Parent selected managers	0.86	1	0.34
<i>Global bank liquidity</i>			
Parent operates centralized treasury	0.55	1	0.50
Parent important to cover funding shortfall	0.73	1	0.45
Liquidity centralization	0.41	0	0.49
Parent provided liquidity support	0.87	1	0.34
Parent provided capital and/or liquidity	0.70	1	0.46

Note: This table presents summary statistics for the sample of banks interviewed as part of the BEPS survey and matched with bank financials. Financial characteristics refer to 208 subsidiaries. All observations are at the bank level, except *Annual credit growth*, *Equity/Total assets*, *Gross loans/Total customer deposits*, and *Net Interest Margin* which are at the bank-year level. Sections 2.2 and 2.3 provide more details on measurement. Appendix Table B1 contains all variable definitions.

Table 2: Global Banks' Lending, Banks' Organization, and Crises

	Annual Credit Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Any crisis host	58.885*** (19.270)	33.271** (13.006)	8.738 (23.244)	10.348 (18.692)	10.180 (28.190)	-0.745 (21.378)	8.917 (23.196)	8.195 (15.842)
# calls with parent × Any crisis host			3.765** (1.462)	3.792*** (1.180)				
Credit risk assessment of clients × Any crisis host					83.190** (40.930)	61.785** (25.706)		
Liquidity centralization × Any crisis host							69.871** (30.875)	45.428** (19.808)
Any crisis home	-79.012 (67.209)	0.673 (63.855)	-24.181 (58.929)	56.471 (56.961)	18.253 (40.054)	31.359 (29.415)	-11.594 (47.373)	10.815 (37.690)
L. Annual credit growth	-0.031 (0.270)	-0.044 (0.271)	-0.025 (0.172)	0.142 (0.143)	-0.188 (0.203)	-0.108 (0.174)	-0.095 (0.235)	-0.064 (0.211)
Equity/Total assets (%)	0.779 (2.225)	0.031 (2.359)	0.647 (1.261)	1.137 (1.461)	0.593 (1.952)	-0.856 (2.055)	0.943 (2.074)	-0.196 (1.884)
Gross loans/Total customer deposits (%)		0.000 (0.001)		0.000 (0.000)		-0.001 (0.001)		0.000 (0.000)
Net Interest Margin		0.281 (4.717)		-4.216 (3.018)		2.330 (5.049)		1.980 (4.931)
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1452	1433	836	833	1294	1275	1402	1383
Number of banks	205	201	109	109	183	179	199	195

Note: This table presents estimates for the effects of crises on global banks' lending in host countries. The estimator is a two-step difference GMM. The panel refers to the 2007-2017 period. For details on measurement see Section 2.3. For the definitions of all variables, see Appendix Table B1. Standard errors are adjusted for the Windmeijer's finite-sample correction for the two-step covariance matrix. ***, **, *, + denote significance at the 1 percent, 5 percent, 10 and 15 percent level, respectively.

Table 3: Parent Banks' Liquidity and Monitoring Support during Crises

	Liquidity Support			Monitoring Support		
	(1)	(2)	(3)	(4)	(5)	(6)
Any crisis host	0.553*** (0.132)	0.655*** (0.155)	0.520*** (0.134)	0.446+ (0.288)	0.674** (0.324)	0.100 (0.210)
SME lending	0.297* (0.164)			0.225 (0.174)		
Relationship is important (SME)		0.249** (0.106)			0.387* (0.212)	
Liquidity centralization			0.128*** (0.044)			
# of calls with parent above 75th percentile						0.122*** (0.041)
Any crisis home	-0.530 (0.488)	-0.366 (0.507)	-0.489 (0.493)	-1.911** (0.916)	-1.566* (0.808)	-1.862** (0.748)
Annual credit growth (winsorized; 0.01)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.002)	-0.001 (0.002)	-0.002 (0.001)
Equity/Total assets (%)	-0.005 (0.005)	-0.004 (0.004)	-0.002 (0.005)	0.001 (0.008)	0.004 (0.007)	-0.002 (0.004)
Gross loans/Total customer deposits (%)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)	-0.001+ (0.001)	0.000* (0.000)
Net Interest Margin	0.011 (0.009)	0.007 (0.009)	0.002 (0.009)	-0.009 (0.014)	-0.013 (0.014)	-0.000 (0.012)
Constant	0.628*** (0.172)	0.683*** (0.122)	0.873*** (0.074)	1.009*** (0.198)	0.818*** (0.264)	1.108*** (0.107)
R-squared	0.085	0.101	0.079	0.126	0.206	0.115
N	184	184	178	91	91	110

Note: This table presents estimates for the effects of the incidence of crises on global banks' liquidity and monitoring support of affiliates in host countries in columns (1) – (3) and (4) – (6), respectively. Estimates are from cross-sectional OLS regressions. The data is the collapsed panel which constitute averages of all variables between 2007 and 2017. For details on measurement see Section 2.3. For the definitions of all variables, see Appendix Table B1. Robust standard errors are in parenthesis. ***, **, *, + denote significance at the 1 percent, 5 percent, 10 and 15 percent level, respectively.

Table 4: Parameters

Parameter	Description	Baseline (symmetric)	Quantitative Hungary	Exercise Foreign
<i>Fixed Parameters</i>				
Households				
β	Discount factor	0.99		
h	Habits on consumption	0.50		
φ	Inverse of Frisch elasticity in goods production	1.00		
γ	Inverse of Frisch elasticity in due diligence	1.00		
ν_H	Disutility of labor in goods production	1.00		
ν_L	Disutility of labor in due diligence at local banks	0.50		
$\nu_{L,g}$	Disutility of labor in due diligence at global banks	0.50		
Firms				
α	Capital share	0.33		
δ	Capital depreciation rate	0.025		
$I(F''/F')$	Inverse elasticity of investment to capital price in SS	1.73		
Banks				
σ	Survival rate of bankers	0.90		
θ	Fraction of deposit interest rate paid on intra-group loans	0.60		
η	Degree of balance sheet consolidation	0.10		
<i>Fitted Parameters</i>				
Banks				
ς	Proportional transfer to entering bankers	0.01	0.008	0.008
ξ^L	Pledgeability of bank loans (local)	2.85	2.85	2.92
ξ	Pledgeability of bank loans (global)	3.00	3.35	3.00
ϕ	Weight of loans in the recovery value of firm shares	0.70	0.71	0.70
χ	Productivity weight on locally-hired loan officers	0.50	0.65	0.50
τ	Elasticity of substitution between loan officers	0.50	0.60	0.50

Note: All fixed parameters in the quantitative exercise take the same values as those in the baseline case.

Table 5: Effects of Shocks on Global Banks' Behavior (Overview)

	Panel A: Bank net worth crunch				
	Loan monitoring	Transfers		Lending	
		Strings attached	No strings attached	Total	
Overall effect	↑	↑	↑	↑	↑
Monitoring centralization	↑	↑	=	↑	↑
Liquidity centralization	↓	↓	↑	↑	↑
	Panel B: Capital quality drop				
	Loan monitoring	Transfers		Lending	
		Strings attached	No strings attached	Total	
Overall effect	↑↓	↑↓	↑↓	↑↓	↓
Monitoring centralization	↓	↓	=	↓	↓
Liquidity centralization	↑	↑	↑	↑	↑
	Panel C: TFP drop				
	Loan monitoring	Transfers		Lending	
		Strings attached	No strings attached	Total	
Overall effect	↑	↑	↑↓	↑↓	↑↓
Monitoring centralization	↑	↑	=	↑	↑
Liquidity centralization	↓	↓	↑	↑	↑

Note: This table provides an overview of the effects of negative shocks on global banks' behavior and of the influence of global banks' structure on such response. In the "overall effect" rows, "↑" indicates that the variable increases, "↓" indicates that the variable decreases, and "↑↓" indicates an ambiguous response (e.g., an increase on impact but then a decline below the steady state level). In the "monitoring centralization" and "liquidity centralization" rows, "↑" indicates that the variable increases more (or decreases less), "↓" indicates that the variable decreases more (or increases less), and "↑↓" indicates an ambiguous or negligible influence of centralization.

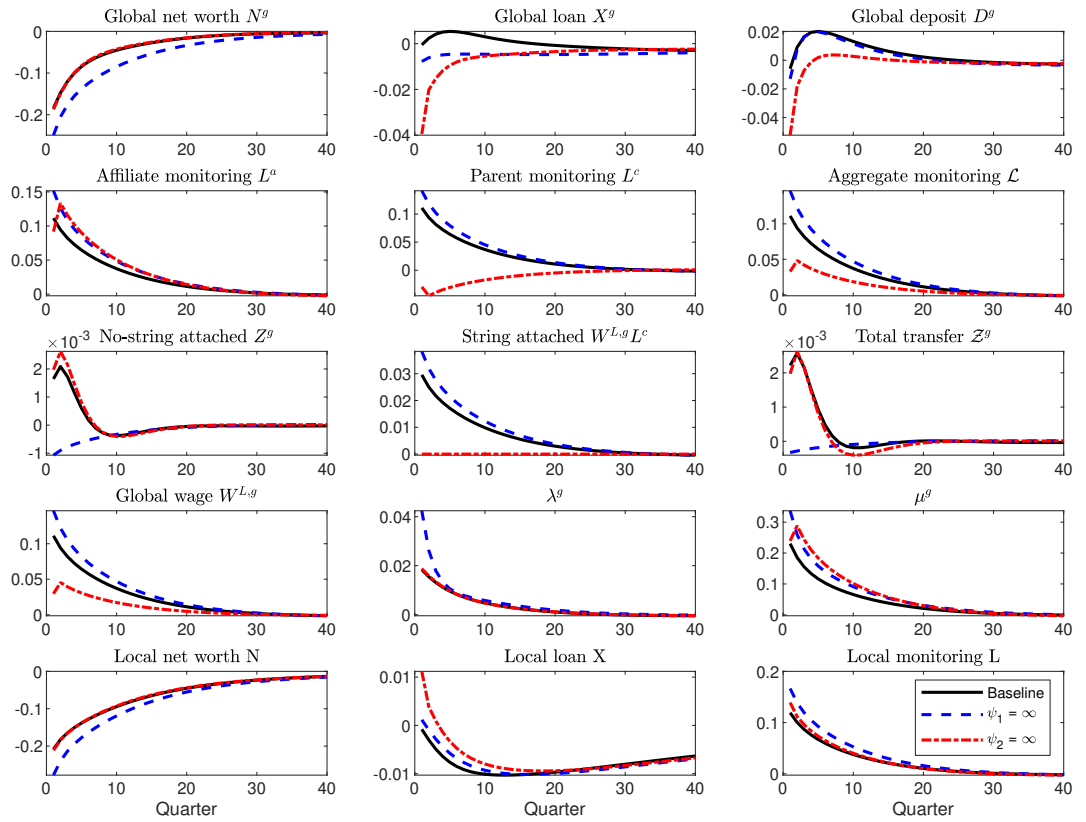


Figure 1: Responses to negative net worth shock in host country: banking variables.

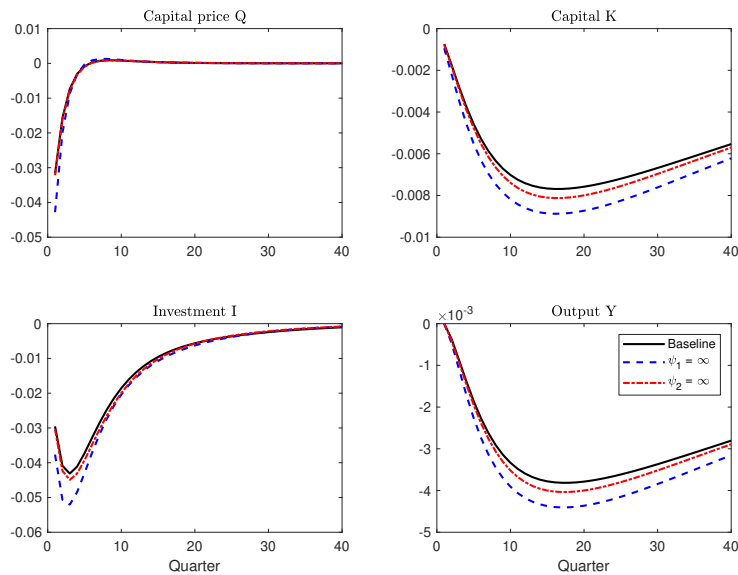
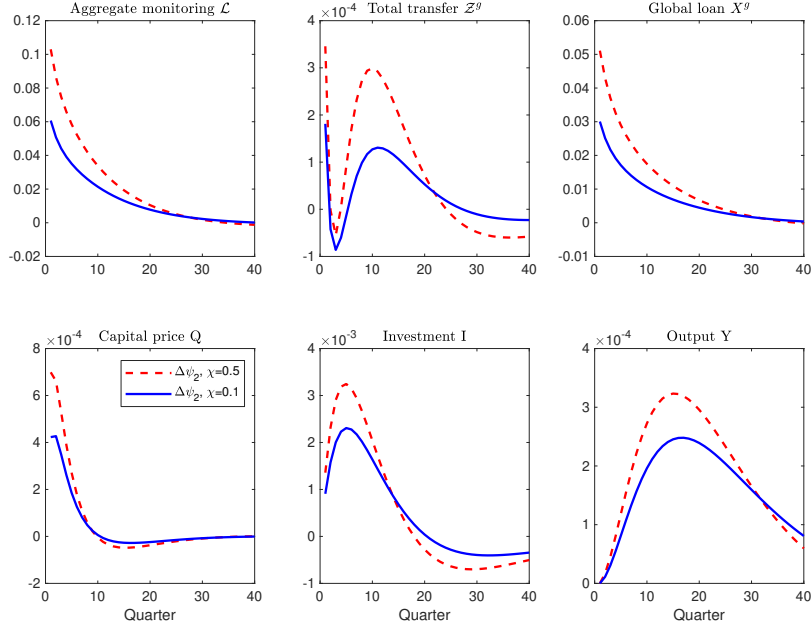
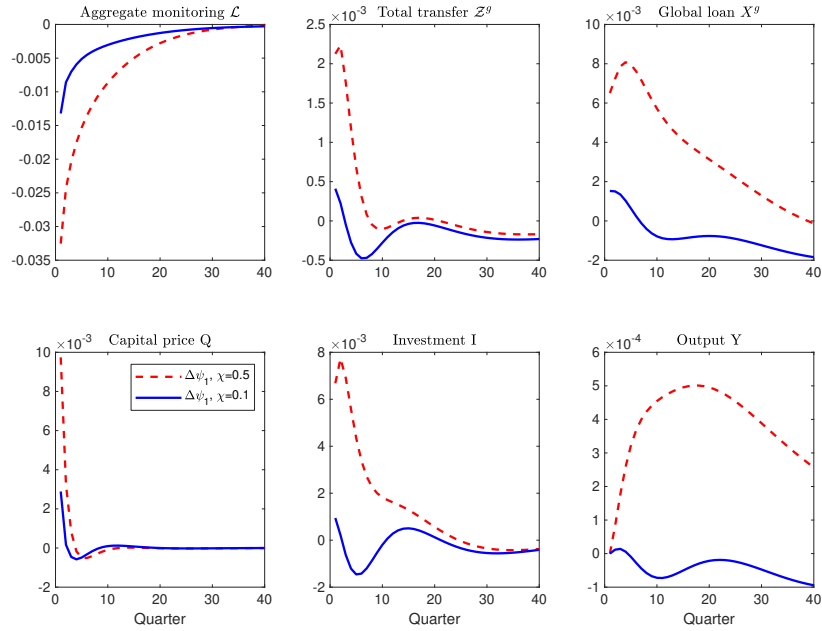


