Global Banking: Towards an Assessment of Benefits and Costs[1]

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1 Motivation

Global activities of banks are a core manifestation of the broader patterns of globalization of production, finance, and trade. A large share of cross-border capital flows is intermediated by banks that operate across different jurisdictions, and the activities and structures of global banks have evolved dynamically over the past decades. The span of types of funding and financial services broadened, while the organizations became increasingly complex, operating both bank and non-bank affiliates in a large number of countries and across a large number of sectors.

This raises anew the issues of the balance of costs and benefits of global banking. Before the global financial crisis of 2007 through 2008, the prevailing viewpoint was that the overall effects are positive. Global banks exist because they have expertise and scale that allow them to meet the needs of their customer base both in home markets and foreign markets, possibly better supporting certain trade and investment activity than local banks.[2] The expansion of banks across borders was expected to have beneficial consequences for home and host countries (Goldberg 2007). Such benefits include facilitating the financing of global activities of non-financial firms, thus allowing benefits of the international division of labor and of knowledge transfers to be reaped. Global activities of banks can contribute to the allocation of capital to sectors and regions where rates of return are highest, thus improving the efficiency of production and providing savers with investment opportunities. Cross-border holdings of asset portfolios can improve the diversification of risks and thus, overall, reduce the volatility of consumption. Global banks also may have advantages in accessing external capital markets, overcoming in part some of the frictions facing local banks, and can

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[2] Niepmann (2015) explores the absolute and comparative advantages that give rise to global banks from a theoretical point of view, while Fillat, Garetto and Smith (2018) provide additional empirical support.

likewise potentially provide credit on more favorable terms. Heightened competitive pressure can spur local firms to use resources more effectively. The presence of bank branches from nations with highly developed financial systems can bring exposure to best practices that result in institutional strengthening on the part of the host country in important areas such as bank supervision.

In the aftermath of the global financial crisis, however, global bank activities received more extensive critical attention.[3] The crisis painfully demonstrated the dark side of banking globalization: global expansion strategies of banks often did not take due account of the risks involved; global banking organizations reached a degree of complexity that raised the costs of restructuring and resolving failing entities, especially in cross-jurisdictional settings; cross-border expansion was not only driven by the objective of better servicing customers and the real economy but by regulatory and tax arbitrage; some activities led to shock amplification rather than mitigation. Moreover, while access to more favorable external finance terms for large global banks continued to support credit provision, too big to fail subsidies were part of the advantage that overcame some local funding frictions. Implicit funding subsidies, in turn, can allow banks to acquire markets shares at the expense of local banks. In banking, unlike in other industries, the welfare effects of more intense competition are indeed not clear-cut, as there can be a tradeoff between competition and stability.[4] In short: systemic risks accumulated in the financial system. Bank buffers held against risks and frameworks for dealing with the recovery and resolution of failing large global banks turned out to be inadequate.

When systemic risks eventually materialized, the negative consequences of banking crises for taxpayers and the real economy were severe. Implicit subsidies that these banks had enjoyed prior to the crisis became explicit, and governments supported these institutions in various ways. Losses in output were quite persistent; unemployment increased, with particularly long-lasting effects on unemployed younger workers; and concerns about the benefits of globalization and broader negative implications on societies were raised. Enhanced frameworks were established to identify and then induce greater resilience of systemically important global banks. Key elements of the frameworks are to improve risk management and raise risk absorbing capabilities so as to reduce probabilities of failure, and to improve recovery and resolution regimes in the event of failure, thereby reducing failure externalities.[5]

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[3] Some of this discussion is subsumed within the broader debate on the global financial cycle, as reflected in Rey (2013), Rajan (2019), Cerutti, Claessens and Rose (2019) and Goldberg and Krogstrup (2019).

[4] See Buch (2018) for a review of the literature.

[5] See FSB for an overview of too-big-to-fail reforms and their evaluation https://www.fsb.org/2019/05/evaluation-of-too-big-to-fail-reforms-summary-terms-of-reference/

Understanding the range of costs and benefits of global banking, dealing with the trade-offs involved, and considering appropriate policy responses, is thus important. Research on the activities of global banks has exploded in recent years with increased data availability and with important economic and regulatory events facilitating new insights.

In this paper, we review the empirical and theoretical literature on global banking with the objective of detailing some of the newer evidence on such trade-offs and providing relevant perspectives for assessing welfare implications. This type of review is overdue, as earlier insights were based on research and data available through the early 2000s, before many financial innovations and changes in business models occurred, and before more comprehensive micro-level datasets on banking and new empirical tools to explore these data became available. As in Claessens (2017) and Buch and DeLong (2019), we emphasize the importance of balancing lessons based on careful empirical analysis with recognition of key dimensions of heterogeneity among borrowers, lenders, and across activities.

Section 2 provides stylized facts on capital flows intermediated through global banks and other intermediaries, flows of funds between bank and to nonbank counterparties, and flows of funds to final users or to other banks – a financial analogue to growth in international trade around production supply chains. We drill down deeper into the more specific features of the heterogeneity of global banks and their activities, highlighting how the characteristics of banking systems involved in international capital flows have evolved over time.

Sections 3 and 4 review the significant body of empirical literature on the drivers and the effects of global banking. Section 3 focuses on the more structural, longer-term determinants of global banking and its links to the real economy. Evidence based on gravity-type models shows that, despite the formal abolition of capital controls and the broader integration of markets, important frictions for cross-border movements of financial services prevail. These frictions can have implications for the welfare effects of global banking: cross-border financing flows can remain below their optimal level, thus leaving opportunities for financing and risk-sharing unexploited. But capital flows might also be tilted towards instruments which carry relatively lower costs, but which are not necessarily optimal in terms of risk-return tradeoffs. Cross-border equity flows, for example, can have stronger positive features affecting growth, innovation and risk-sharing.

Section 4 looks into the more volatile and cyclical nature of global banking, considering how global banks affect international risk sharing and shock transmission. This work informs about the prevalence of broader cycles, as well as surges and retrenchments of capital flows. It is foundational for understanding the shifting importance of drivers of capital flows related to host countries versus global factors such as monetary policy in advanced economies, global growth, and risk features of the global financial cycle. This section also discusses the

important lessons that result from research using bank-level data.[6] This research, particularly highlighting work of the International Banking Research Network (IBRN), details the mechanisms and magnitudes of shock transmission through global banks. One important finding is that higher levels of bank capitalization, and more substantial buffers, support the international provision of credit through global banks while reducing the amplitude of transmission of shocks across borders.

Section 5 concludes with perspectives on the policy environment for global banks and on next steps for research. The actions of globally active banks are consequential, both during their lifetimes and at times of stress. During the more normal operations of global banks, extracting more of the range of benefits is supported by policies that mitigate negative externalities and to ensure sufficient resilience to shocks. Effective stress testing and (macro)prudential policies that target the build-up of systemic risks are important elements of such a policy framework. The response of banks and supervisors during the Covid-19 pandemic reinforced the importance of having built greater resilience prior to the many stresses that manifested in the first quarter of 2020. Another general lesson arises in preparing for global banks (as well as other large banks) that might fail. The policy environment had recognized the need to prepare for and place extra emphasis on appropriately crafted recovery and resolution frameworks. These frameworks reduce the negative externalities from failure when a large global institution is no longer viable, including the provision of critical banking activities.

Overall, we conclude that fully reaping the benefits of globally active banks requires support by appropriate regulation, cross-country policy collaboration and coordination. Good policy frameworks are needed to help recognize the benefits of global banking activity where they arise, but also to guide surveillance of financial stability risks and to evaluate the effects of such policy measures. Both research and policymaking around global banking benefit from improved infrastructures around collection of and access to granular data and repositories of evaluation studies.

In terms of research, we emphasize the need for a better understanding of the two main aspects we stress. First, more work is needed on the longer-term linkages between global finance, international trade, and real economic activity development. Structural financing needs could arise from demographic and production-related changes, or for example from broader impacts around climate change and migration. Research could focus more on frictions and constraints that affect the costs and benefits of internationalization. To give an example: understanding the evolution of global value chains in production and the risks involved is important, but little research to date links globalization of trade to risk sharing

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[6] Often, these datasets are confidential and can be used with special permission only. Central banks are increasingly making these data available also for external researchers. INEXDA is a network of central bank research centers that promotes data sharing. For details, see Bender et al. (2018)

through global banks. As the integration environment for trade evolves, it is likewise possible that the structure of international finance – as well as the related welfare consequences – evolves in turn. Second, research should more explicitly model and introduce heterogeneity in global financial intermediation. How global banks – as well as nonbanks – contribute to risk sharing or propagation depends on bank balance sheets, business models, and the regulatory environment. Linking the significant body of micro-level research on global banks to macroeconomic outcomes remains a challenge that should continue to be addressed.