Figure 2: Responses to negative net worth shock in host country: aggregate variables

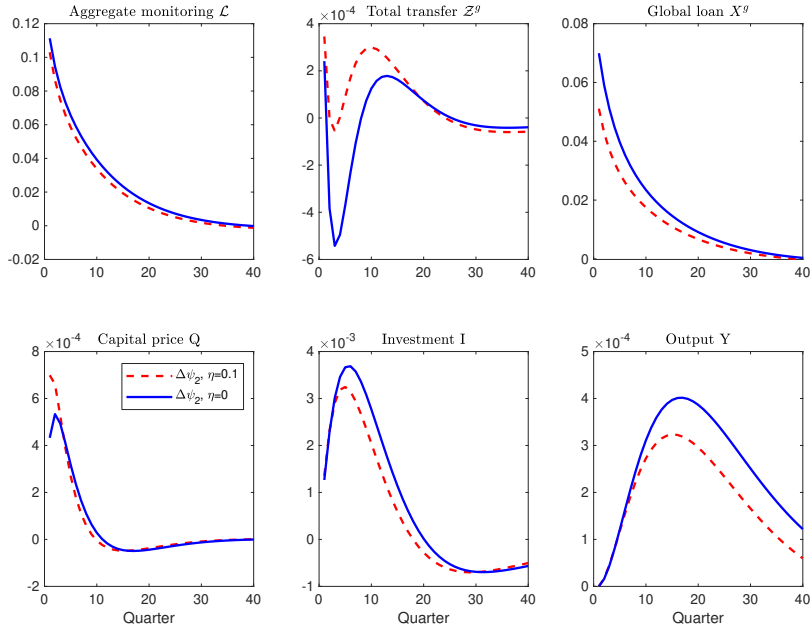


(a) Global banks' monitoring skills and monitoring centralization

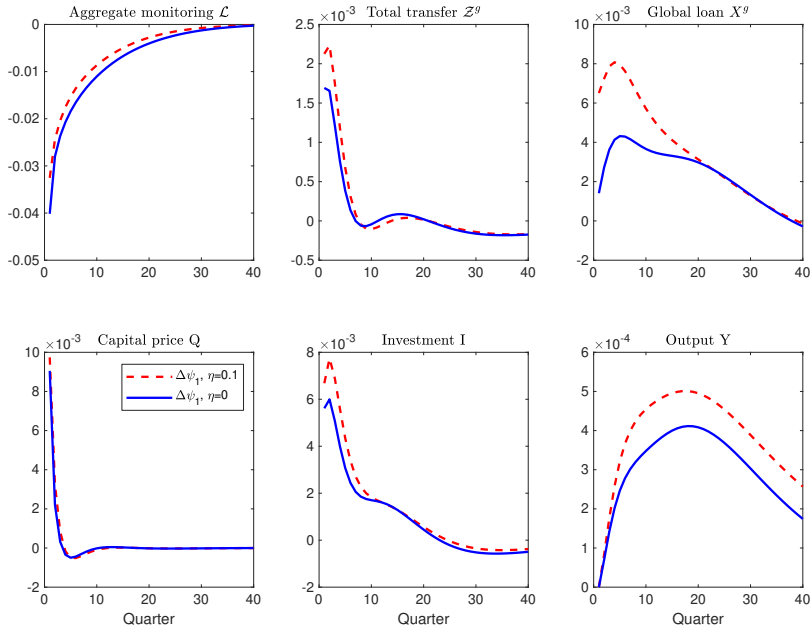


(b) Global banks' monitoring skills and liquidity centralization

Figure 3: Global banks' monitoring skills and centralization. The IRFs are in difference between the baseline economy and the comparison economy with $\psi_2 = \infty$ (Panel a) or the comparison economy with $\psi_1 = \infty$ (Panel b).



(a) Global banks' consolidation and monitoring centralization



(b) Global banks' consolidation and liquidity centralization

Figure 4: Global banks' consolidation and centralization. The IRFs are in difference between the baseline economy and the comparison economy with $\psi_2 = \infty$ (Panel a) or the comparison economy with $\psi_1 = \infty$ (Panel b).

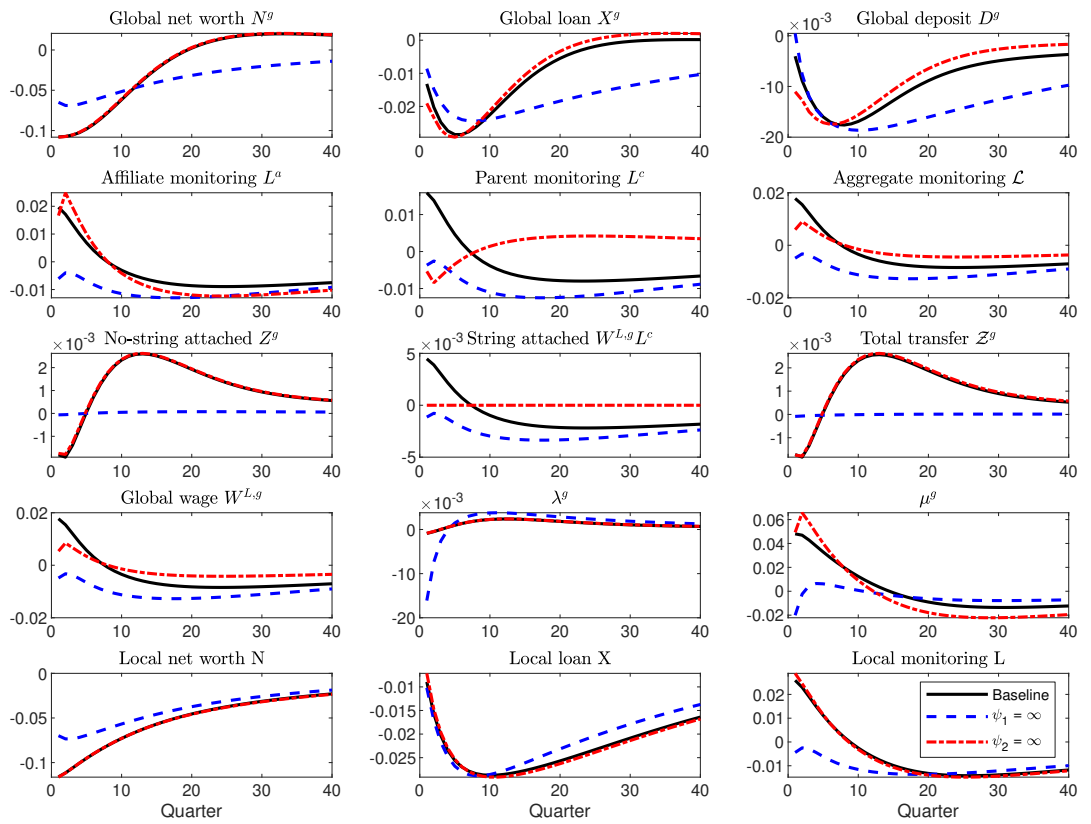


Figure 5: Responses to negative capital quality shock in host country: banking variables

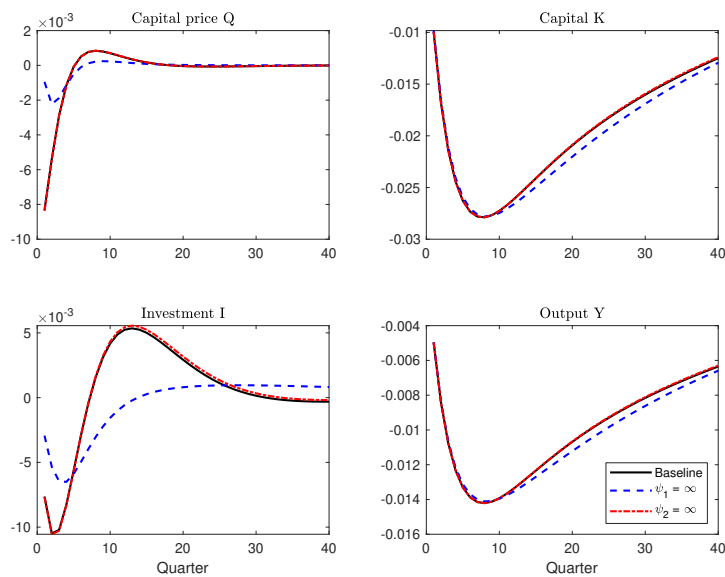


Figure 6: Responses to negative capital quality shock in host country: aggregate variables

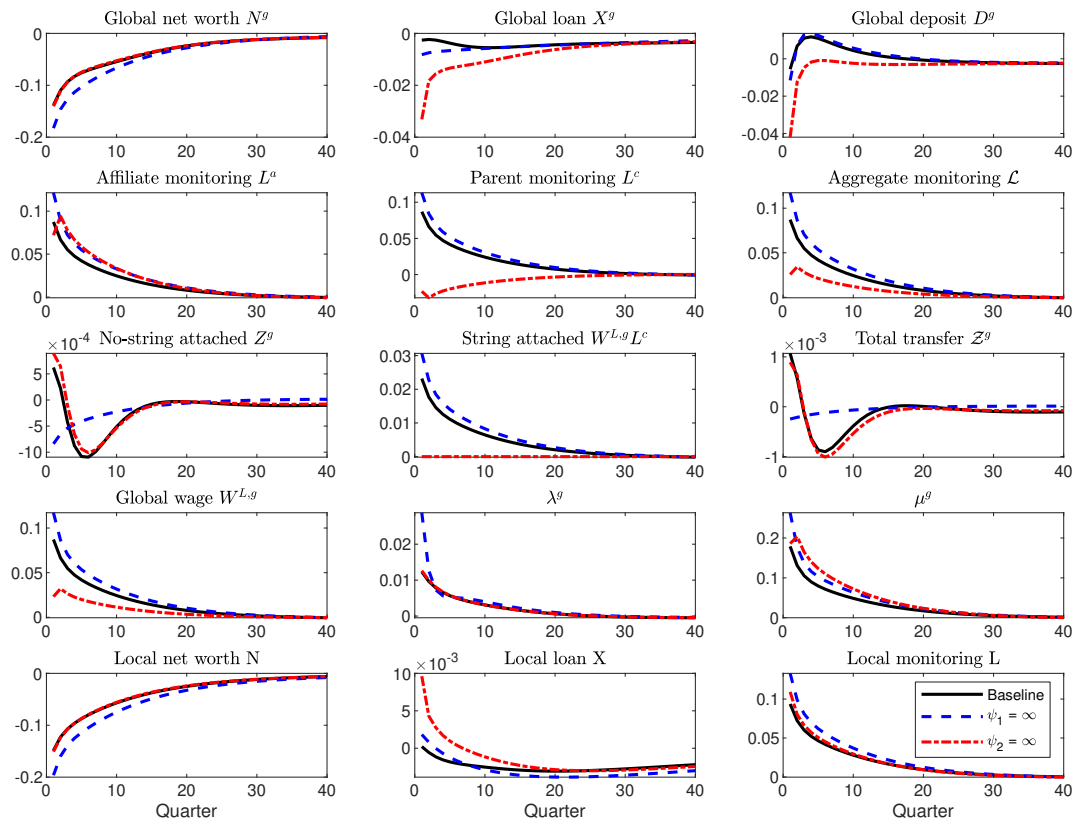


Figure 7: Responses to negative TFP shock in host country: banking variables

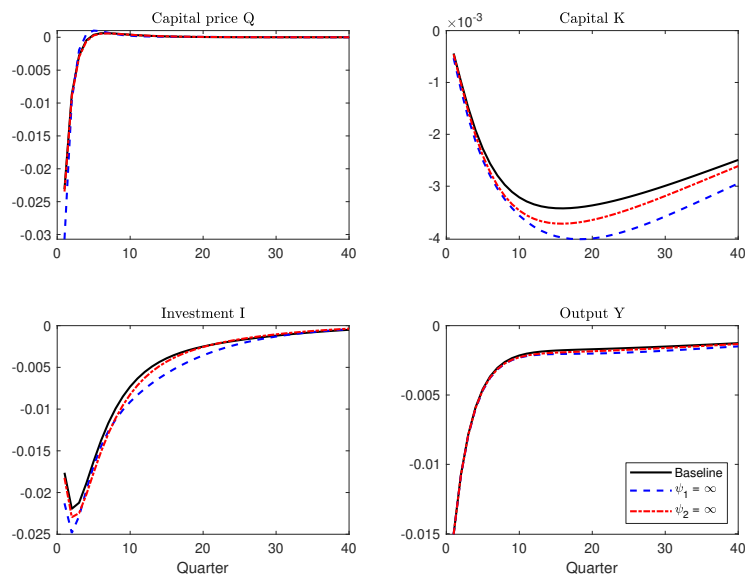


Figure 8: Responses to negative TFP shock in host country: aggregate variables

Online Appendices

Global Banking and Macroeconomic Stability: Liquidity, Control, and Monitoring

These Online Appendices present details on the derivations of the model (Appendix A), details on the data used for the empirical analysis and for the calibration and additional empirical results (Appendix B), and additional model results, robustness and sensitivity (Appendix C).

Appendix A: Details on Derivations of the Model

Households and Firms

Households' optimization yields equations (43) for the supply of labor to final good producers and to banks and the Euler equations (44) for consumption,

$$-\frac{U_{H_t}}{U_{C_t}} = W_t^H, \quad -\frac{U_{L_t}}{U_{C_t}} = W_t^L, \quad -\frac{U_{L_t^g}}{U_{C_t}} = W_t^{L,g}, \quad (43)$$

$$1 = E_t \Lambda_{t,t+1} R_t^D = E_t \Lambda_{t,t+1} R_t^{D,g}, \quad (44)$$

where $\Lambda_{t,t+1} = \beta \frac{U_{C_{t+1}}}{U_{C_t}}$ is the stochastic discount factor. The equations in (44) imply equality between the deposit rate paid by local banks and global bank affiliates, $R_t^D = R_t^{D,g}$.

Turning to final good producers, standard firm profit maximization yields their demand curves for labor and capital

$$W_t^H = (1 - \alpha) \frac{Y_t}{H_t}, \quad R_t^k = \alpha \frac{Y_t}{K_{t-1}}, \quad (45)$$

where R_t^k is the return to capital.

Moreover, looking at capital producers, in equilibrium the price of capital is equal to the marginal cost of producing capital:

$$Q_t = 1 + F \left(\frac{I_t}{I_{t-1}} \right) + \frac{I_t}{I_{t-1}} F' \left(\frac{I_t}{I_{t-1}} \right) - E_t \Lambda_{t,t+1} \left(\frac{I_{t+1}}{I_t} \right)^2 F' \left(\frac{I_{t+1}}{I_t} \right). \quad (46)$$

Local Banks

The local bank's objective function can be written in the following recursive form:

$$V_{t-1}(X_{t-1}, D_{t-1}, L_{t-1}) = E_{t-1} \Lambda_{t-1,t} \left[(1 - \sigma) N_t + \sigma \max_{X_t, D_t, L_t} V_t(X_t, D_t, L_t) \right].$$

Then, the Lagrangian can be written as

$$\Upsilon = E_{t-1} \Lambda_{t-1,t} \left\{ (1 - \sigma) N_t + \sigma \max_{X_t, D_t, L_t} [V_t(D_t, X_t, L_t) + \lambda_t(\dots) + \mu_t(\dots)] \right\}.$$

The first-order conditions are:

$$\begin{aligned} [\partial X_t] : \quad & \sigma \frac{\partial V_t}{\partial X_t} - \sigma \lambda_t Q_t + \sigma \mu_t \xi^L \phi(L_t)^{1-\phi} (Q_t)^\phi (X_t)^{\phi-1} = 0, \\ [\partial D_t] : \quad & \sigma \frac{\partial V_t}{\partial D_t} + \sigma \lambda_t - \sigma \mu_t R_t^D = 0, \\ [\partial L_t] : \quad & -\sigma \lambda_t W_t^L + \sigma \mu_t \xi^L (1 - \phi) (L_t)^{-\phi} (Q_t X_t)^\phi = 0. \end{aligned}$$

The envelope conditions are:

$$\begin{aligned} \frac{\partial V_{t-1}}{\partial X_{t-1}} &= E_{t-1} \Lambda_{t-1,t} \left[R_t^k + (1 - \delta) \kappa_t Q_t \right] (1 - \sigma + \sigma \lambda_t), \\ \frac{\partial V_{t-1}}{\partial D_{t-1}} &= -E_{t-1} \Lambda_{t-1,t} (1 - \sigma + \sigma \lambda_t) R_{t-1}^D. \end{aligned}$$

Combining the FOC for X_t , D_t , L_t with the corresponding envelope conditions, we get:

$$\begin{aligned} [\partial X_t] : \quad & -\lambda_t Q_t + \mu_t \xi^L \phi(L_t)^{1-\phi} (Q_t)^\phi (X_t)^{\phi-1} + \\ & + E_t \Lambda_{t,t+1} \left[R_{t+1}^k + (1 - \delta) \kappa_{t+1} Q_{t+1} \right] (1 - \sigma + \sigma \lambda_{t+1}) = 0, \end{aligned} \quad (47)$$

$$[\partial D_t] : \quad \lambda_t - \mu_t R_t^D - E_t \Lambda_{t,t+1} (1 - \sigma + \sigma \lambda_{t+1}) R_t^D = 0, \quad (48)$$

$$[\partial L_t] : \quad -\lambda_t W_t^L + \mu_t \xi^L (1 - \phi) (L_t)^{-\phi} (Q_t X_t)^\phi = 0. \quad (49)$$

The total net worth for the local bank, N_t , equals the sum of the net worth of existing bankers $N_{o,t}$ (o for old) and of entering bankers $N_{y,t}$ (y for young):

$$N_t = N_{o,t} + N_{y,t}.$$

Net worth of existing bankers equals earnings on assets net debt payments made in the previous period, multiplied by the fraction of bankers who survive until the current period, σ :

$$N_{o,t} = \sigma \left\{ \left[R_t^k + (1 - \delta) \kappa_t Q_t \right] X_{t-1} - R_{t-1}^D D_{t-1} \right\}.$$

As for entering bankers, the entry of each new banker is accompanied by a net transfer from the household equal to a small and exogenous fraction ($\varsigma/(1 - \sigma)$) of the total value of the assets of exiting bankers:

$$N_{y,t} = \varsigma \left[R_t^k + (1 - \delta) \kappa_t Q_t \right] X_{t-1}.$$

Putting things together, the total bank net worth $N_t = N_{o,t} + N_{y,t}$ evolves as

$$N_t = (\sigma + \varsigma)[R_t^k + (1 - \delta)\kappa_t Q_t]X_{t-1} - \sigma R_{t-1}^D D_{t-1}. \quad (50)$$

Global Bank Affiliates

The affiliate bank's objective function can be written in the following recursive form:

$$V_{t-1}^g(X_{t-1}^g, D_{t-1}^g, L_{t-1}^a) = E_{t-1}\Lambda_{t-1,t}^* \left[(1 - \sigma)N_t^g + \sigma \max_{X_t^g, D_t^g, L_t^a} V_t^g(X_t^g, D_t^g, L_t^a) \right].$$

The Lagrangian could be written as:

$$\Upsilon^g = E_{t-1}\Lambda_{t-1,t}^* \left\{ (1 - \sigma)N_t^g + \sigma \max_{X_t^g, D_t^g, L_t^a} [V_t^g(D_t^g, X_t^g, L_t^a) + \lambda_t^g(\dots) + \mu_t^g(\dots)] \right\},$$

The first-order conditions are:

$$[\partial X_t^g] : \sigma \frac{\partial V_t^g}{\partial X_t^g} - \sigma \lambda_t^g Q_t + \sigma \mu_t^g \xi (1 - \eta) \phi \left[(1 - \chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau(1-\phi)}{\tau-1}} (Q_t)^\phi (X_t^g)^{\phi-1} = 0,$$

$$[\partial D_t^g] : \sigma \frac{\partial V_t^g}{\partial D_t^g} + \sigma \lambda_t^g - \sigma \mu_t^g R_t^D = 0,$$

$$[\partial L_t^a] : -\sigma \lambda_t^g W_t^L + \sigma \mu_t^g \xi (1 - \eta) (1 - \phi) \left[(1 - \chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \\ \times (1 - \chi) (L_t^a)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi = 0.$$

The envelope conditions are:

$$\frac{\partial V_{t-1}^g}{\partial X_{t-1}^g} = E_{t-1}\Lambda_{t-1,t}^* \left[R_t^k + (1 - \delta)\kappa_t Q_t \right] (1 - \sigma + \sigma \lambda_t^g),$$

$$\frac{\partial V_{t-1}^g}{\partial D_{t-1}^g} = -E_{t-1}\Lambda_{t-1,t}^* (1 - \sigma + \sigma \lambda_t^g) R_{t-1}^D.$$

Combining the FOC for X_t^g , D_t^g , L_t^a with the corresponding envelope conditions, we get:

$$[\partial X_t^g] : -\lambda_t^g Q_t + \mu_t^g \xi (1 - \eta) \phi \left[(1 - \chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau(1-\phi)}{\tau-1}} (Q_t)^\phi (X_t^g)^{\phi-1} \\ + E_t \Lambda_{t,t+1}^* \left[R_{t+1}^k + (1 - \delta)\kappa_{t+1} Q_{t+1} \right] (1 - \sigma + \sigma \lambda_{t+1}^g) = 0, \quad (51)$$

$$[\partial D_t^g] : \lambda_t^g - \mu_t^g R_t^D - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) R_t^D = 0, \quad (52)$$

$$[\partial L_t^a] : -\lambda_t^g W_t^L + \mu_t^g \xi (1 - \eta) (1 - \phi) \left[(1 - \chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \\ \times (1 - \chi) (L_t^a)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi = 0. \quad (53)$$

Similarly to the case of the local bank, the total net worth, N_t^g , is the sum of the net worth

of existing bankers $N_{o,t}^g$ and of entering bankers $N_{y,t}^g$:

$$N_t^g = (\sigma + \varsigma) \left[R_t^k + (1 - \delta)\kappa_t Q_t \right] X_{t-1}^g - \sigma R_{t-1}^D (D_{t-1}^g + \theta Z_{t-1}^g). \quad (54)$$

Global Bank Parent

The parent's problem reads:

$$V_t^{g*} \equiv \max_{\{X_{t+j}^{g*}, D_{t+j}^{g*}\}_{j \geq 0}} E_t \sum_{j=0}^{\infty} (1 - \sigma) \sigma^j \Lambda_{t,t+j+1}^* N_{t+j+1}^{g*}, \quad (55)$$

$$\text{s.t. } Q_t^* X_t^{g*} = N_t^{g*} + D_t^{g*} - W_t^{L,g,*} L_t^{g*} + Z_t^{g*}, \quad [\lambda_t^{g*}] \quad (56)$$

$$R_t^{D*} D_t^{g*} + \theta R_t^D Z_t^{g*} \leq \xi \left[(1 - \eta) \mathcal{P}^{g*}(\cdot) Q_t^* X_t^{g*} + \eta \mathcal{P}^g(\cdot) Q_t X_t^g \right], \quad [\mu_t^{g*}] \quad (57)$$

$$L_t^{g*} = L_t^{a*} + L_t^{c*}, \quad (58)$$

where λ_t^{g*} and μ_t^{g*} are, respectively, the Lagrange multipliers for the resource constraint and the collateral constraint of the parent, while W_t^{L*} is the wage earned by loan officers in the foreign country. Similar to the affiliate, the capital constraint (57) of the parent consolidates the balance sheets of the parent and the affiliate. The net worth N_t^{g*} of the parent bank is

$$N_t^{g*} = \left[R_t^{k*} + (1 - \delta)\kappa_t^* Q_t^* \right] X_{t-1}^{g*} - R_{t-1}^{D*} D_{t-1}^{g*} - \theta R_{t-1}^D Z_{t-1}^{g*}. \quad (59)$$

The problem could be written as:

$$\Upsilon^{g*} = E_{t-1} \Lambda_{t-1,t}^* \left\{ (1 - \sigma) N_t^{g*} + \sigma \max_{X_t^{g*}, D_t^{g*}} \left[V_t^{g*}(X_t^{g*}, D_t^{g*}) + \lambda_t^{g*}(\dots) + \mu_t^{g*}(\dots) \right] \right\}.$$

from which

$$\begin{aligned} [\partial X_t^{g*}] : & \sigma \frac{\partial V_t^{g*}}{\partial X_t^{g*}} - \sigma \lambda_t^{g*} Q_t^* + \sigma \mu_t^{g*} \xi \phi (1 - \eta) \left[(1 - \chi) (L_t^{a*})^{\frac{\tau-1}{\tau}} + \chi (L_t^{c*})^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau(1-\phi)}{\tau-1}} \\ & \times (Q_t^*)^\phi (X_t^{g*})^{\phi-1} = 0, \\ [\partial D_t^{g*}] : & \sigma \frac{\partial V_t^{g*}}{\partial D_t^{g*}} + \sigma \lambda_t^{g*} - \sigma \mu_t^{g*} R_t^{D*} = 0. \end{aligned}$$

and

$$\begin{aligned} [\partial L_t^{a*}] : & -\lambda_t^{g*} W_t^{L,g,*} + \mu_t^{g*} \xi (1 - \eta) (1 - \phi) \left[(1 - \chi) (L_t^{a*})^{\frac{\tau-1}{\tau}} + \chi (L_t^{c*})^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \\ & \times (1 - \chi) (L_t^{a*})^{-\frac{1}{\tau}} (Q_t^* X_t^{g*})^\phi = 0. \end{aligned}$$