2 Changing patterns of global banking: Stylized facts

Capital flows that cross borders, that finance international trade or large-scale infrastructure projects, are certainly not only a feature of modern times. Yet, what has changed over the past decades is the shift away from "one-way" capital flows from capital-rich to capital-poor countries towards "two-way" capital flows between higher income countries. This shift has also been associated with a declining role of global banks in intermediating financial flows as nonbank financial intermediaries have expanded. This Section documents both the broad patterns in aggregate data as well as the rich insights that studies based on micro-data can provide.

a. The aggregate picture

Global financial integration through gross capital flows increased significantly in the past decades. Flows intermediated through global banks play an important role. The global stock of other investment assets, which include mainly cross-border loans and trade credit, increased from slightly below 6% in the early 1990s to a peak of over 43% of global GDP in 2018.[7] At the same time, two-way gross capital flows, coined as "diversification finance" by Obstfeld and Taylor (2004), increased more strongly than "development finance", one-way net capital flows which transfer net resources across countries in response to changes in investment opportunities. Even in cases where net capital flows are (close to) zero, such as between advanced market economies with similar growth trends, positive two-way gross capital flows occur and contribute to international risk sharing and the types of surges and waves in international financial flows as documented by Forbes and Warnock (2012).[8]

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[7] These numbers have been calculated relative to global GDP in 2018 and are based on the Balance of Payments Statistics of the International Monetary Fund.

[8] Theoretically, higher rates of return abroad should trigger net capital flows from the home to the foreign economy. Empirically, however, this is not always the case. The reasons for the lack of responsiveness of net capital flows – the "Lucas Paradox" – have been widely discussed in the literature. See Gourinchas and Jeanne (2013) for a discussion.

These high-level patterns in international capital flows are illustrated in Figure 1, which shows the composition of gross inflows to advanced economies and emerging markets since 1990. [9] Portfolio investment and foreign direct investment plus other investment flows – inclusive of bank lending – have changed in relative importance over time. While all forms of financing surged in gross terms prior to the Global Financial Crisis (GFC), the growth and subsequent collapse of the "other" investment category (comprising flows intermediated through banks) was particularly pronounced during the crisis. Within cross-border capital flows, portfolio debt and bank flows tend to be more volatile than FDI flows especially for emerging markets (Pagliari and Hannan 2017).

Figure 1: Composition of Annualized Gross Capital Flows for Advanced and Emerging Economies (1985 Q1—2019 Q3)

The composition of borrowers – sovereign, banks, or private nonbank – financed by international bank flows also evolved over time (Figure 2). Historically, global banks often served as a means of sovereign finance. They then shifted towards following multinational firms to provide financial services. More recently, global banks increasingly intermediated capital flows financing banks and nonbank counterparties. Beyond traditional lending and trade finance activities, global banks also provide cash management and investment services to customers.

Figure 2: Composition of Cross-Border Bank Claims by Borrower Type, for Advanced and Emerging Economies (1985 Q1—2019 Q4)

In line with these shifts in the composition of counterparties, the conventional wisdom in the 1990s was that market shares of foreign banks in private-sector finance and host countries were small, mostly reflecting the globalization of trade and multinationals. Indeed, the importance of this type of global banking activity grew on par with growth of international trade until the pre-crisis decade. Global banks often expanded their footprints internationally by building significant market shares in many countries, often driven by bank privatization in emerging markets and by broader acquisition strategies implemented across advanced economies. In the mid-1990s, market shares of foreign banks stood at 16% of total assets on average for developing countries and 15% for high-income countries. By 2012-2013, these numbers had increased to 43% and 36%, respectively (Cull, Martinez Peria, and Verrier 2017).

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[9] Within the BIS data, the Advanced Economies grouping is: Australia, Austria, Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Netherlands, New Zealand, Norway, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States. The Emerging Markets grouping is: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech Republic, Hong Kong, Hungary, India, Indonesia, Israel, South Korea, Kuwait, Lebanon, Malaysia, Mexico, Mongolia, Nigeria, Peru, Philippines, Romania, Russian Federation, Saudi Arabia, Singapore, South Africa, Thailand, Ukraine, Uruguay, Vietnam.

Even within these country groups, significant heterogeneity characterizes the role of foreign banks: market shares of foreign banks ranged from highs of 86% of total assets in Luxembourg to around 3-4% in Germany and Japan (CGFS 2018). Furthermore, the globalization of banking is not an observable feature of all kinds of banking business. In the Eurosystem, for example, retail banking remains a largely domestic business, despite a significant degree of institutional and regulatory convergence associated with the Single Market Programme and, more recently, the Banking Union.[10] The period following the financial crisis has witnessed even a withdrawal from foreign markets.

The share of global banks in retail banking has not been affected much by the financial crisis. Figure 3 shows the share of assets held by foreign banks in the domestic banking system pre- (2000-2008) and post-crises (2009-2016). In most countries the share of foreign banks hardly changed.

Figure 3: Foreign-Owned Banks' Share of Host Banking System Assets, Advanced and Emerging Economies

As foreign banks increased their physical presence in host locations, the share of local claims in the total of local and cross-border flows increased. In Figure 4, this share peaked around 45 percent in 2017 and in 2005 in both advanced and emerging economies.

Figure 4: Composition of International and Local Claims, Advanced and Emerging Economies (2000 Q1—2019 Q4)

Given these differences in the importance of foreign banks across countries and across specific activities, and the different dynamics over time, understanding the drivers of global banking services is important. It can provide insights into welfare effects in terms of contributing to international trade, responding to local and foreign shocks, and managing liquidity across full global banking conglomerates through internal capital markets.

Indeed, while banks from OECD countries still dominate global banking markets, they have lost market share to non-OECD banks and to home banking systems that were ex-ante better capitalized and less impacted by the crisis. Geography mattered for these adjustments: Banks tended to withdraw from crisis countries and tighten engagements with more important trading partners. Also, there has been a tendency to lend to geographically closer regions. Banks from countries that were particularly hit by the crisis and with relatively low ex-ante risk absorbing capacity slowed lending or withdrew more from foreign markets, while other institutions acquired the assets that those banks sold. Asian-based banking

[10] See the financial integration indicators published by the ECB: https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/financial_integration/html/index.en.html

organizations picked up a larger share of overall emerging market finance in the post-crisis years.

While global banks historically dominated international credit provision, recent history is characterized by much greater roles of nonbank financial institutions. The latter institutions, including pension funds, mutual funds, and insurance companies, provide market-based and bond financing to some of the same types of borrowers previously reached by global and local banks.

The shift away from bank towards market-based and bond finance has been significant. Figure 5 shows that growth rates in international debt securities have been persistently higher than those of global bank flows. The shift was dubbed the "second phase" of global liquidity by Shin (2013) with accompanying arguments that new risks and frictions require monitoring. Whereas financial stability risks of global banking are highly correlated with the leverage of these institutions, vulnerabilities of market-based financial flows are associated with pro-cyclicality, interconnections with the banking systems, or governance mechanisms and incentives of asset managers. At the same time, nonbank financial intermediaries remain highly connected to banking systems, thus requiring an understanding of these linkages for the transmission of shocks.

Figure 5: Components of Global Liquidity Growth Rates for Advanced and Emerging Economies (2000 Q1 – 2019 Q4)

Examination of international flows of funds data underscores that different types of financial institutions cannot be viewed in isolation (FSB 2019).[11] Banks are quite important for the rest of the financial system through both their assets and liabilities. Intra-sectoral linkages within the banking sector are important, and banks are tightly connected internationally. However, other financial institutions are likewise highly connected across borders while insurance corporations and pensions funds have a more domestic portfolio structure.

b. Volatility of global liquidity

Global liquidity, which is the ease of financial flows in global financial markets, has two main components: cross-border loan and bond flows. Analysis of these components using BIS data shows that the features of respective types of flows have shifted over time. Funding flows to bank borrowers tend to be more volatile than direct funding to nonbank borrowers. This relative ranking is similar for advanced economy borrowers and those from emerging

[11] The following information is based on Exhibit 3-2 from the 2019 non-bank financial intermediation monitoring report of the FSB. These data include cross-sectoral linkages within the financial sector.

markets (Table 1).[12] Some of these patterns have changed in the period following the global financial crisis. Cross-border bank lending became more sensitive to macroeconomic shocks or policy changes, with changes being most pronounced for weakly capitalized and smaller banks. The different abilities of banks to buffer shocks has led to an adjustment of market structures. In particular, banking systems with higher capital ratios, larger shares of deposit funding, and a greater role of local affiliates in lending gained market shares.

Table 1: Global Liquidity Growth Rates for Advanced and Emerging Market Borrowers (2000 Q1—2018 Q4)

The shift from cross-border activity to locally hosted foreign bank affiliates in the form of branches and subsidiaries also raises the issue of how global banks manage liquidity across affiliate locations, with consequences for sustaining credit provision.[13] Liquidity management is often achieved through borrowing and lending across related locations within the global bank, otherwise known as internal capital market or intrabank flows.

In recent periods, magnitudes of international intrabank liquidity flows reached levels comparable to *inter*bank flows. Using data available since 2014Q1, Table 2 shows the patterns of growth according to the type of borrower: unrelated banks, related banks, and private nonbanks. During this post-crisis period, mean quarterly growth rates of claims to related banks were higher than those to unrelated banks and to private nonbanks for both advanced and emerging market countries. The variation of claims on private nonbanks was relatively low. Volatility of flows was highest for unrelated banks in advanced economies, and highest for intrabank flows in emerging markets. One interpretation of these patterns in the data is that banks try to maintain business operations with those counterparties in which they have invested a larger degree of informational and relationship capital.

Table 2: Cross-Border Claims Growth Rates by Counterparty Sector for Advanced and Emerging Economies (2014 Q1 – 2019 Q4)

c. Insights from micro-data

Understanding the drivers and potential welfare effects of global banking requires pulling aside the curtain of aggregate data and looking into bank-level and banking system heterogeneities.[14] A starting observation is that global banking is highly concentrated across

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[12] Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020a, 2020b) show the changing drivers of volatility in global liquidity flows and the role of different types of institutions.

[13] Examples of liquidity management through global banks, and consequences, include Cetorelli and Goldberg (2011, 2012a, 2012b and 2012c) and McGuire and von Peter (2016).

[14] Following the seminal work by Peek and Rosengren (2000, 2005) and Klein, Peek, and Rosengren (2002) that identified effects of shocks to the Japanese economy on real activity in the United States and for foreign direct investment, a large body of research has in fact developed that studies the cross-border transmission of shocks using bank-level data.

countries and across institutions. The cross-border banking data reported by the Bank for International Settlements contain more than 4,800 bilateral linkages, only 2.4% of which are larger than $50 billion in size, and around 50% of which are smaller than $100 million (Aldasoro and Ehlers 2019). The distribution of global bank assets reflects the very uneven distribution of country sizes but also the very uneven distribution of banks of different sizes within countries. Bank sizes typically are characterized by many small and a very few very large institutions that also dominate international activities.[15]

These market structures are rooted in different institutional settings and regulations of domestic banking markets and different degrees of integration of non-financial firms into the global division of labor. The German banking system, for example, has a three-tier structure of smaller and regionally active savings and cooperative banks (the former being publicly owned), and larger private banks which have traditionally dominated international activities. The US banking system has many small banks that serve local communities, while the fewer very large banking organizations are more focused on a range of financial services that go well beyond traditional banking.

Generally, differences in size also have implications for the effects that individual banks can have on the financial system. Banking regulations take explicit account of the systemic risk of large financial institutions. In 2011, 29 banking organizations were thus designated as being systemically important for the global financial system (GSIBs), with this number rising to 30 by 2019.[16] These banks have to have higher capital buffers than smaller banks, maintain additional bail in debt (Total Loss Absorbing Capacity TLAC), are subject to higher supervisory expectations, and face specific requirements in the context of new regimes on the recovery and resolvability of systemic financial institutions. In addition, the Basel Committee defines frameworks for the designation of domestically systemically important institutions (DSIBs).[17]

Large global "banks" are often broad conglomerates, comprising bank and nonbank affiliates. Recent analytical work across the International Banking Research Network, building on Cetorelli and Goldberg (2014) and Goldberg and Meehl (2020), uses regulatory reporting information on conglomerate structures to highlight the importance of organizational, business, and geographic complexity and relate these features to risk outcomes.[18] As the examples of the United States and Germany provided in Figure 6 show,

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[15] Bremus, Buch, Russ, and Schnitzer (2018) model granularity effects in banking, based on previous research for non-financial firms by Gabaix (2011). Amiti and Weinstein (2018) show the relevance of granularity effects for Japanese banks. Buch, Koch, Kötter (2011) document the size dispersion of German banks' international activities.

[16] The list of global systemically important that the Financial Stability (FSB) designates in consultation with the Basel Committee for Banking Supervision is given here: https://www.fsb.org/wp-content/uploads/P221119-1.pdf

[17] See BCBS (2014), https://www.bis.org/publ/bcbs233.pdf

[18] See https://www.newyorkfed.org/ibrn for details and cross-country evidence.

the largest and most complex banking organizations span thousands of legal entities worldwide, engage in many broad lines of business, and span many locations.

Figure 6 Organizational, Business and Geographic Complexity of US and German Banking Organizations (2005—2018)

Global banks differ greatly in their business models and in their capacity to absorb risk. The magnitude of shocks transmitted through claims of global banks depends on a number of bank-specific factors such as the size of institutions, degrees of bank capitalization, reliance on stable funding sources, extent of global liquidity management, mode of operation in hosted markets, and balance sheet funding mismatches. [19] This bank-level heterogeneity also affects their ability to provide services across countries.

Global banks provide services to customers through different modes of entry, both due to legal and regulatory requirements of host countries, and due to efficiency and specialization considerations across competing banks. These modes include supplying services through cross-border flows, through branches that are legally part of the parent bank and regulated accordingly, or through subsidiaries that are separate legal entities in a host market with locally held capital and liquidity. These different modes of entry also have implications for the stability of lending patterns. Data compiled by Claessens and van Horen (2013) show that foreign bank presence through branches and subsidiaries remained quite resilient during the financial crisis, while cross-border lending tended to contract.

Parent banks that enter foreign markets with subsidiaries tend to be larger than those that enter via branches, and their subsidiaries tend to be larger than branches (Fillat, Garetto and Smith 2018). Moreover, different types of affiliates exhibit distinct behavior during stress periods: branches are more subjected to flighty deposits in stress periods, such as during the European sovereign debt crisis. Comparing growth in lending since 2014, loans extended by branches grew faster and were more volatile than loans extended by hosted subsidiaries in both advanced economies and emerging markets (Table 3).

Table 3 Local Claims Growth Rates by Hosted Foreign Bank Type in Advanced and Emerging Market Economies (2014 Q1 – 2019 Q4)

3 Global banking and the real economy

Assessing the balance of benefits and costs of these changing patterns of global banking is not easy. In fact, a debate about the growth-finance-nexus and the direction of causality continues even at the domestic level: are finance and the structure of the financial system

[19] For details, see Sections 3 and 4.

conducive to growth – or do economies that grow faster have a better financial system?[20] Indeed, empirical evidence suggests that the link between financial openness and growth is indeed non-linear (Kose, Prasad and Taylor 2011).

Empirical evidence shows that the costs and benefits of banking integration can take various forms. On the one hand, foreign lending can improve access to finance and increase real growth, net of the competitive reaction of local lenders, across a wide sample of advanced and developing economies (Bruno and Hauswald 2014). A well-functioning financial system can thus contribute to productivity and growth. On the other hand, empirical studies also show that higher debt and poor regulation can lead to excessive growth of the financial system (Arcand, Berkes and Panizza 2015, Beck 2014a and 2014b, Demirgüc-Kunt and Levine 2009). Moreover, the real consequences of entry by foreign banking organizations depends on whether this occurs through cross border loans, which increase competition among banks in the host market, or through acquisitions of existing banks, which generate weaker competitive gains and efficiency improvements (de Blas and Russ 2013).

We do not review the extensive literature on this issue here, but rather focus on specific aspects of global banking – namely its implications for foreign trade and the global management of liquidity. The facilitation of trade can be an important channel through which international banking flows affect the real economy. Banks can contribute to the financing of trade or local investment, thus promoting growth. However, if these flows become disrupted during sudden stops, the real economy can be adversely affected.

Advances in the modelling of international trade such as gravity models and models analyzing firm-level heterogeneity have contributed to a better understanding of international banking. Higher frequency drivers of flows, which are also pertinent for themes around the global financial cycle, are explored in Section 4 where we focus on risk sharing and international shock transmission.

While we do not discuss macroeconomic models of global banks in detail in this paper, promising new approaches imbed features of banks into general equilibrium models. Cacciatore, Ghironi, and Stebunovs (2015) model, for instance, the implications of the deregulation of interstate banking in the US for macroeconomic dynamics and competition in banking markets. Similar mechanisms are at work after a deregulation of bank entry across national borders. Faia and Ottavanio (2017) have a macroeconomic model of the link between deregulation and risk-taking incentives of banks. De Blas and Russ (2015) focus on different modes of entry of banks into foreign markets such as FDI or cross-border lending and the effects on output, current account imbalances, and markups.