The envelope conditions are:

$$\begin{aligned}\frac{\partial V_{t-1}^{g*}}{\partial X_{t-1}^{g*}} &= E_{t-1} \Lambda_{t-1,t}^* \left[R_t^{k*} + (1-\delta) \kappa_t^* Q_t^* \right] \left(1 - \sigma + \sigma \lambda_t^{g*} \right), \\ \frac{\partial V_{t-1}^{g*}}{\partial D_{t-1}^{g*}} &= -E_{t-1} \Lambda_{t-1,t}^* \left(1 - \sigma + \sigma \lambda_t^{g*} \right) R_{t-1}^{D*}.\end{aligned}$$

Combining the FOCs for X_t^{g*} , D_t^{g*} and L_t^{a*} with the corresponding envelope conditions yields the following optimizing conditions for the loans of the global parent

$$\begin{aligned}[\partial X_t^{g*}] : \quad & -\lambda_t^{g*} Q_t^* + \mu_t^{g*} \xi \phi (1-\eta) \left[(1-\chi) (L_t^{a*})^{\frac{\tau-1}{\tau}} + \chi (L_t^{c*})^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau(1-\phi)}{\tau-1}} (Q_t^*)^\phi (X_t^{g*})^{\phi-1} \\ & + E_t \Lambda_{t,t+1}^* \left[R_{t+1}^{k*} + (1-\delta) \kappa_{t+1}^* Q_{t+1}^* \right] \left(1 - \sigma + \sigma \lambda_{t+1}^{g*} \right) = 0,\end{aligned}\quad (60)$$

for its deposit gathering

$$[\partial D_t^{g*}] : \quad \lambda_t^{g*} - \mu_t^{g*} R_t^{D*} - E_t \Lambda_{t,t+1}^* \left(1 - \sigma + \sigma \lambda_{t+1}^{g*} \right) R_t^{D*} = 0,\quad (61)$$

and for the loan officers hired by the parent

$$\begin{aligned}[\partial L_t^{a*}] : \quad & -\lambda_t^{g*} W_t^{L,g,*} + \mu_t^{g*} \xi (1-\eta) (1-\phi) \left[(1-\chi) (L_t^{a*})^{\frac{\tau-1}{\tau}} + \chi (L_t^{c*})^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \\ & \times (1-\chi) (L_t^{a*})^{-\frac{1}{\tau}} (Q_t^* X_t^{g*})^\phi = 0.\end{aligned}\quad (62)$$

The total net worth, N_t^{g*} , is the sum of the net worth of existing bankers $N_{o,t}^{g*}$ and of entering bankers $N_{y,t}^{g*}$:

$$N_t^{g*} = (\sigma + \varsigma) \left[R_t^{k*} + (1-\delta) \kappa_t^* Q_t^* \right] X_{t-1}^{g*} - \sigma (R_{t-1}^{D*} D_{t-1}^{g*} + \theta R_{t-1}^D Z_{t-1}^{g*}).\quad (63)$$

The Decisions of the Conglomerate

When $\psi_1 = \psi_2 = 0$, the conglomerate's choice of the monitoring at the affiliate (35) becomes

$$\begin{aligned}[\partial L_t^c] : \quad & \xi (1-\phi) \left[\mu_t^g (1-\eta) + \mu_t^{g*} \eta \right] \left[(1-\chi) (L_t^a)^{\frac{\tau-1}{\tau}} + \chi (L_t^c)^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \chi (L_t^c)^{-\frac{1}{\tau}} (Q_t X_t^g)^\phi \\ & = W_t^{L,g} \lambda_t^g.\end{aligned}\quad (64)$$

The first-order condition for the conglomerate's hiring of officers at the parent bank is

$$\begin{aligned}[\partial L_t^{c*}] : \quad & \xi (1-\phi) \left[\mu_t^g \eta + \mu_t^{g*} (1-\eta) \right] \left[(1-\chi) (L_t^{a*})^{\frac{\tau-1}{\tau}} + \chi (L_t^{c*})^{\frac{\tau-1}{\tau}} \right]^{\frac{1-\tau\phi}{\tau-1}} \chi (L_t^{c*})^{-\frac{1}{\tau}} (Q_t^* X_t^{g*})^\phi \\ & = W_t^{L,g,*} \lambda_t^{g*}.\end{aligned}\quad (65)$$

The choice of no strings attached transfers (34) simplifies to

$$\begin{aligned} & \lambda_t^g - \theta R_t^D \mu_t^g - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^g) \theta R_t^D \\ & = \lambda_t^{g*} - \theta R_t^D \mu_t^{g*} - E_t \Lambda_{t,t+1}^* (1 - \sigma + \sigma \lambda_{t+1}^{g*}) \theta R_t^D. \end{aligned} \quad (66)$$

Appendix B: Data and Additional Empirical Results

This Appendix B contains additional details on the BEPS Survey, further details on the sample countries (including a brief account of some episodes of banking disruptions), as well as additional empirical results.

The BEPS Survey

For data on cross-bank heterogeneity in the financial and organizational integration of foreign subsidiaries into their respective multinational banking groups, we turn to the Banking Environment and Performance Surveys (BEPS) undertaken by the EBRD and Tilburg University.⁴⁵ As part of this unique survey, senior financial consultants—each with considerable first-hand banking experience—conducted in-depth interviews with bank CEOs. As part of BEPS III, each bank’s Head of Credit was (separately) interviewed as well. The BEPS II survey was implemented face-to-face in 2012 while the BEPS III survey was conducted on-line in 2020-21, using either the Zooms or Microsoft Teams platform.

Sampling Frame and Sample Construction

The BEPS research design covers both large and small banks and is nationally representative. For both BEPS II and III, the sample was drawn from all commercial, cooperative and savings banks active at the time of sampling. The aim was to survey banks that jointly represent at least 95 percent of all bank assets in each country. To arrive at this sample, a list was obtained from each country’s central bank with all savings, commercial, and cooperative banks. By country, these banks were then ordered by total assets and, moving down the list, banks were

⁴⁵<https://www.ebrd.com/what-we-do/economics/data/banking-environment-and-performance-survey.html>.

added until an aggregate market share of at least 95 percent was reached.⁴⁶

As part of BEPS, bank CEOs and Heads of Credit were asked about their bank's lending activities, the competitive environment and various other topics. A dedicated module for subsidiaries of multinational banks was also fielded and this is module we use in this paper. Importantly, in case of multinational banks, each subsidiary was treated as an independent (foreign-owned) bank. The resulting sampling frame consists of banks in 30 countries for BEPS II. These banks represent 76 percent of all bank assets (and 80 percent of all foreign bank assets) in the sample countries. For BEPS III, the sampling frame comprised banks in 28 countries. These banks represent 75 percent of all bank assets (and 81 percent of all foreign bank assets) in these countries.

Survey Implementation

All interviews followed a standardized survey instrument, which was first piloted in several countries. Based on the pilot results, the questionnaire was adapted and modified to the final version. Interview teams were extensively trained so that all interviewers understood the full scope of the project and were able to confidently respond to questions by the bank CEOs and Heads of Credit. Interviews were conducted in either Arabic, English, French, Romanian, Russian, Serbo-Croatian, Turkish, or Ukrainian. These languages proved to cover the needs of all the countries. In advance of the interview, a list of topics to be covered in the interview was submitted to the bank by e-mail following the meeting confirmation or, upon request of the bank, in anticipation of the confirmation. In a small number of cases, and upon request of the bank, the full survey instrument was submitted to the bank by e-mail ahead of the meeting.

In the case of BEPS II, each interviewer was provided with a portable scanner. Following the interviews, the completed questionnaires were scanned by the interviewer and submitted to the central support team using an encrypted Dropbox. The completed original questionnaire was then submitted for archiving. The scanned questionnaires were received by the central support team and printed. These were then separately entered into two instances of Snap 10 Survey Software by two different people. The resulting datasets were compared for discrepancies and those found corrected. Any missing or inconsistent answers were noted and the interviewer was

⁴⁶In each country, the goal was therefore to interview all banks except for the very smallest ones: those banks that (jointly) make up no more than five percent of all bank lending. Leaving out these banks does not affect our results as these banks are typically domestic banks that only operate one or very few branches.

asked to provide clarification by e-mail.

In the case of BEPS III, a CAPI (computer-assisted personal interviewing) form was programmed to allow data to be entered instantaneously as the questionnaires were administered. In addition to allowing appropriate skip patterns to be programmed, the CAPI form also limited responses to pre-defined ranges and provided warning notifications to interviewers if responses were internally inconsistent. The CAPI form was programmed using Open Data Kit (ODK). The CAPI program allowed all responses to be directly entered into the BEPS III database. Data verification, to the greatest extent possible, occurred during data entry itself as the survey instrument was programmed with pre-defined ranges and provided warning notifications for inconsistent data. Each questionnaire was checked by a logical check code that was developed during the pilot. Any issues that emerged from data cleaning and validation codes were immediately followed up on with the respondent.

Merge with Other Data

We hand-match the BEPS survey data with two other datasets. First, we draw on Bureau Van Dijk's BankScope and Orbis databases for bank-level financials for the years 2007–2017. Specially, for each subsidiary we calculate annual credit growth, the solvency ratio (equity divided by total assets, %), wholesale funding (gross loans divided by total customer deposits, %), net interest margin, and the liquid assets to total assets ratio. Second, we use the Systemic Banking Crises Database II by [Laeven and Valencia \(2020\)](#) to identify any crises in subsidiaries' host and home country. Specifically, we create *Any Crisis host (home)*, a dummy variable equal to 1 if there was a banking crisis, currency crisis, sovereign debt crisis or sovereign debt restructuring in a country-year in the subsidiary's host (home) country. In the end, our data contains a panel of foreign banks interviewed as part of BEPS II and/or BEPS III matched to banking financials and systemic crisis data between the years 2007–2017.

Some Examples of Banking Disruptions in the Sample

The history of the countries in our sample features several episodes of bank distress and disruptions that originated in the domestic banking sector and during which multinational banks allegedly played a role in moderating the disruptions. In several such episodes, global banks expanded their presence and partly replaced the scarce credit of local banks, broadening their

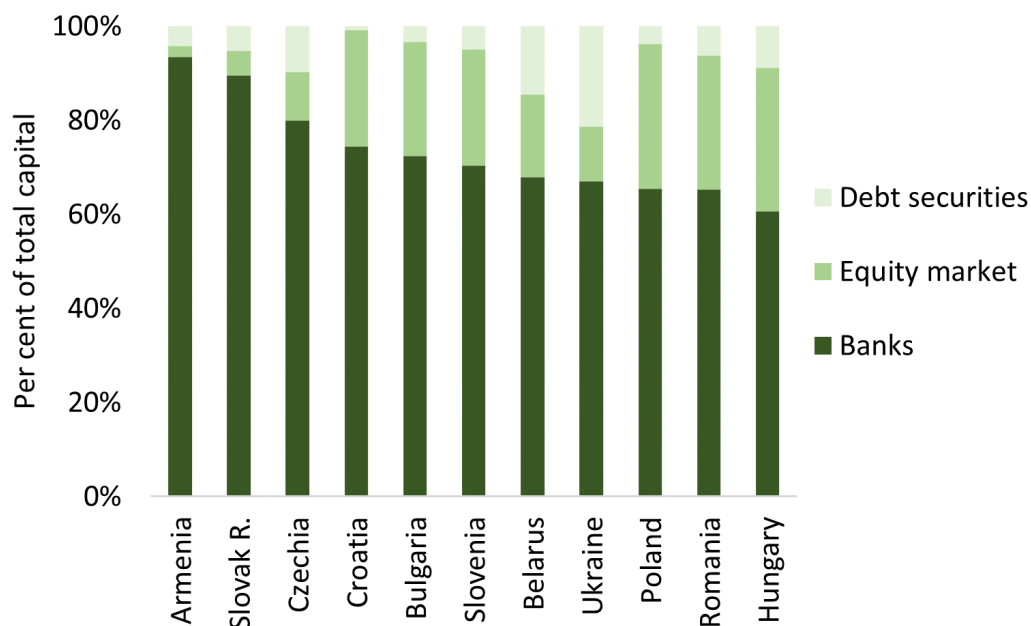
lending and acquiring larger credit market shares. We describe here a few such examples, with details on the country, approximate years of turbulence in the banking sector and (in parentheses) the primary causes of banks' problems. We note that, on the one hand, the list is only partial and, on the other hand, banks' distress did not always turn into a full-blown crisis.