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[20] Carrè und L'Oeillet (2018) review the empirical evidence on the finance-growth nexus.

a. Global banking, international portfolios, and the gravity model

Foreign trade requires funding: firms that operate globally, trade intermediate or final products across borders, or maintain foreign production or distribution facilities, require funding. Funding needs can be of a longer-term nature if larger-scale investments are involved, or they can be of a shorter-term nature when it comes to raising working capital and generating letters of trade credit. The provision of financial services to customers may also be used to support the broad activities of multinational companies in the locations where they produce or sell products.[21]

The specific role of finance changes as patterns of globalization of non-financial firms change. Baldwin (2016), for instance, documents changing trends in globalization of the corporate sector, including a lengthening in global value chains. This type of structural change in production internationally is likely to affect banking globalization: new risks emerge, new funding and investment locations enter the scene. For example, if globalization of firms primarily takes the form of domestic production and sales on foreign markets, risks related to production are primarily related to shocks hitting the domestic and foreign economies. If however, firms increasingly use global markets not only to sell outputs of wholly domestically produced goods but also to sell outputs of intermediate goods and to source inputs, it becomes increasingly difficult to trace the exposure of production to country-specific shocks. As global production chains may span several countries, the types of shocks to which production is exposed may further change. There might be "weak links" in those chains that expose the entire production process to shocks of a very different nature compared to business cycle events. The closure of foreign plants because of strikes, disruptions in logistics, or other idiosyncratic events may matter. This, in turn, has implications for the risks that need to be insured through financial markets and the exposure of global banks to these risks.

Academic research has responded to the changing patterns of globalization by employing a work-horse model for the analysis of global trade – the gravity model – first to understand the globalization of non-financial firms. In international trade, models that link patterns of bilateral trade between two pairs of countries to country size and the inverse of geographical distance very robustly fit patterns in the data.[22] Applying gravity models to patterns of financial globalization as well shows that geographic factors, such as distance, cultural factors such as language, and regulations have an important impact on global equity flows or banking flows. Studying the impact of distance on lending indeed follows a long tradition in the literature on banking relationships. Recent evidence shows that the distance

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[21] Multinational manufacturing firms often maintain affiliates providing financial services abroad (Buch, Kleinert, Lipponer, and Toubal 2015).

[22] See Brei and Von Peter (2018) for a recent review of the literature.

between banks and borrowers varies over the cycle, with implications for risk-taking (Granja, Leuz, and Rajan 2019).

Portes and Rey (2005) use data on bilateral gross cross-border portfolio equity flows between 14 countries, spanning the years 1989–1996. Hence, their data precede the recent period of a rapid increase in cross-border financial flows. Similar to the trade literature, they find that cross-country financial flows depend – positively – on the size of markets and – negatively – on the distance between two countries. Depending on the specification chosen, the distance coefficient ranges from -0.5 to -0.8 in their baseline model, meaning that an increase in distance between countries by 1% lowers bilateral equity flows by 0.5 to 0.8%. Costs of trading, which reflect both information costs and technology, matter as well. More traditional channels capturing international portfolio diversification find, however, weaker support in the data.

Similar gravity models have been estimated using banking data.[23] Buch (2005) surveys the literature and uses data from the BIS locational statistics for 5 reporting countries and 50 host countries for the years 1983 through 1998. Her estimates of the distance coefficient range from around –0.3 to –1. Overall, these estimates are surprisingly similar despite the different markets and activities that are presumably served by portfolio equity investors and banks – and thus the different frictions involved.

In a more recent application, Norring (2019) uses a gravity model to study the cross-border implications of domestic macro-prudential policies through international bank lending. Using a cross-country dataset for almost 160 countries, she finds that effects differ across advanced economies and emerging markets, and she relates this to different potentials for regulatory arbitrage. Also, spillovers of prudential policies through cross-border lending are stronger for measures targeting financial institutions than for measures targeting borrowers.

This literature shows that distance and geographic factors more broadly impact global financial flows not only because of physical transportation costs but also as they relate to information and regulatory costs.[24] These quantitative insights are valuable and consistent with some recent theoretical work on gravity models and international portfolio choices, as in Martin and Rey (2004). Okawa and van Wincoop (2012) argue that gravity equation specifications need to be grounded in complex non-linear equations that relate bilateral asset holdings to all bilateral financial frictions. Yet, even when taking this issue into account, measures such as country size or asset return risk still find empirical support.

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[23] See, for example, Buch (2003).

[24] Separate literatures relate distance to information costs in global banking, including Brei and von Peter (2018), or study the response of international bank flows to changes in regulation (Houston, Lin and Ma 2012).

Additional theoretical arguments underpin the empirical findings that gravity models fit international banking data quite well. Differences in relative factor endowments across countries and in the efficiency of banking sectors can lead to patterns of foreign bank asset and liability holdings that resemble those found in gravity models and that are consistent with the observed heterogeneity in foreign bank activities (Niepmann 2015). Larger – and presumably more efficient – parent banks tend to open and operate subsidiaries rather than branches, with the subsidiaries serving as larger and more stable lenders. This finding is in line with empirical work such as by Fillat, Garetto, and Smith (2018). A complementary theoretical approach explaining the geography of global banking models negotiations between banks and borrowers over loan characteristics such as maturity and collateral. As loan terms involve costs that go beyond merely the interest rate, loan offers can differ across jurisdictions, again leading to patterns in the data consistent with gravity models (Brüggemann, Kleinert, and Prieto 2012).

Recent theoretical work studies the international expansion of banks, and in particular the entry decision, by focusing on its implications for risk-taking.[25] Faia and Ottaviano (2017) provide such a framework. In their model, multinational banks compete for retail deposits and loans in several jurisdictions. Multinational banking can reduce risk-taking by promoting local competition. Key to their results is a trade-off between, on the one hand, the increase in banks' profits through larger scale and, on the other hand, the compression of the spread between the loan and the deposit rate. In equilibrium, multinational and domestic banks co-exist. Globalization is modelled as the decline or even complete removal of costs of banks' activities in foreign markets, which leads to an increase in banks' foreign market shares. Banks fund their foreign operations by raising local deposits.

Faia, Ottaviano, and Sanchez Arjona (2017) bring this model to the data by using a panel of 15 globally active banks over a horizon of 10 years, instrumenting for the observed geographic expansion of banks with the prediction of a gravity model. They find that there is a strong negative correlation between bank risk (proxied by CDS spreads and loan loss provisions) and foreign expansions. But expansions decrease riskiness only if competition in the origin country is less intense than competition in the destination country. Adams and Gramlich (2014) model the choice of banks to enter a "foreign" market within the United States, focusing on regulatory and macroeconomic considerations. They show that declines in entry rates across this period were mainly attributable to weak macroeconomic conditions and low interest rates.

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[25] Some research on intra-national finance, with bank expansion and credit provision across borders, potentially maps to inter-national financing. van Wincoop (2000) recognized this potential early on in an edited volume with Gregory Hess and in work on the US (Athanasoulis and van Wincoop 2001) and on Japan (Iwamoto and van Wincoop 2000).

Generally, the coexistence of global and local banks reflects comparative advantages that these institutions possess in terms of generating and assessing local information needed for the provision of lending services and tapping domestic versus global sources of funding. Globally active banks can exploit economies of scale and scope, but some of their competitive advantages may also stem from funding cost advantages. To the extent that these advantages are from too big to fail subsidies, a general concern has been that large global banks may thus expand their activities and risk-taking beyond the socially optimal scale (Hughes and Mester 2014). The specific choice of entry into foreign markets – through branches or subsidiaries – in turn, reflects bank-level organizational choices as well as regulatory considerations, including incentives affecting the type of permissible activities, the strength of liquidity and capital regulation through home versus host authorities, and tax regimes (Cerutti et al. 2007; Fiechter et al. 2011).

b. Financing global trade

The importance of finance for global integration of the real economy has implications for our understanding of the welfare effects of global banking. Few papers directly link patterns in global trade and banking, despite the early lessons about finance following trade internationally before expanding next to serve more local customers and later in short term interbank financing.