A few such examples include the crisis of Türkiye in 2001 and following years (sovereign debt problems, political instability, and currency depreciation),⁴⁷ the banking shocks that hit Kazakhstan in 2007 and in 2015-16 (poor risk management of local banks and politically exposed individuals in banks with a resulting siphoning off of resources), the banking shock of Azerbaijan in 2012-16 (exposure of local banks to oil shock and currency depreciation), the banking turmoil of Armenia in 2015-16 (currency shock, especially hitting local banks with large agricultural loans), the banking crisis of Hungary in 1995 (problems of mismanagement in large state-owned banks including major losses in the second state bank, Postabank). It also includes the banking crisis of Latvia in 1995 (compromised private local banks, including Baltija; large bank withdrawals), the banking shocks of Macedonia in 2014 (political crisis and ensuing losses) and earlier in 1994 (mismanagement and large losses of state-owned banks), the banking crisis of Lithuania in 1996 (local banks' mismanagement), Estonia in 1994-95 (mismanagement in local, especially state-owned, banks), Bulgaria in 1996-97 (currency exposure of local banks and liquidity crunch for local state-owned banks) and 2014 (default of Corporate Commercial Bank (CCB), the country's fourth-largest lender, resulting from alleged fraudulent activities within CCB and public distrust in the banking system), and Georgia in 1995-97 (siphoning off of resources in local banks, such as Agrobank). It further includes the episodes of Kyrgyzstan in 1994-96 (mismanagement and inefficiency in local, state-owned banks), Egypt in 2013 and 2023 (political crisis, sovereign debt problems), Tajikistan in 2014 (losses due to inefficiency and corruption issues in large domestic banks), Morocco during the 2010s (sovereign debt issues), Ukraine in 2014-16 (major losses of local banks due to political crisis, banks involved in pyramid schemes with consequent siphoning off of funds from local banks to companies linked to banks' owners or abroad; currency devaluation; exposure of local banks to the Donetsk and Luhansk regions involved in war), and the Czech Republic in 1996-97 (losses due to inefficiency and mismanagement).

⁴⁷Many local banks in Türkiye had taken on excessive risk, particularly through foreign currency borrowing, and were involved in connected lending practices.

In the above episodes, among others, foreign banks allegedly played a moderating role. We provide some examples. In the banking shock of Ukraine, the banks that managed to sustain their market position were either state-owned banks which received recapitalizations from the central bank, or foreign banks which could count on tight support from their parent banks. For instance, Austria's Raiffeisen Bank International continued to support its Ukrainian subsidiary through additional liquidity and capital. During the 2014 Bulgarian banking turmoil, Italy's UniCredit Group provided support to its subsidiary UniCredit Bulbank. Likewise, foreign banks played a key role in supplanting scarce credit of local banks in the banking shocks of Latvia and Hungary, as well as in those of Armenia and Türkiye, among several others.

Importance of Bank Lending in Selected Host Economies



Appendix Figure B1: This figure shows the relative importance of banks, the local stock market, and international corporate bonds as sources of corporate funding in a subset of our sample countries. *Banks* measures total credit to the private sector disbursed and scaled by GDP. *Equity market* measures total stock market capitalization scaled by GDP. *Debt securities* measures total outstanding international private debt securities scaled by GDP. All data refer to 2023 or the latest available and are sourced from the World Bank Global Financial Development and World Development Indicators databases.

Appendix Table B1: Variable Definitions

	Definition	Source
<i>Credit growth and other bank characteristics</i>		
Region: Central Asia	Dummy variable equal to 1 if the subsidiary is located in Central Asia and 0 otherwise.	BEPS
Region: Central Europe and Baltic States	Dummy variable equal to 1 if the subsidiary is located in Central Europe and Baltic States and 0 otherwise.	BEPS
Region: Eastern Europe and the Caucasus	Dummy variable equal to 1 if the subsidiary is located in Eastern Europe and the Caucasus and 0 otherwise.	BEPS
Region: Russia	Dummy variable equal to 1 if the subsidiary is located in Russia and 0 otherwise.	BEPS
Region: South-eastern Europe	Dummy variable equal to 1 if the subsidiary is located in South-eastern Europe and 0 otherwise.	BEPS
Region: Southern and Eastern Mediterranean	Dummy variable equal to 1 if the subsidiary is located in Southern and Eastern Mediterranean and 0 otherwise.	BEPS
Region: Türkiye	Dummy variable equal to 1 if the subsidiary is located in Türkiye and 0 otherwise.	BEPS
Annual credit growth	Annual credit growth (%), winsorized at the 1% level.	Bankscope and Orbis
Equity/Total assets (%)	Equity as a percentage of total assets.	Bankscope and Orbis
Gross loans/Total customer deposits (%)	Wholesale funding defined as gross loans as a percentage of total customer deposits.	Bankscope and Orbis
Net Interest Margin	The ratio of the net interest income expressed as a percentage of earning assets.	Bankscope and Orbis
Liquid assets/Total assets (%)	Liquid assets as a percentage of total assets.	Bankscope and Orbis
<i>Subsidiary lending behaviour</i>		
SME lending	Dummy variable equal to 1 if the subsidiary provides credit to Small and Medium Enterprises (SME) with between 10 and 250 employees and 0 otherwise.	BEPS
Relationship is important (SME)	Dummy variable equal to 1 if knowledge of the client is important or very important when lending to SME customers and 0 otherwise.	BEPS
<i>Global bank monitoring</i>		
Parent targets credit growth	Dummy variable equal to 1 if the parent bank sets annual targets for the subsidiary in terms of credit growth and 0 otherwise.	BEPS
Parent targets market share	Dummy variable equal to 1 if the parent bank sets annual targets for the subsidiary in terms of market share and 0 otherwise.	BEPS
Parent important in credit assessment of clients	Dummy variable equal to 1 if the parent bank is important in the credit assessment of borrowers of the subsidiary and 0 otherwise.	BEPS
# Calls of subsidiary with parent	Number of phone calls, conference calls, and video conference calls the subsidiary holds per month, on average, with the management or board of their parent bank.	BEPS
Parent provided monitoring support	Dummy variable equal to 1 if the parent bank provided managers of the subsidiary with training and 0 otherwise.	BEPS
Parent selected managers	Dummy variable equal to 1 if the parent bank was involved in the selection of at least one manager at the subsidiary and 0 otherwise.	BEPS
<i>Global bank liquidity</i>		
Parent operates centralized treasury	Dummy variable equal to 1 if the parent bank operates a centralized treasury department or desk (i.e. a desk that centrally raises funding for subsidiaries in several countries)	BEPS
Parent is most important to cover funding shortfall	Dummy variable equal to 1 if the CEO considers parent bank funding to be the most important funding source to plug a gap created by an unexpected shortfall in funding and 0 otherwise.	BEPS
Liquidity centralization	Dummy variable equal to 1 if the parent operates a centralized treasury and the parent is most important to cover unexpected funding shortfall and 0 otherwise.	BEPS
Parent regularly provides capital and/or liquidity	Dummy variable equal if the CEO agrees that the parent bank provides capital and/or liquidity to its various subsidiaries on a regular basis and 0 otherwise.	BEPS
Parent provided liquidity support	Dummy variable equal to 1 if the parent bank provided the subsidiary, at least once, with internal credit lines/loans/liquidity during the period and 0 otherwise.	BEPS

Appendix Table B2: Global Banks' Lending, Banks' Organization, and Crises. Further Tests

Panel A: Additional Controls or Lagged Controls								
	Annual Credit Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Any crisis host	28.488*	11.826	13.337	18.518	49.518***	-1.835	6.358	30.323
	(16.152)	(20.093)	(19.507)	(16.376)	(18.234)	(18.677)	(18.219)	(21.639)
# calls with parent × Any crisis host		3.366***				3.594***		
		(1.040)				(1.012)		
Credit risk assessment of clients × Any crisis host			63.410**				59.987**	
			(25.874)				(23.992)	
Liquidity centralization × Any crisis host				30.933+				19.339
				(21.351)				(23.588)
Any crisis home	33.097	40.634	29.781	29.924	6.368	33.167	37.797+	8.907
	(68.587)	(52.588)	(26.058)	(35.841)	(36.386)	(71.959)	(24.316)	(24.096)
L. Annual credit growth	-0.145	0.148	-0.148	-0.102	0.200+	0.216	0.116	0.096
	(0.211)	(0.138)	(0.139)	(0.162)	(0.128)	(0.154)	(0.145)	(0.144)
Equity/Total assets (%)	0.261	1.168	-0.588	-0.094				
	(1.166)	(1.291)	(1.359)	(1.503)				
Gross loans/Total customer deposits (%)	0.001	0.000	-0.002	0.000				
	(0.001)	(0.000)	(0.002)	(0.000)				
Net Interest Margin	-0.985	-3.960	1.236	0.421				
	(5.427)	(2.756)	(5.330)	(4.658)				
Liquid assets/Total assets (%)	-1.173*	-0.363	-1.116**	-0.542				
	(0.710)	(0.539)	(0.569)	(0.826)				
L. Equity/Total assets (%)					1.407+	0.357	0.599	1.398*
					(0.905)	(0.779)	(0.791)	(0.789)
L. Gross loans/Total customer deposits (%)					-0.000	0.000	-0.001	-0.000
					(0.001)	(0.001)	(0.002)	(0.001)
L. Net Interest Margin					-10.714**	-5.149*	-4.888*	-8.856**
					(4.222)	(2.861)	(2.684)	(3.955)
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1433	833	1275	1383	1435	834	1277	1385
Number of banks	201	109	179	195	201	109	179	195

Panel B: Recessions						
	Annual Credit Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Recession year (host)	51.832**	30.118**	17.022	2.925	40.755**	16.925
	(21.692)	(13.270)	(17.019)	(13.605)	(20.499)	(13.078)
Recession year (host) × # calls with parent	-0.629+	-0.279				
	(0.420)	(0.234)				
Recession year (host) × Credit risk assessment of clients			16.376	16.422		
			(18.291)	(13.627)		
Recession year (host) × Liquidity centralization					17.037	2.616
					(15.577)	(13.767)
Recession year (home)	3.420	-0.063	3.635	5.869	2.916	6.193
	(9.796)	(9.411)	(12.883)	(12.053)	(10.667)	(13.513)
L. Annual credit growth	0.111	-0.038	-0.253	-0.131	-0.245	-0.145
	(0.156)	(0.064)	(0.202)	(0.137)	(0.207)	(0.156)
Equity/Total assets (%)	0.038	0.118	0.347	-1.386	-0.336	-1.311
	(1.267)	(1.168)	(2.039)	(1.556)	(1.430)	(1.006)
Gross loans/Total customer deposits (%)		0.000		-0.000		0.000+
		(0.000)		(0.001)		(0.000)
Net Interest Margin		-2.565		4.355		8.813
		(2.673)		(4.864)		(7.021)
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	805	802	1256	1240	1363	1347
Number of banks	107	107	180	176	196	192

Note: Panel A of this table presents additional estimates for the specifications of Table 2. Panel B of this table presents estimates for the effects of recessions on global banks' lending in host countries. The estimator is a two-step difference GMM. The panel refers to the 2007-2017 period. Standard errors are adjusted for the Windmeijer's finite-sample correction for the two-step covariance matrix. ***, **, * and + denote significance at the 1 percent, 5 percent, 10 and 15 percent level, respectively.

Appendix Table B3: Parent Banks' Liquidity and Monitoring Support. Further Tests

	Liquidity Support		Monitoring Support	
	(1)	(2)	(3)	(4)
Any crisis host	0.575*** (0.146)	0.472*** (0.130)	0.609** (0.274)	0.204 (0.203)
Relationship is important (SME)	0.251** (0.114)		0.417+ (0.263)	
Liquidity centralization		0.116** (0.045)		
# of calls with parent above 75th percentile				0.123*** (0.041)
Any crisis home	-0.003 (0.299)	-0.142 (0.311)	-0.544 (0.588)	-0.870* (0.503)
Annual credit growth (winsorized; 0.01)	0.000+ (0.000)	0.000 (0.000)	-0.000 (0.001)	0.000 (0.001)
Equity/Total assets (%)	-0.003 (0.004)	-0.001 (0.004)	-0.001 (0.005)	-0.004 (0.004)
Gross loans/Total customer deposits (%)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Net Interest Margin	0.010 (0.008)	0.005 (0.008)	-0.000 (0.011)	0.006 (0.010)
Constant	0.594*** (0.130)	0.809*** (0.072)	0.667* (0.340)	1.044*** (0.122)
R-squared	0.099	0.068	0.203	0.078
N	179	173	88	104

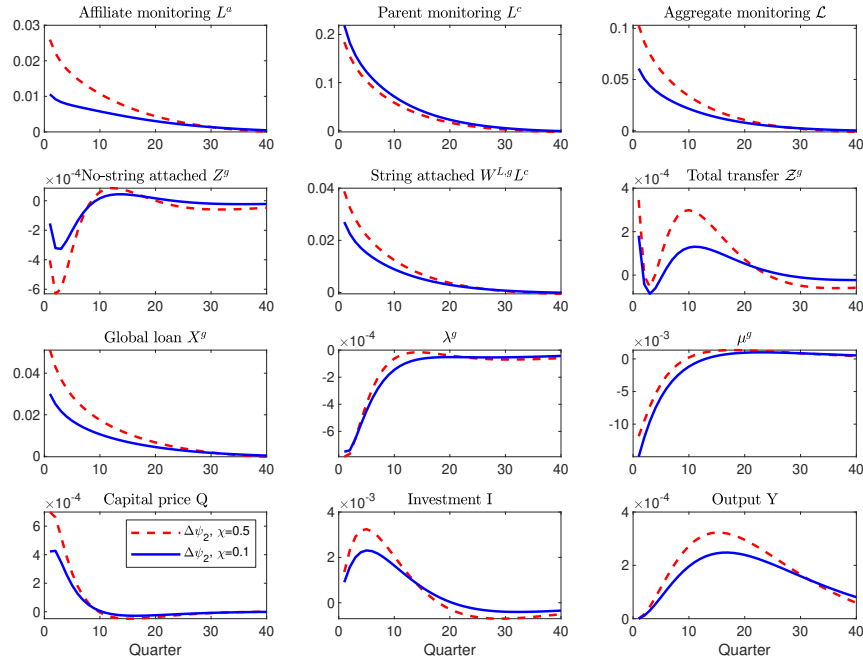
Note: This table presents estimates for the effects of crises on global banks' liquidity and monitoring support of affiliates in host countries. Estimates are from cross-sectional OLS regressions. The data is the collapsed panel which constitute averages of all variables between 2007 and 2012. For details on measurement see Section 2.3. For the definitions of all variables, see Appendix Table B1. Robust standard errors are in parenthesis. ***, **, *, + denote significance at the 1 percent, 5 percent, 10 and 15 percent level, respectively.

Appendix C: Additional Model Results, Robustness, Sensitivity

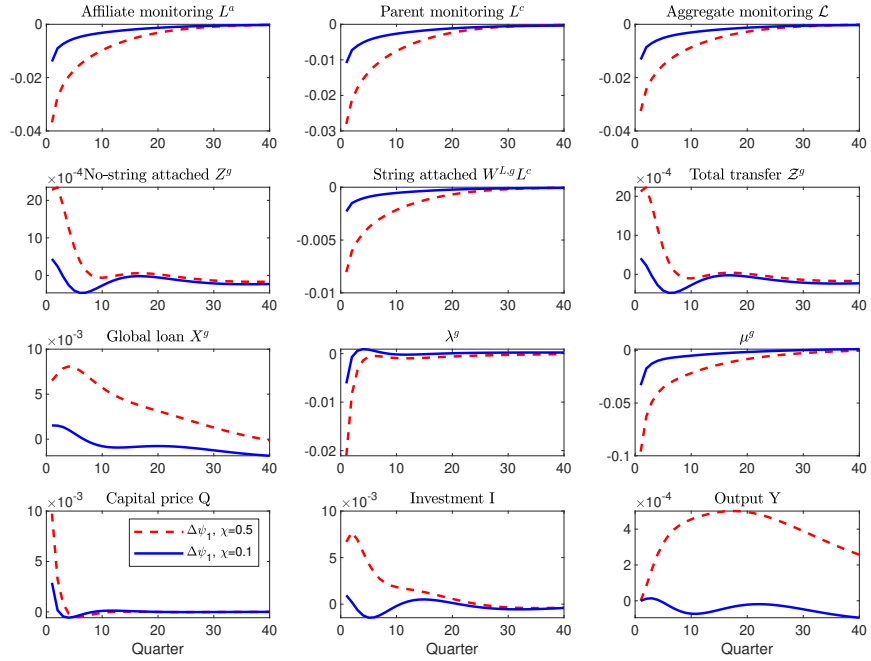
This Appendix C contains additional details on model results, further details on model robustness and sensitivity, as well as details on quantitative exercise for Hungary.

Additional Details on Results

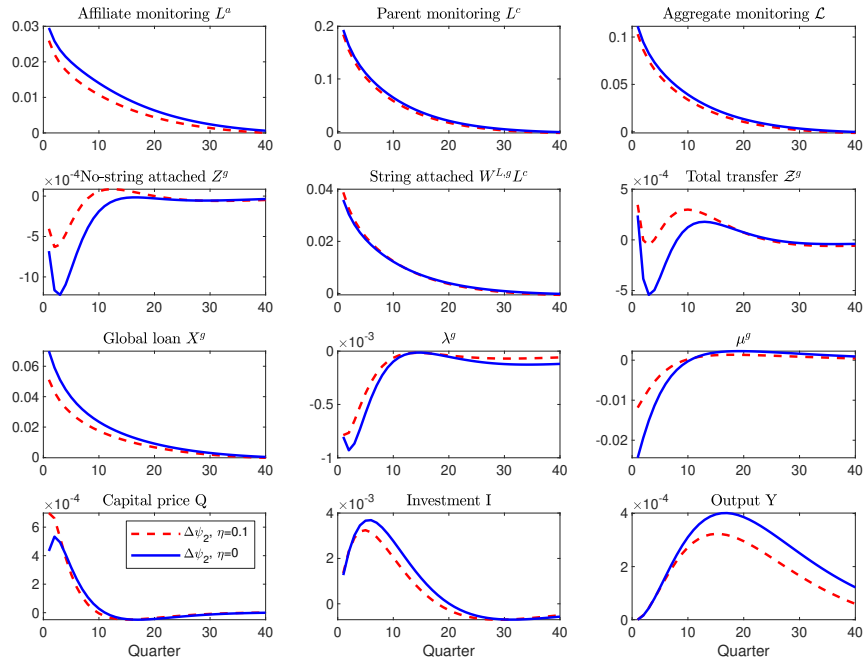
The Appendix Figures C1-C4 provide additional details on the results of Section 5.1.2, on centralization and other characteristics of global banks.



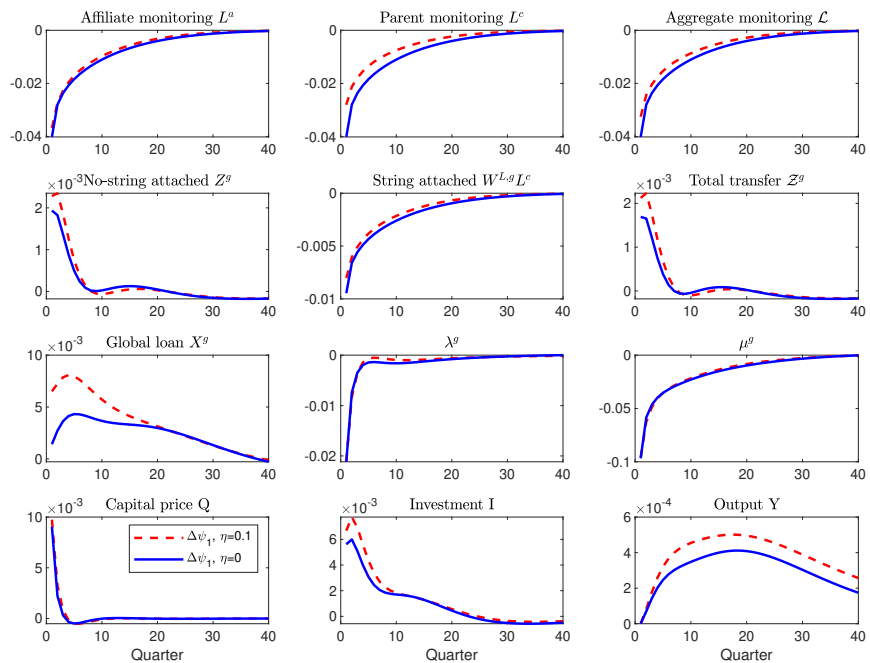
Appendix Figure C1: Global banks' monitoring skills and monitoring centralization. The IRFs are in difference between the baseline economy and the comparison economy with $\psi_2 = \infty$.



Appendix Figure C2: Global banks' monitoring skills and liquidity centralization. The IRFs are in difference between the baseline economy and the comparison economy with $\psi_1 = \infty$.



Appendix Figure C3: Global banks' consolidation and monitoring centralization. The IRFs are in difference between the baseline economy and the comparison economy with $\psi_2 = \infty$.



Appendix Figure C4: Global banks' consolidation and liquidity centralization. The IRFs are in difference between the baseline economy and the comparison economy with $\psi_1 = \infty$.

Informativeness of Internally Calibrated Parameters

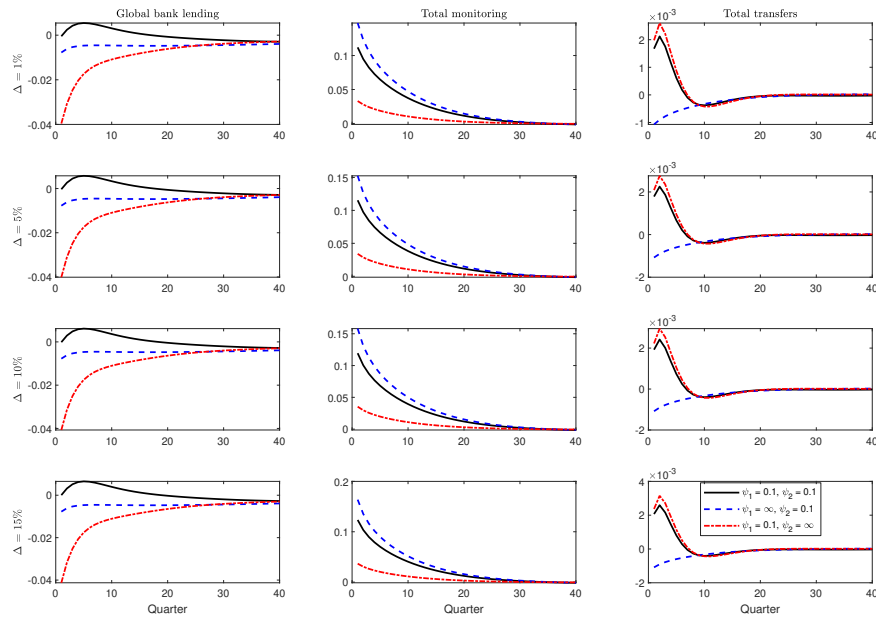
The Appendix Table C1 provides more details on the informativeness of the internally calibrated parameters. It shows how the targets of the calibration change when altering the single parameters by 1%, 5% and 10% relative to the baseline values. The table shows that this produces material changes in the calibration targets. The effects are intuitive. For example, the ratio L^c/L^a is mostly affected by the parameters χ and τ . The weight on loans in the recovery value of firm shares ϕ is mostly responsible for the loan spread and wage over assets, while the transfer to entering bankers ς especially accounts for changes in the global banks' leverage. The pleigeability of global and local banks' loans ξ and ξ^L influence most steady state targets other than L^c/L^a .

Appendix Table C1: Steady State Values for Different Parameters' Calibration

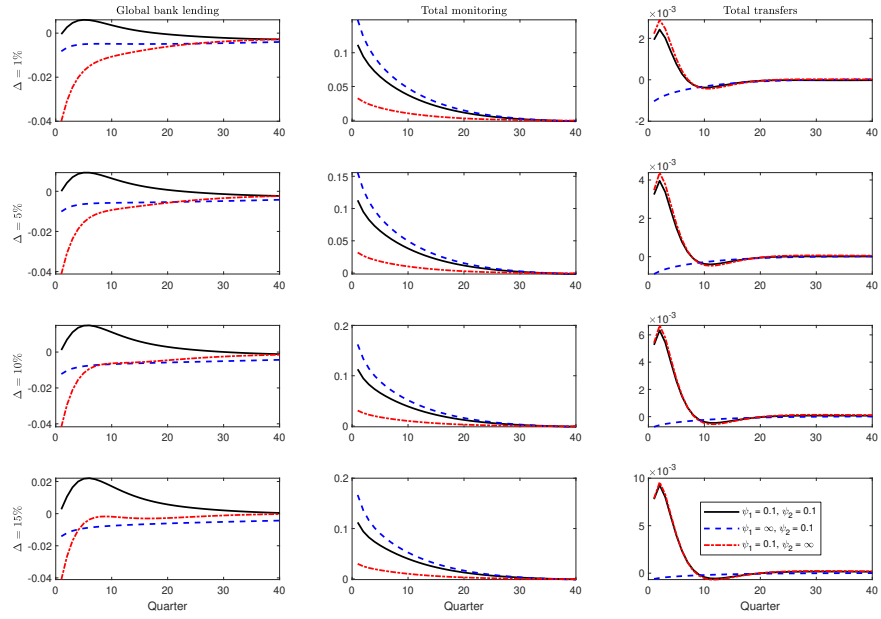
Parameter	Value	Loan Spread	$\frac{L}{L^s}$	$\frac{L^c}{L^a}$	Wage Over Assets	Global Bank Leverage	Share Of Global Bank Loans
ς	0.0101	0.0335	0.6679	1.0541	0.0170	6.5144	0.2357
	0.0105	0.0329	0.6676	1.0541	0.0165	6.3402	0.2356
	0.0110	0.0322	0.6672	1.0541	0.0159	6.1360	0.2355
	0.0115	0.0315	0.6669	1.0541	0.0154	5.9453	0.2355
χ	0.5050	0.0336	0.6679	1.0647	0.0171	6.5601	0.2357
	0.5250	0.0336	0.6676	1.1082	0.0171	6.5629	0.2361
	0.5500	0.0336	0.6669	1.1653	0.0171	6.5671	0.2369
	0.5750	0.0335	0.6659	1.2261	0.0171	6.5722	0.2382
ξ	3.0300	0.0333	0.6606	1.0541	0.0169	6.5804	0.2477
	3.1500	0.0317	0.6314	1.0541	0.0163	6.6717	0.2983
	3.3000	0.0296	0.5951	1.0541	0.0153	6.8020	0.3658
	3.4500	0.0273	0.5595	1.0541	0.0142	6.9481	0.4356
ξ^L	2.8785	0.0325	0.6755	1.0541	0.0166	6.6261	0.2235
	2.9925	0.0283	0.7041	1.0541	0.0147	6.8887	0.1803
	3.1350	0.0235	0.7362	1.0541	0.0124	7.2008	0.1376
	3.2775	0.0193	0.7646	1.0541	0.0103	7.4860	0.1052
ϕ	0.7070	0.0297	0.6684	1.0541	0.0151	6.7721	0.2353
	0.7175	0.0243	0.6690	1.0541	0.0124	7.0941	0.2349
	0.7280	0.0193	0.6696	1.0541	0.0098	7.4132	0.2346
	0.7385	0.0149	0.6702	1.0541	0.0075	7.7205	0.2346
τ	0.5050	0.0336	0.6680	1.0546	0.0171	6.5595	0.2357
	0.5250	0.0336	0.6680	1.0569	0.0171	6.5596	0.2357
	0.5500	0.0336	0.6680	1.0597	0.0171	6.5598	0.2357
	0.5750	0.0336	0.6679	1.0625	0.0171	6.5599	0.2357