A recent contribution by Brei and von Peter (2018) simultaneously model real and financial linkages between countries. This work targets solving the “distance puzzle”: despite advances in technology and a reduction in transportation costs, distance has a significant impact on bilateral linkages across countries. An estimated coefficient on “distance”, of -1, for example, implies that bilateral trade or financial flows with a country nearby are twice as large as with a similar country located at twice the distance. Apparently, “distance” captures frictions that are unaccounted for by other variables in empirical models, such as information costs or differences in regulations. Earlier research attributed these findings to specific features of international markets. However, more recent work shows that the distance puzzle disappears when accounting for domestic distance or domestic credit: distance matters in cross-border activities, but it also matters domestically. Information frictions that are correlated with distance thus seem to matter even if pure transportation costs are small and even if there are no large cultural differences across regions.

Other econometric work shows the importance of financial frictions for trade (Manova 2013). More financially developed countries with more advanced financial institutions export larger quantities and a wider range of products, while having more trading partners and also entering into smaller markets. Niepmann and Schmidt-Eisenlohr (2017) explore the role of trade finance through letters of credit, showing that the highly concentrated

geographic supply by US firms is a clear channel for idiosyncratic bank stresses to generate localized disruptions of trade activity.

Narrative historic evidence supports the interpretation of distance in terms of information frictions and the importance of simultaneously studying the globalization of financial and non-financial firms. In an account of the globalization of the Swiss economy, historian Haller (2019) documents the importance of transit trade: despite its relatively disadvantageous land-locked location, firms based in Switzerland have played an important role for global transit trade in goods and raw materials over centuries. Swiss trading firms benefited from their close global information networks across countries and across sectors, which provided information on rules and regulations, cultural norms, and economic developments. Close linkages between banks and other multinational firms facilitated the globalization of the Swiss economy. At the same time, tracing the links between real and financial flows in the data is difficult, given the complex nature of multinational firms (Haller 2019: 374).

These studies suggest that research that tries to look at the features of global banking in an even more granular way than research has done so far can be promising. Credit registry data, for instance, can provide important insights into the links between banks and firms, in particular in terms of foreign expansions.[26] Some of the relevant linkages may not even be visible in credit registry data but require analysis of structures of multinational firms and the links within firms.

c. Abrupt swings and special liquidity facilities

Global banking can be particularly harmful for local economies if it is disrupted. Episodes of abrupt re-assessments of economic conditions, investor panics, and herd behavior can lead to reversals of capital flow or “sudden stops”. Forbes and Warnock (2012) document that extreme movements of capital flows are mostly driven by global factors such as risk aversion and economic uncertainty. This also explains why such episodes can be highly contagious and costly.[27]

It is indeed important to distinguish fluctuations during normal and more tranquil market periods from those during financial crisis. Kalemli-Ozcan, Papaioannou, and Perri (2013) show that, outside of financial crises, bilateral global bank linkages are associated with more divergent output cycles, while during the global financial crisis, shocks to global banks played an important role in co-movement, triggering and spreading the crisis. Amiti, McGuire and Weinstein (2019) use banking system aggregates to show that during non-crisis years,

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[26] See Cantú, Claessens, and Gambacorta (2019) for recent work using credit registries for Latin American countries.

[27] Claessens and Kose (2013) provide a rich discussion of types of financial crises, with explanations and implications. Laeven and Valencia (2018) provide details around banking crises, policy responses, and outcomes updating and extending the earlier work and analyses of their System Banking Crises database.

international bank flows are well explained by a common global factor, while in crisis periods flows are mainly driven by idiosyncratic shocks to borrower and creditor banks.

Costs of financial crises that are associated with large swings of global capital flows can indeed be severe. Historically, GDP dropped in the decade following financial crises by 7.5-10% on average (Cerra and Saxena 2008, Teuling and Zubanov 2014),[28] and thus by more than after normal recessions (Jordà, Schularick and Taylor 2013, 2015). Real output losses can be particularly severe following bubbles in real estate markets which are fueled by an expansion of credit (Jordà, Schularick and Taylor 2016). Unemployment increases, and entry of younger workers into the labor market is delayed (Malmendier and Nagel 2011). Public debt increases — in the past, often to excess — as a result of support to failing financial institutions, higher social spending, and fiscal stimulus packages (Reinhart and Rogoff 2009). Part of this dynamic has been attributed to excesses that propagated through and were amplified by banks.

While "sudden stops" were, prior to the global financial crisis, mostly associated with emerging market economies, the global crisis led to dollar funding shortages and massive reversals in capital flows into advanced economies such as some European countries. Some of the dollar funding shortages were met through special liquidity facilities established across central banks. Following extensive use of the U.S. Federal Reserve's discount window by global banks with branches in the United States, with dollar liquidity then transferred abroad to parent organizations, central bank reciprocal currency arrangements (dollar swap lines) were shown to have been important in stemming some of the consequences of funding disruptions internationally.[29] Cetorelli and Goldberg (2011; 2012a, b, c) show that liquidity management across entire banking organizations distributes the real effects of the shocks.[30]

Other critical mechanisms activated in response to this liquidity shock and associated stress in the financial sector include the Vienna Initiative, in which banks committed to maintain liquidity to affiliates in Eastern Europe, and the massive liquidity assistance programs within the Eurosystem. While countries in the euro area could access liquidity provided by the

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[28] Results by Teuling and Zubanov (2014) are based on a sample of 99 countries for the years 1974-2001. Using a sample of 190 countries for the period 1960-2002, Cerra and Saxena (2008) find a decline of 7.5% over a 10 year period.

[29] See Goldberg and Skeie (2011) for a discussion of the use of the discount window by foreign banks in the United States, and Goldberg, Kennedy and Miu (2011) on the central bank dollar swap lines and dollar funding costs. See Aizenman and Psricha (2010), Aizenman, Jinjarak and Park (2011), and Bahaj and Reis (2018) for studies of consequences.

[30] Following adverse bank-specific shocks, stressed parent banks may contract lending at home and abroad. Credit provision in home market is protected relative to foreign lending, with a further pecking order in how bank credit contracts to foreign markets. Cross-border lending is often more volatile than lending by hosted bank branches and subsidiaries. Also, the reallocation of liquidity to affiliates abroad is driven by bank-specific priorities. Internal capital market flows thus stabilize credit activity in some cases, and generate volatility in others.

Eurosystem, European countries that pegged their currencies against the euro but, in the period under review, remained outside the Eurosystem could not. Because of the fixed exchange rate regime, neither group of countries could respond immediately to the liquidity shock through a devaluation of their currency. Hence, the necessary adjustment to the shock had to take place internally. Buch, Buchholz, Lipponer, and Prieto (2017) analyze whether liquidity provision by the Eurosystem affected the pattern of internal adjustment after the global financial crisis. They find that liquidity provision by the Eurosystem has reduced adjustment in real unit labor costs and real wages, especially in financially vulnerable sectors. Financially vulnerable sectors with access to central bank liquidity increased prices by a smaller amount relative to financially vulnerable sectors without liquidity support.

Abrupt liquidity needs of global banks and the potential importance of global liquidity management were likewise a feature of the financial strains that arose in March 2020 with the Covid-19 pandemic. As one example, large changes occurred in the balance sheets of the U.S. branches of foreign bank organizations (FBOs) that are important credit providers to U.S. based corporate customers. As discussed in Cetorelli, Goldberg and Ravazollo (2020), many of these branches had sizable usage of committed credit lines by U.S. based clients, resulting in increased funding needs. The branches of FBOs from countries that are part of the network of standing swap central banks (SSCBs) with the Federal Reserve, met their increased funding needs by dollars that flowed into the U.S. through their foreign parent banks.

4 Global banking and shock transmission

So far, we have emphasized the longer-term structural drivers of global banking. Yet, cyclical and risk-sharing considerations are important components of any framework for assessing benefits and costs. Capital flow volatility has been richly studied in relation to the volatility of real output and of consumption. One empirical tool commonly used in this literature are models of consumption risk sharing, which specify the volatility of consumption as a function of financial openness and the volatility of output. The estimated correlation of consumption with domestic output can be reduced by international risk sharing, which would be reflected in capital flows, or ex-post through price adjustments and *stocks* of cross-border asset holdings, even if capital flows would not change.[31] Research shows that the potential gains

[31] To see this, consider a two-country setting in which residents hold claims vis-à-vis each other in the form of debt and equity capital. If a negative shock hits country A, thus leading to a decline in profits of companies located in country A, equity owners in country B (and in country A, of course) are immediately affected through lower dividends and a decline in the value of their assets. Creditors to country A residing in country B are affected only if the shock is sufficiently severe so that even interest payments have to be suspended. The income of residents in country A and B that hold equity claims on firms in A declines. *Ceteris paribus*, there is effective consumption risk sharing, but this would *not* be reflected in capital flows across borders.

from holding a diversified international portfolio to diversify aggregate national consumption risk are positive but highly model and parameterization dependent.[32]

This type of risk sharing relates to, but is not synonymous with shock transmission across heterogeneous countries and through heterogeneous global banks. What matters for welfare is the pro-cyclicality of capital flows and the potential of capital flows to amplify shocks. Capital flows may react to the realization of shocks and exacerbate their impact. Countercyclical capital flows might facilitate precisely the risk sharing that is needed to insure consumers against fluctuations in output. Empirically though, capital flows are indeed often pro-cyclical, thus aggravating the effect of output shocks on consumption (Prasad 2014). Another amplification channel is related to the structure of the domestic financial system. In the presence of frictions on domestic capital markets, inflows of capital from abroad can exacerbate the domestic business cycles, which leads to an increase in the volatility of domestic consumption (Aghion, Bacchetta, and Banerjee 2004).