Robustness to Variations in Key Calibrated Parameters

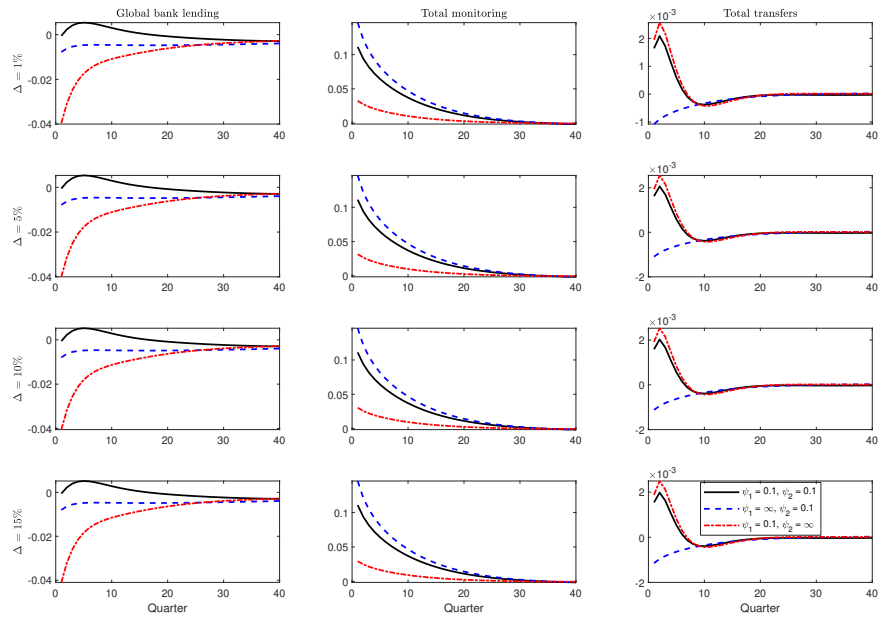
The Appendix Figures C5-C10 illustrate the robustness of the dynamic responses to bank net worth shocks. They display the impulse response functions (IRFs) of global bank lending, total monitoring of global bank affiliates and total transfers to global bank affiliates when altering the values of the internally calibrated parameters (including the proportional transfer to entering bankers, the pledgeability of local bank loans, the pledgeability of global bank loans, the productivity weight on locally hired loan officers, the elasticity of substitution between locally hired and globally hired loan officers) by 1%, 5%, 10% and 15% relative to their baseline values.



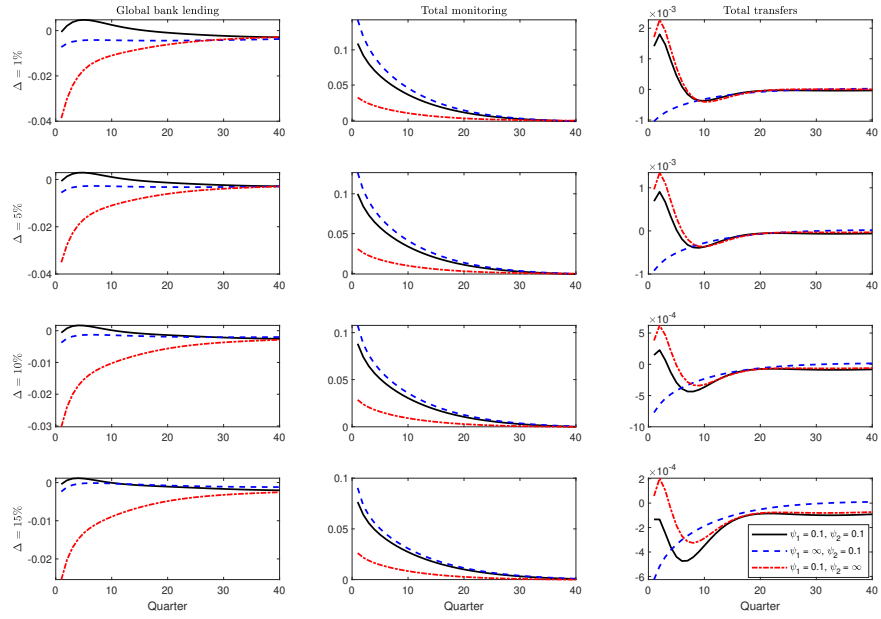
Appendix Figure C5: the figure shows the impulse response functions (IRFs) for global bank lending, total monitoring, and total transfers under different calibrations of the proportional transfer to entering bankers, ς . The variations considered are 1%, 5%, 10%, and 15% from the baseline value.



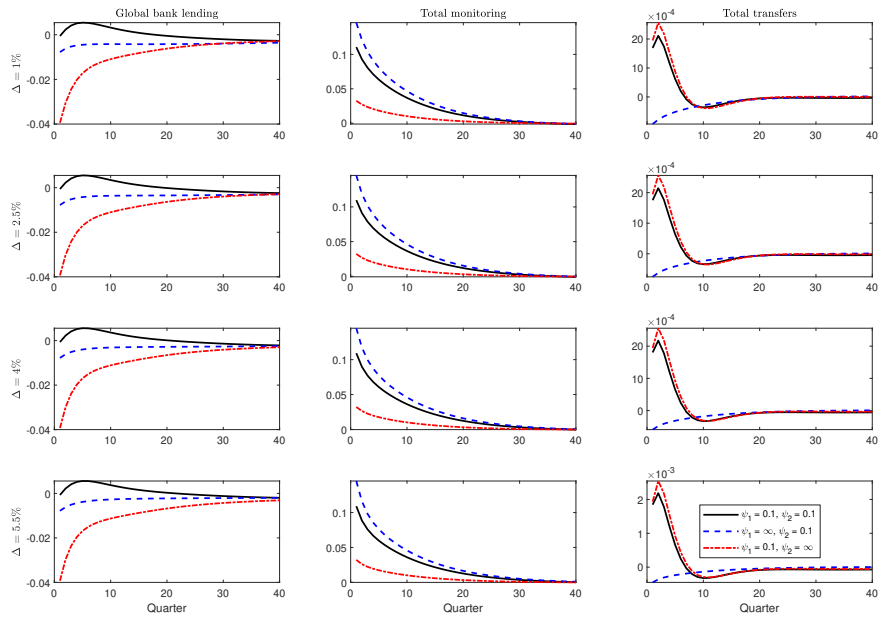
Appendix Figure C6: the figure shows the impulse response functions for global bank lending, total monitoring, and total transfers under different calibrations of the pledgeability of local bank loans, ξ^L . The variations considered are 1%, 5%, 10%, and 15% from the baseline.



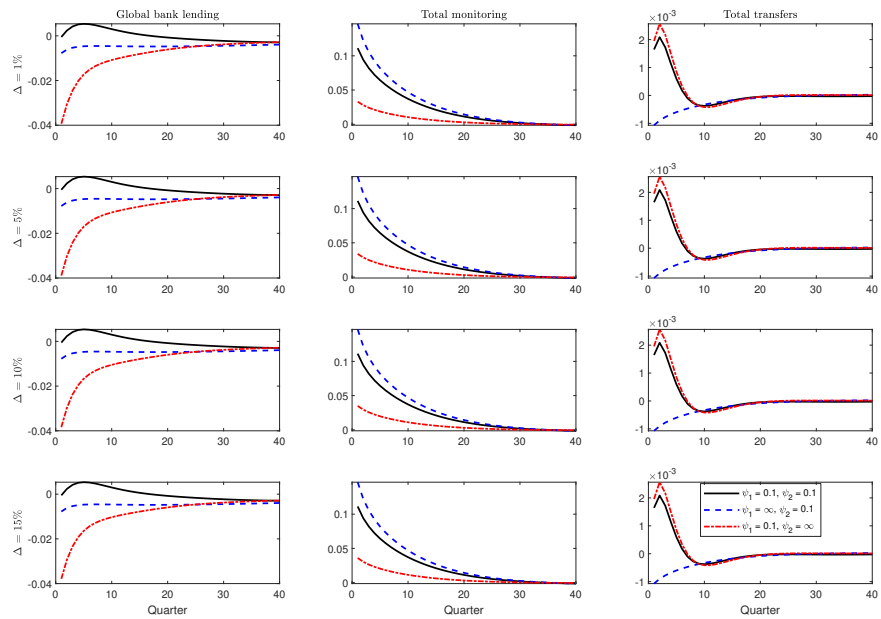
Appendix Figure C7: the figure shows the impulse responses for global bank lending, total monitoring, and total transfers under different calibrations of the productivity weight on locally-hired loan officers, χ . The variations considered are 1%, 5%, 10%, and 15% from the baseline.



Appendix Figure C8: the figure shows the impulse responses for global bank lending, total monitoring, and total transfers under different calibrations of the pledgeability of global bank loans, ξ . The variations considered are 1%, 5%, 10%, and 15% from the baseline.



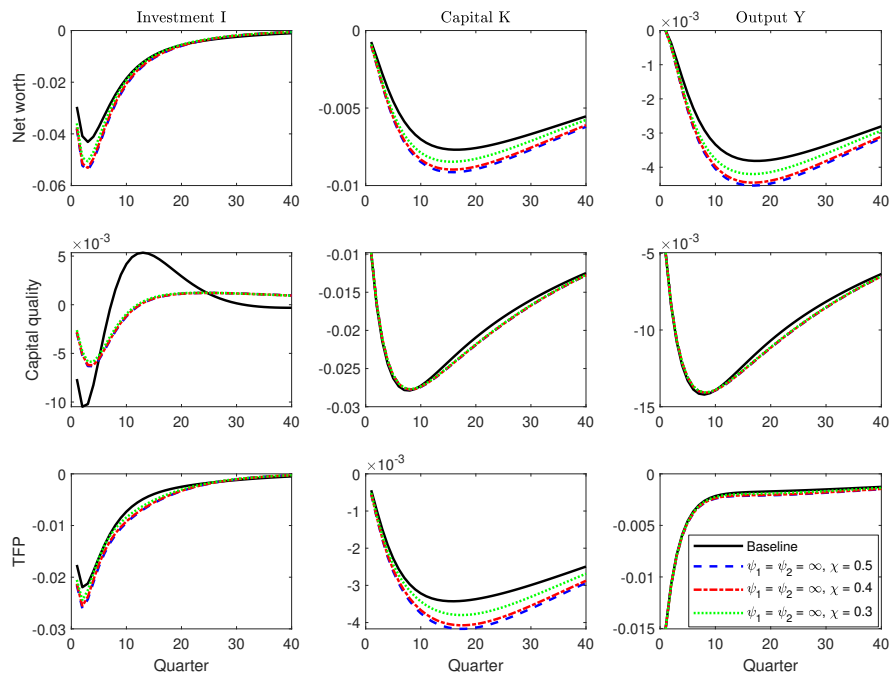
Appendix Figure C9: the figure shows the impulse responses for global bank lending, total monitoring, and total transfers under different calibrations of the elasticity of portfolio recovery with respect to capital, ϕ . The variations are 1%, 2.5%, 4%, and 5.5% from the baseline.



Appendix Figure C10: the figure shows the impulse response functions (IRFs) for global bank lending, total monitoring, and total transfers under different calibrations of the elasticity of substitution between loan officers controlled by the affiliate and loan officers controlled by the conglomerate, τ . The variations considered are 1%, 5%, 10%, and 15% from the baseline value.

Comparison with Setting where All Banks Operate Locally

The Appendix Figure C11 compares the responses to shocks of salient real sector variables between our baseline economy and an economy where all banks effectively operate locally (that is, both string-attached and no string-attached transfers are shut down, implying that global bank affiliates are isolated from parent banks). The figure displays the impulse response functions (IRFs) for different values of the parameter capturing the productivity weight on locally hired loan officers. Our baseline economy exhibits more resilience than the economy where all banks effectively operate locally following bank net worth shocks and, to a lower extent, TFP shocks. In line with the findings in the main text, the comparison yields more ambiguous insights following capital quality shocks, where global banks can turn out to be destabilizing, as noted.



Appendix Figure C11: The figure shows the impulse response functions for investment, capital, and output for the three shocks: bank net worth, capital quality, and TFP shocks.

Global banks' business models and business cycles in Hungary

As described in Section 5.4 of the paper, we quantitatively assess the implications of global banks' business models for the business cycle dynamics of Hungary. This is a country in our empirical sample that has exhibited a significant presence of multinational banks' affiliates since its major banking reforms of the early 1990s. To conduct the quantitative assessment, we adapt our calibration to a scenario with two asymmetric countries. We treat Hungary as the host economy and continue to let the foreign country represent the rest of the world.

We re-calibrate the following parameters for each of the two countries: the transfer to entering bankers ς ; the pledgeability of local bank loans ξ^L ; the productivity weight on locally-hired loan officers χ ; the pledgeability of global bank loans ξ ; the parameter ϕ in banks' due diligence function; and the elasticity of substitution between locally-hired loan officers and loan officers hired by banking conglomerates τ . The bottom panel of Table 4 reports the parameter values. To perform the recalibration, we adjust four targets of the host economy to match data moments for Hungary drawn from our database.⁴⁸ We target a ratio of global bank loans over total bank loans of 40%, and a leverage of global banks of 9.65. We target a ratio of loan officers hired by conglomerates over loan officers hired by affiliates such that about 60% of loan officers at an affiliate is ultimately selected by parent offices. Further, we set the monitoring (loan officers) at local banks over total monitoring to 0.6. In addition, in this quantitative exercise, we use Bayesian techniques to estimate values for the transfer implementation costs ψ_1 and ψ_2 incurred by global banks operating in Hungary (further details below).

Using Hungarian data, we estimate $AR(1)$ processes for the three shocks of the model: bank net worth, capital quality, and total factor productivity. For the estimation, we rely on time series data on banks' TIER 1 capital to asset ratio for the bank net worth shock (National Bank of Hungary data); time series data on banks' non-performing loans for the capital quality shock (National Bank of Hungary data); and time-series data on gross domestic product, capital and labor (Hungarian Central Statistical Office data) for the TFP shock, as in Fernald (2014). We feed the estimated shocks into the model and conduct 3,000 stochastic time-series simulations spanning 11,000 quarters, discarding the first 1,000 quarters of data to counteract initial condition biases.

Using the simulated data, we identify recessionary episodes following the criterion proposed by Abiad et al. (2011), where recessions are defined as episodes in which the output series falls

⁴⁸For the host country, the other two targets remain as in the baseline calibration. Moreover, for the foreign country we retain the targets used in the baseline calibration.

more than one standard deviation below zero. The onset of a recession is defined as the quarter immediately following an output peak. For each recessionary episode, we analyze the simulated data over 40 quarters following the recession’s onset. We next categorize recessions based on the relative influence of the three shocks in driving the output contraction. As a metric of each shock’s impact, we consider the standardized mean of the shock, computed as the average of the shock over the 40-quarter span, divided by its standard deviation. We next define “bank net worth-driven recessions” as the recessionary episodes in which the standardized mean of the bank net worth shock is more negative than the standardized mean of the capital quality and TFP shocks (and analogously for “capital quality-driven recessions” and “TFP-driven recessions”). Aggregating across simulations within each category of recessions, we then compute the average path of the recessions and a 90% confidence interval.

Appendix Figure C12 displays the results of this quantitative exercise. The results point to a stabilizing influence of global banks’ centralization in bank net worth-driven recessions. This is somewhat more pronounced in the case of monitoring centralization than in the case of liquidity centralization. In the average bank net worth-driven recession, aggregate investment drops by 14.14% on average during the following 40 quarters in the baseline model, but by 15.8% (respectively, 14.84%) in the comparison model without monitoring (liquidity) centralization. Global bank loans exhibit a more pronounced decline in the comparison model without monitoring centralization (average drop of 32.46%) than in the baseline model (11.97%), while their pattern is more mixed in the absence of liquidity centralization.⁴⁹

As a result of the contrasting forces uncovered in the impulse response analysis, the influence of global banks is much more nuanced following capital quality shocks. In the average capital quality-driven recession, the economy without liquidity centralization exhibits a slightly smaller investment drop than the baseline setting, but the difference is very modest (1.67% versus 1.7% on average over the 40-quarter span). And the economy without monitoring centralization exhibits a slightly smaller investment reduction than the baseline (1.55% versus 1.7%). This is due to the decline in global banks’ monitoring in the baseline economy, which tends to be muted when monitoring is decentralized. Finally, the patterns and comparisons in the average TFP-driven recession are closer to those in the average bank net worth-driven recession, though the effects of global banks’ business models are generally less pronounced.

⁴⁹The average response of global bank loans in the absence of liquidity centralization falls within the 90% confidence interval of their response in the baseline economy.

Aggregate effects of regulatory policies. Some countries, such as Hungary, propose policies aimed at rebalancing the composition of the banking sector between multinational and domestic banks. Our framework enables us to study the potential effects of these policies depending on the organizational structure of the global banks operating in the country. To mimic a regulation aimed at rebalancing credit market shares from global to domestic banks, we posit a collateral (capital) requirement on global banks higher than the baseline. In particular, we reduce the value of the parameter ξ in the host economy so as to have a 10% lower loan share of global banks in steady state. We then repeat the above simulation exercise, with key results summarized in Appendix Table C2. The table displays the difference (in percentage points) between the average response of global bank loans and aggregate investment over 40 quarters after the onset of a recession in the main scenario ($\xi = 3.35$) and in this alternative policy scenario ($\xi = 3.3$).

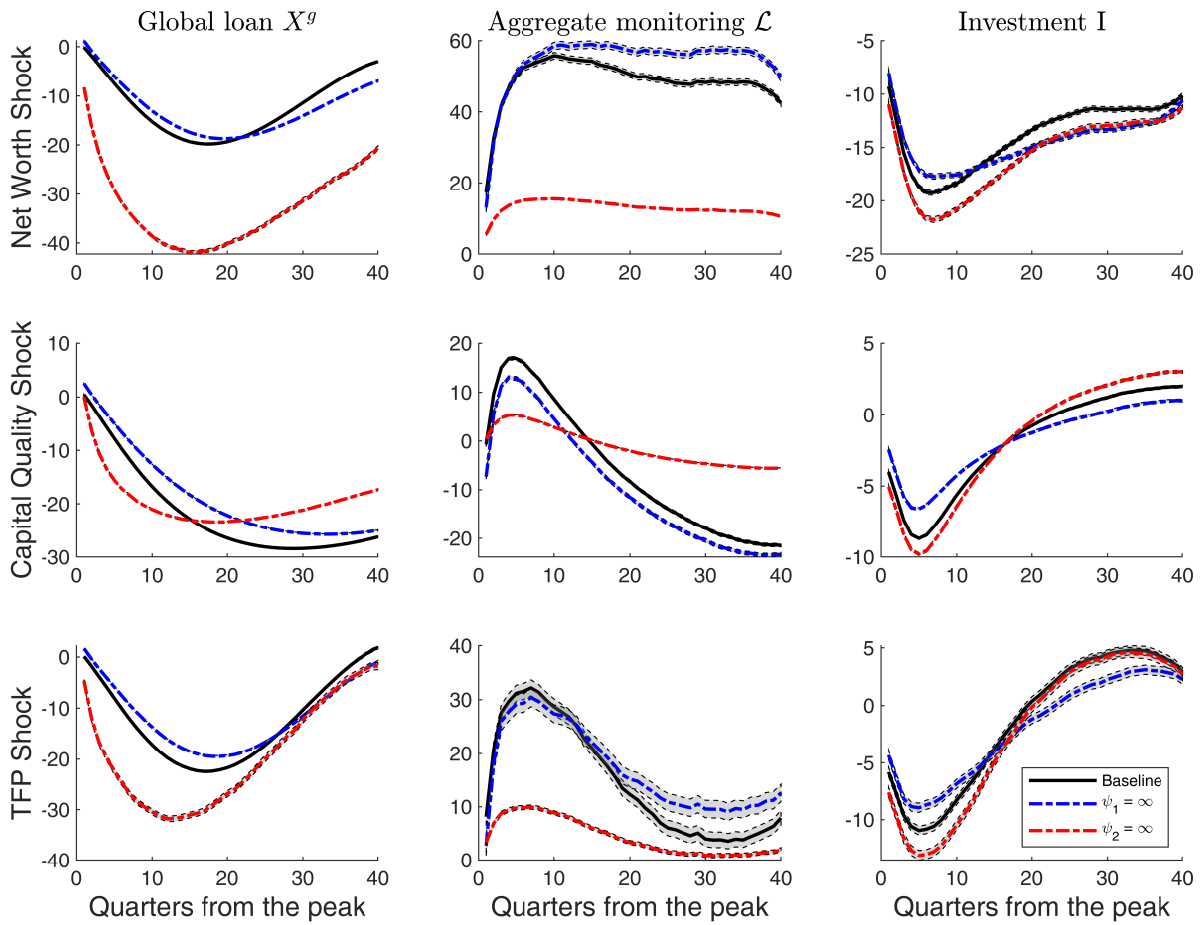
Two main insights emerge. First, the policy tends to overall reduce the countercyclicality of global banks' lending and raise the procyclicality of aggregate investment during recessions. Second, these effects on the cyclical behavior of global banks' lending and aggregate investment are significantly more pronounced when global banks active in the country exhibit more decentralized liquidity and monitoring structures, while the aggregate consequences of the policy are more modest when banks feature a centralized structure. This suggests that global banks' lending behavior (and hence the behavior of aggregate investment) is more sensitive to the tightness of bank collateral requirements when global banks cannot fully centralize their liquidity and monitoring. Considering bank net-worth driven recessions, for example, the average response of global bank loans is 0.11 percentage points smaller in the alternative policy scenario when global banks are fully centralized, but 0.52 (1.39) percentage points smaller under decentralized liquidity (monitoring). And the average investment response is 2.2 percentage points smaller in the alternative policy scenario when global banks are fully centralized, but 2.47 (2.23) percentage points smaller under decentralized liquidity (monitoring). A conclusion we draw is that, while in general policymakers put emphasis on banks' credit market shares when designing policies, understanding the effects of regulatory policies on global banks cannot abstract from accounting also for global banks' organizational structures and business models.

Details on Estimation of Transfer Implementation Costs for Hungary

In the quantitative exercise for Hungary, we use Bayesian techniques to estimate values for the transfer implementation costs ψ_1 and ψ_2 . In order to exploit the major disruption to

domestic banks occurred in Hungary around the mid-1990s, we consider data for the 1994 to 2001 period. In particular, we use detrended series for TIER1 capital, loan to deposit ratio of local banks and loan to deposit ratio of multinational banks operating in Hungary (the trends are removed by using the Christiano-Fitzgerald time series filter). Once we account for the observed shock series, we match the dynamic behavior of the loan to deposit ratios predicted by the model with the observed time series. The Bayesian estimation yields a value of 0.849 for the implementation cost parameter ψ_1 for no strings attached transfers and a value of 0.301 for the implementation cost parameter ψ_2 for strings attached transfers. Thus, the estimation suggests that global banks operating in Hungary have a somewhat more centralized management of monitoring resources relative to their management of liquidity (that is, the costs for reallocating monitoring resources within banking conglomerates are slightly lower than those for reallocating liquid resources).⁵⁰

⁵⁰To assess the performance of the model, we compared two specifications: one incorporating estimated values of ψ_1 and ψ_2 , and the other with both parameters set to zero (effectively eliminating transfer costs). We used the Bayes factor, which depends on the marginal data density, to evaluate which specification better explains the data. We find that the model with the estimated values of ψ_1 and ψ_2 offers a superior fit, as evidenced by a higher log-marginal likelihood compared to the alternative specification.



Appendix Figure C12: Dynamics during recessions. The figure reports the average response of selected variables across 3,000 simulations, and associated 90% confidence intervals. See Section 5.4 for details.

Appendix Table C2: Aggregate Effects of Regulations on Global Banks

Variable	Baseline	$\psi_1 = \infty$	$\psi_2 = \infty$
<i>Bank Net Worth-Driven Recessions</i>			
<i>(differences between baseline and alternative policy scenario)</i>			
Global loan X^g	0.11 pp [0.11 pp, 0.12 pp]	0.52 pp [0.52 pp, 0.53 pp]	1.39 pp [1.39 pp, 1.39 pp]
Investment I	2.20 pp [2.18 pp, 2.22 pp]	2.47 pp [2.45 pp, 2.49 pp]	2.23 pp [2.22 pp, 2.25 pp]
<i>Capital Quality-Driven Recessions</i>			
<i>(differences between baseline and alternative policy scenario)</i>			
Global loan X^g	0.12 pp [0.12 pp, 0.12 pp]	0.05 pp [0.05 pp, 0.05 pp]	0.75 pp [0.74 pp, 0.75 pp]
Investment I	0.64 pp [0.63 pp, 0.65 pp]	0.62 pp [0.61 pp, 0.63 pp]	0.73 pp [0.72 pp, 0.74 pp]
<i>TFP-Driven Recessions</i>			
<i>(differences between baseline and alternative policy scenario)</i>			
Global loan X^g	0.12 pp [0.12 pp, 0.12 pp]	0.33 pp [0.33 pp, 0.33 pp]	1.00 pp [0.98 pp, 1.01 pp]
Investment I	1.24 pp [1.20 pp, 1.28 pp]	1.44 pp [1.39 pp, 1.48 pp]	1.19 pp [1.16 pp, 1.23 pp]
<i>All Recessions</i>			
<i>(differences between baseline and alternative policy scenario)</i>			
Global loan X^g	0.06 pp [0.06 pp, 0.06 pp]	0.07 pp [0.07 pp, 0.07 pp]	0.91 pp [0.91 pp, 0.92 pp]
Investment I	0.90 pp [0.90 pp, 0.91 pp]	0.96 pp [0.95 pp, 0.96 pp]	1.02 pp [1.01 pp, 1.02 pp]

Note: This table displays the differential average impact of recessions on global bank loans and on aggregate investment between the baseline scenario and an alternative policy scenario with tighter collateral limits for global banks. In the main scenario $\xi = 3.35$, while in the alternative policy scenario $\xi = 3.30$. The average impact of recessions is computed over a 40-quarter horizon from the onset of a recession. The difference between the average effects in the two scenarios is in percentage points (pp). In brackets, 90% confidence intervals.