In this section, we present results organized around different host market, global, and bank-specific shocks that influence the balance sheets of banks. Accumulated insights on the pro-cyclicality of (bank and nonbank) flows come from experiment designs using distinct levels of data aggregation, various forms of banking systems, and heterogeneity across specific banking organizations. This heterogeneity covers the array of business models adopted by global banks as well as time-specific balance sheet characteristics cross-sectionally and over time. For instance, some banks focus on the provision of specialized financial services for globally active firms, and others on a broader span of wholesale or retail financial services.

We primarily discuss the questions that have been explored in the cross-country coordinated initiatives of the International Banking Research Network (IBRN), and also evidence on the importance of internal capital markets in global banks. In the IBRN, central bank researchers and international organizations use confidential bank-level datasets based on a common research methodology to better understand activities of global banks.[33]

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[32] For OECD countries, van Wincoop (1999) estimates gains from risk sharing through diversified portfolios to be equivalent to a permanent increase in tradable goods consumption in the range of 1.1 to 3.5% over a 50 year horizon, and 2.5 to 7.4% for a 100 year horizon.

[33] For details on the *International Banking Research Network*, past and current projects, membership, and associated data projects, see the IBRN website maintained by the New York Fed (https://www.newyorkfed.org/ibrn). A series of initiatives conducted are focused around Liquidity risk transmission (*IMF Economic Review* 2015), prudential policies (*International Journal of Central Banking* 2017), monetary policy spillovers (*Journal of International Money and Finance* 2019), and the interactions between monetary and prudential policies (*Review of International Economics forthcoming*). Work on the risk consequences of the complexity of banking organizations will appear in the *Journal of Banking and Finance*.

a. International transmission of liquidity risk[34]

In the post-global financial crisis period, policymakers stated their intention "to manage capital flows in order to deal with the risks and reap the benefits of cross-border capital flows", recognizing that "central banks play a major role in addressing global liquidity shocks".[35] Yet, after the crisis, relatively little systematic information was available about the actual transmission of liquidity shocks through international banks, about which types of banks are affected most, and about the effectiveness of policy interventions by governments and central banks.

Against this background, the International Banking Research Network coordinated an initiative across countries to address four main questions: How do liquidity conditions affecting parent banks transmit into domestic and foreign lending? How does the ex-ante balance sheet composition of banks and banks' business model influence their responses to liquidity risk? What role does internal liquidity management within multinational banks play in magnifying or damping lending effects of liquidity risk? Did the use of official sector liquidity provision matter? Previously, these questions had been studied separately and in individual papers, but not in a consistent framework across countries.[36]

Eleven country teams of the IBRN analyzed transmission of liquidity shocks across borders, the papers focus on the *exposure of banks to liquidity shocks* and the resulting *impact of liquidity shocks on bank lending*, both domestic and foreign lending using quarterly data from 2006 through 2013. All papers use a common research methodology wherein changes in different types of lending are regressed on bank balance sheet characteristics, measures of liquidity risk, and information on policy interventions by central banks. Some studies refine the change in bank loans, subdividing loans according to the domestic or foreign residence of the borrower, or according to cross-border claims and foreign office claims. The studies also analyze the change in net borrowing between the lead commercial banking office of a bank holding company and its affiliates. A distinction is made between domestic banks and global banks, i.e. banks with and without foreign affiliates.

This body of research shows a large degree of heterogeneity across banks and countries in terms of adjustment of lending activity to liquidity shocks. It also reveals some common patterns in explaining the heterogeneity in bank lending response to liquidity risk. First, the regression specifications explain more of the variation in domestic lending compared with

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[34] This section draws on the meta-analysis by Buch and Goldberg (2015), the individual papers have been published in the *IMF Economic Review* (2015). The papers are available through https://link.springer.com/journal/41308/63/3 and include 11 country studies for Australia, Austria, Canada, France, Germany, Hong Kong, Ireland, Italy, Poland, the United Kingdom, and the United States.

[35] See Communiqué of the G20 Finance Ministers and Central Bank Governors, Paris, October 15, 2011. On the role of public sector liquidity provision during crises, see also Committee on the Global Financial System (2011).

[36] For a review of the earlier literature, see Buch and Goldberg (2015).

lending to related affiliates (i.e. net due to or intrabank lending) or cross-border lending. In general, patterns of domestic lending growth by banks are more stable over time and across institutions. Second, official liquidity affects the response of lending to liquidity risk. This change in the transmission of liquidity risk seems to be somewhat stronger for banks with foreign affiliates than for the banks without foreign affiliates. Third, internationally active banks have access to and have used net borrowing from affiliates, and thus an "internal" channel of adjustment as liquidity risk rose in order to support domestic and cross-border lending. Fourth, cross-border lending growth tends to be more sensitive to liquidity risk in relation to the balance sheet characteristics of the banks than domestic lending. One interpretation is that banks may subordinate cross-border lending relative to domestic lending activity as stress conditions change.

In general though, no single balance sheet factor affects the response of bank lending to liquidity risk in a consistent way across time and across countries (or banks). This high degree of heterogeneity in the data may seem unsatisfactory for those looking for a consistent story of how banks respond to liquidity risk. Thus, a large degree of heterogeneity may complicate finding appropriate regulatory responses. It does, at the same time, reflect how differences in bank business models may contribute to an enhanced resilience of the system. Studying such system-wide effects would require modelling the interaction between bank-level adjustment and aggregate outcomes.

b. International transmission of monetary policies

Another central issue around global banks is their role in propagating, and possibly amplifying, advanced economy monetary policy and risk sentiment across borders. Propagation is not necessarily destabilizing, so again, heterogeneity in organizations, constraints that bind responses, and amplification mechanisms are important objects for careful study.

Literature stresses different channels through which monetary policy can affect bank lending: the bank lending channel, a balance sheet channel, risk channels, and exchange rate channels. The bank lending channel, which emphasizes the role of funding constraints when banks cannot fully offset deposit availability constraints, is one mechanism through which global banks transmit monetary policy. Analysis of U.S. banks shows that those intermediaries with access to internal capital markets and cross border lending transmit shocks directly to nonbank counterparties and indirectly, although to a lesser degree, to their affiliated branches and subsidiaries abroad (Cetorelli and Goldberg 2012a). The bank balance sheet channel based on dollar debt exposures is stressed, too, as looser U.S. monetary policy leads to dollar depreciation, strengthening the balance sheets of global financial intermediaries with dollar debt and thereby generating expanded leverage and credit provision (Rey 2013, Miranda-Agrippino and Rey 2019). Bank health and banking

system characteristics matter, as ex-ante funding currencies of banks are important for patterns of ex-post adjustment to shocks (Krogstrup and Tille 2018). Related mechanisms include the currency dimension of the bank lending channel, and the international risk taking channel of monetary policy through banks, whereby global bank leverage translates lower risk and looser monetary policy into more funding of regional banks and credit extension to riskier borrowers.[37] Corporate sector leverage particularly matters under high foreign currency (dollar) debt.[38]

The International Banking Research Network led a multi-country exploration of the cross-border transmission of conventional and unconventional monetary policy through banks, including 17 country teams and 2 cross-country analyses. [39] As summarized in Buch, Bussiere, Goldberg and Hills (2019), these studies show extensive evidence for international spillovers through bank lending, either "inward" through the transmission of foreign policy to domestic banks or "outward" through the transmission of domestic policy shocks through global banks. Studies of monetary policy transmission show differences between source countries and across banks. In terms of countries, US policy generates significant spillovers for almost all countries. Evidence of transmission is more varied for other source countries.

One focus of the bank-level analysis is the identification of "frictions" that affect the response of bank lending to monetary policy shocks.[40] Frictions can be reflected in the capital and liquidity position of individual banks, access to (wholesale) funding, availability of collateral, or access to a global banking network. These frictions affect marginal costs and benefits to changing balance sheet positions, some of which are binding at certain points in time and thus become effective constraints to the adjustment of banks to monetary policy shocks. Results show that, generally, while adjustment of banks runs through the traditional "channels" stressed in the literature, the specific adjustment of banks depends on the frictions that they are facing.

In terms of bank characteristics, spillovers of monetary policy shocks to lending are heterogeneous. During periods of conventional monetary policy, banks' cross-border gross and net liability positions matter most, because banks with internal capital markets have lower frictions on shifting assets across countries. Relevant frictions vary by currency, access

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[37] Tákats and Temesvary (2017), Bruno and Shin (2017), Coimbra and Rey (2017). The international bank lending channel has been explored in multiple studies, including Morais, Peydro, Roldan-Pena and Ruiz-Ortega (2019), Albrizio, Choi, Furceri and Yoon (2020) , Lee and Bowdler (2020) and Avdjiev and Hale (2019).

[38] See Kalemli-Ozcan, Sorensen and Yesiltas (2012) and Kalemli-Ozcan (2019).

[39] Teams from central banks of seventeen countries use confidential micro-banking data for the years 2000 through 2015 to explore the international transmission of monetary policies of the U.S., euro area, Japan, and United Kingdom. Two other studies use international data with different degrees of granularity. The country teams are: Austria, Canada, Chile, France, Germany, Hong Kong, Ireland, Italy, Korea, the Netherlands, Poland, Portugal, Russia, Spain, Switzerland, the United Kingdom and the United States.

[40] This section draws heavily on Buch, Bussiere, Goldberg, and Hills (2019), which provides details.

to funding in foreign currencies, monetary policy regime, country characteristics, and domestic market structure. Yet, the relevant frictions do not map exactly to bank lending and portfolio channels as in the literature that focused on large advanced economies with developed financial markets. Finally, domestic lending activity is more insulated from spillovers of foreign monetary policy than might be expected. In this sense, there does not seem to be a strong "global factor" that dominates domestic loan growth. Despite finding evidence for statistically significant spillovers of monetary policy, there is low power in terms of explaining loan growth. This could imply that spillovers are small – or that relevant spillovers occur through changes in prices rather than quantities.

Within country aggregate data, the role of monetary policy and risk as drivers of global liquidity flows likewise evolves over time for reasons beyond the balance sheet components highlighted in the micro data. As documented in Avdjiev, Gambacorta, Goldberg and Schiaffi (2020a,b), the years immediately following the global financial crisis had sharply escalated sensitivities of banks to US monetary policy. The main driver of the fluctuations in estimated bank lending sensitivities to US monetary policy was the degree of convergence among advanced economy monetary policies. Meanwhile, a post-crisis fall in the sensitivity of international bank lending to global risk, in comparison to the crisis period and near term aftermath, was mainly driven by increases in the lending shares of better-capitalized banking systems.

c. International transmission of prudential policies[41]

The large transmission of the global financial crisis to countries around the world, and the broader recognition of the need for a better toolkit for dealing with financial vulnerabilities, generated substantial interest in the issue of how (macro) prudential instruments work in a domestic context and spillover across borders. The International Banking Research Network looked at the impact of (macro)prudential policies on cross-border activities of banks (Buch and Goldberg 2017), as the development of prudential policy tools has been one of the most significant changes in banking regulation in recent years. Researchers from 15 central banks and two international organizations use micro-banking data to study international spillovers of prudential policy changes for bank lending growth.[42] The IBRN, in collaboration with the

[41] This section heavily draws on Buch and Goldberg (2017), which provides more details on the analytical methods and results of specific country studies.

[42] The teams involved in this initiative are: Canada, Chile, France, Germany, Hong Kong, Italy, Mexico, Korea, the Netherlands, Poland, Portugal, Switzerland, Turkey, United Kingdom and United States of America, as well as BIS and IMF. Published papers can be found at: *International Journal of Central Banking* 2017, 13(1).

International Monetary Fund, also built a new (macro)prudential instrument, described in Cerutti, Correa, Fiorentino and Segalla (2017) and updated through 2016.[43]

Results show that prudential instruments do sometimes spill over internationally through bank lending. Heterogeneity in spillovers through lending is common. This heterogeneity is at the bank-level, where effects of prudential instruments on lending can differ with the balance sheet characteristics and business models of banks. For example, foreign affiliates with higher illiquid asset shares and with stronger reliance on deposit funding tend to have loan growth that responds more to loan-to-value ratio limits and sector-specific capital buffer changes in the foreign parent location. Internal liquidity management matters as well, and the response of lending by affiliates to shocks additionally depends on constraints that capital requirements impose on their parents. These same characteristics do not appear to be as important for the inward transmission of foreign policies into the domestic lending of global banks, perhaps reflecting the ability of banks to shield their domestic customers.

The economic magnitudes of international spillovers of policy thus far have not been large on average. However, the pattern of results highlights the potential for larger and more consequential spillovers as the use of macroprudential instruments increases. Changes in capital requirements, for instance, have largely been implemented in many countries during similar time frames, potentially limiting some of the first mover advantages for countries that had banks with higher initial capital ratios. Even with this limitation, in some cases, banks with higher initial capital were poised to increase lending internationally, sometimes pivoting from domestic loan growth, when foreign countries tightened their capital requirements.

But, there is no one-size-fits-all response. Spillovers are rather heterogeneous in terms of size and direction, they depend on the prudential instrument considered and the business models of banks. Results do lend support though to the importance of balance sheet strength: banks with stronger balance sheets tend to reduce international lending by less when regulations tighten. Hence, market share repositioning occurs as activity moves away from the weaker towards the stronger banks in the system. This can be considered an intended consequence of higher capital requirements and a step towards an improved resilience of the system to shocks.

Considering the importance of institutional quality stressed by previous literature, it is interesting to note that responses of banks in advanced economies and emerging markets to liquidity shocks do not look very different. There are no indications of strong pro-cyclicality of cross-border bank flows: responses of bank lending to indicators of the stages of business cycles are often not significant. This finding is important because spillovers per se do not

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[43] See also Akinci and Olmstead-Rumsey (2018), Kuttner and Shim (2016), Claessens, Gosh, and Mihet (2013) and Bruno, Shim, and Shin (2017).

have immediate welfare implications. Capital flows or bank lending that are highly pro-cyclical can aggravate cycles.

Generally, deriving lessons from this literature would require a richer, macroeconomic framework, which allow studying issues such as systemic risk externalities of broader repercussions from the micro-level. We will return to this issue in Section 5.

d. Interactions between monetary and prudential policies[44]

Both, monetary policy and prudential policies are identified as spilling over across borders, but these spillovers could be mutually reinforcing or moderating. A key question is the extent to which negative or destabilizing patterns of international financial flows can be mitigated by use of domestic macroprudential or capital flow management measures by recipient countries. In this context, the IMF is currently coordinating a major international workplan on an "integrated policy framework" (Gopinath 2019). An important discussion considers the extent to which there is an economically important global financial cycle, driven by the monetary policy stance of the US and risk sentiment,[45] and the magnitude of trade-offs this poses for policymakers. While there is a body of evidence on how prudential policy affects the domestic transmission of monetary policy (Maddaloni and Peydro 2013) and an emerging strand on how prudential policies can offset the unintended consequences of monetary policy (Takáts and Temesvary 2017), the empirical evidence on the extent to which macroprudential policy affects the transmission of monetary policy and mitigates the propagation of shocks across borders remains partial at best.

The IBRN engaged in a multi-country initiative to provide carefully derived insights relevant for this debate (Bussiere et al. 2020). Insights come through experiments using micro-banking data and exploring relevant experiences of the United States, United Kingdom, France, Germany, Netherlands, Ireland, Chile, Mexico, Russia, Norway and Sweden, plus a cross-country perspective using country aggregate data of the Bank for International Settlements. The participating countries differ substantially with regard to their monetary and macroprudential policy frameworks, the structure of their banking sector, and the overall macroeconomic development.

The interactions between monetary and macroprudential policies are statistically significant, which prudential policies in general dampening monetary spillovers from core advanced economies. The degree of offsets are quite heterogeneous, with prudential instruments only sometimes sufficient in neutralizing the effects of foreign monetary policy. The research

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[44] This section draws heavily on Bussiere et al (2020), which provides more details on the analytical methods and results of specific country studies.

[45] See Miranda-Agrippino and Rey (2015), Bruno and Shin (2015), Claessens and Rose (2019), Avdjiev, Gambacorta, Goldberg and Schiaffi (2020), and Kalemli-Ozcan (2019).

shows the importance of analyzing these effects at the bank level. Key bank characteristics such as bank size or status as global systemically important institutions (GSIBs) play a first order role in the transmission of these policies. Finally, the nature of the prudential instrument also matters greatly, which again calls for a very granular analysis.

Another important finding is that domestic prudential policy in the US significantly affects the transmission of domestic monetary policy to foreign lending. This result suggests that there is scope for macroprudential policy in the source countries to attenuate the international spillover effects from domestic monetary policy by changing bank capital buffers, reducing the amplitude of responses and consistent with the observations of Avdjiev, Gambacorta, Goldberg and Schiaffi (2020a).

The United States contribution, by Liu, Niepmann and Schmidt-Eisenlohr (2019), considers how the outcomes of stress tests performed on large US banks influence the spillovers of monetary policy through bank lending. Using data on US bank loan issuance to emerging market borrowers, the study finds that monetary easing increases lending especially to riskier countries. Banks with lower minimum capital ratios in Federal Reserve's annual Comprehensive Capital Analysis and Review (supervisory-run stress tests) increased their lending to emerging market borrowers less than banks with better CCAR results. Banks with higher liquid asset shares and deposit shares increased lending to emerging market borrowers to a greater degree.

5 Where to go next? Open issues for research and policy

International financial flows provide benefits in terms of access to credit, increased efficiencies, and enhanced risk sharing. The expansion and reallocation of global bank branches and subsidiaries, and cross-border bank lending, are important features of the globalization of finance. It reflects broader underlying globalization trends in international production and trade linkages, comparative advantage, and production efficiencies of banking firms.

Despite the common narrative of finance being "global", financial integration through global banks is not without frictions. Part of the provision of banking services is, in the end, about managing and mitigating information costs. Such information costs tend to be higher in an international context than at the national level due to cultural, geographic, and technological differences. This results in implicit or explicit barriers to entry between markets, which global banks may overcome and may even manage more easily than local banks, but which nevertheless constrain cross-border expansions and affect economic outcomes.

In addition, regulations differ across countries and shape international activities of banks. Such regulations aim to mitigate frictions inherent in financial markets that lead to adverse selection, moral hazard, or systemic risk externalities. Well-crafted, internationally

coordinated, and effective regulation thus contributes to increasing the benefits of global banking. But regulatory arbitrage and regulatory competition may also contribute to increased fragilities and heightened risks.

Because global banking is a core feature of the globalization process, any feature of global banks that contributes to the magnification of shocks, to excessive volatility, and eventually to systemic risk can have fundamental consequences for the real economy and for welfare. Banking services are a core input for the production function of non-financial firms, and banks are closely linked to other, non-bank financial intermediaries. For these reasons, it is important to understand the drivers and effects of the global supply of banking services. In terms of policy, reaping the benefits of globally active banks requires appropriate regulation and policy coordination.

Research on global banking has changed quite fundamentally over the past decades, partly responding to the urgency of the policy issues that different crises have exposed, partly responding to scientific advances in modelling, and due to the availability of rich data that permit careful identification of mechanisms underlying global banking dynamics.

a. What we have learned

Our review of the literature has focused on the volatility of credit supply in response to bank-specific, country-specific, and global factors.

A first lesson of this literature has been that a disaggregated view – distinguishing shocks, amplification mechanisms, and adjustment through prices and quantities – provides important insights on specific frictions that can hamper growth and stability. Understanding relevant frictions requires taking a home *and* a host country perspective. Volatility of cross-border financial flows can, for example, be amplified both by weak institutions in host markets and by a high degree of leverage of banking institutions in source countries.

A second lesson is that the response of global banks to shocks is highly heterogeneous. A pecking order characterizes the resilience of banks' international operations and the retrenchments that occur following idiosyncratic, bank-level shocks or changes in global, macroeconomic drivers. Banks tend to withdraw from markets and borrowers more easily if there is not much relationship capital involved and when the effects of this withdrawal are less persistent for their own operations. Responses to shocks are larger when bank-specific capabilities to absorb shocks are weaker, when bank capital is lower, and when bank internal liquidity management is less effective. Responses also depend on the business model of the parent bank, the importance of the foreign market for the overall balance sheet, and on the degree of its geographic or organizational complexity. Country-specific macroeconomic factors matter as well, including the policy environment: lender of last resort liquidity

facilities at central banks, prudential policies tools, and stress testing have clearly influenced the direction and scale of international spillovers.

This is where micro- and the macroeconomic views need to be combined. A rich body of research documents the sensitivity of bank credit supply to market returns and risks, and it shows that banking organizations are subject to short-term constraints and frictions. These can either deter excessive risk taking or serve as amplification mechanisms. Identification of these frictions requires bank-level, granular evidence.

The resulting amplification mechanisms matter for aggregate outcomes, and they can be particularly severe when many institutions are exposed to the same macroeconomic shock. For example, international spillovers of monetary policies and risk conditions are exacerbated during periods of synchronized declines in business cycles or monetary policy shocks that are correlated across countries. Under more normal conditions, the responses of bank lending to shocks and policies are often quite heterogeneous, which can dampen aggregate effects.

This underscores an important challenge for the research community: while we have learned a lot from carefully executed and well-identified micro-econometric studies, linking micro- and macro-observations and developing tools to do so remains important.[46]

From the vantage point of quantifying costs and benefits, it is important to understand whether adjustment of global banks to shocks is "excessive", being amplified by poor regulation and private incentives which are misaligned with social incentives, or whether the adjustments we observe are part of regular cyclical fluctuations and contribute to efficient risk sharing. Indeed, the concept of "excessive" credit supply responsiveness is still not well defined, although there are clear costs linked to extreme surges and retrenchments of banking flows. Costs of such disruptions go beyond costs in terms of output losses and costs to the taxpayers as the global financial crisis had deep-rooting disruptive effects on economies and societies.

b. Implication for policy

Policy obviously has an important role to play in aligning incentives at the bank-level, addressing amplification mechanisms, and mitigating systemic risk externalities. Many substantive changes have occurred in international policy frameworks around capital flows intermediated through banks. On the more macroeconomic level, national policymakers have focused on developing and implementing expanded toolkits, including instruments to manage international capital flows and (macro) prudential policy instruments. In the space

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[46] Factor-augmented VAR (FAVAR) models are one empirical tool that brings micro- and macro-data together. But more research is needed to develop such tools and models.

of financial stability through regulation and supervision of banks, there have been many post-crisis accomplishments in international cooperation and collaboration.[47]

Bank capital requirements and liquidity frameworks have tightened, risk management frameworks have improved, and risk assessments have been supported by important advances in stress testing of banking organizations. Recovery and resolution frameworks for large and systemically important banks have improved, for example through living will structures of the type contained in the Dodd Frank Act of the United States and the Bank Recovery and Resolution Directive (BBRD) in Europe. Some countries have changed the frameworks for hosting foreign financial institutions, adopting intermediate holding company structures or single points of entry and advancing bilateral memoranda of understanding to lay out frameworks for resolving large global institutions should they fail.

More work needs to be done though to rigorously analyze the effects of these policies. This can be done within structured frameworks for the surveillance of risks, in particular financial stability risks, and for the evaluation of policy measures (FSB 2017). The suggestion by Rodrik (2019) to establish procedures that improve domestic policies could take the form of an explicit policy cycle that involves specifying of objectives, defining data requirements, monitoring intermediate targets, calibrating policy instruments, and engaging in ex-post impact assessment.

These international policies are important because domestic policymakers, in particular in emerging economies with strong international financial linkages, cannot stem the tide of global capital flows. While costs of sudden stops for the domestic economy are high, domestic policy makers have relatively few tools at their disposal to reduce the volatility of flows. Hence, policy packages are needed that combine measures to improve resilience against volatile flows domestically with international cooperation and coordination to reduce the amplitude of volatility globally, while still supporting the benefits of global financing.

c. Unfinished business

Despite the progress that has been made, there is unfinished business for research and policy communities. The full span of effects of regulatory and other policy framework changes is not yet well understood. From a systemic risk perspective, it remains to be seen whether the overhaul of the regulatory framework for globally active banks has been

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[47] See Cecchetti and Tucker (2016), Ghironi and Schembri (2015), or Tucker (2016) for a detailed analysis of the need for international policy coordination and cooperation. The most recent FSB report on post-crisis financial sector reform can be found here: https://www.fsb.org/2019/10/fsb-publishes-annual-report-on-implementation-and-effects-of-financial-regulatory-reforms/.

sufficient to contain and manage systemic risks going forward, including at times of bank failure, and to what extent risks have shifted to other parts of the global financial system.[48]

Our review of the evidence shows that global liquidity provision shifted post global financial crisis, with market shares evolving towards better capitalized banks and some more regional concentration, and with more activity from international debt securities issuance. Better capitalized banks, and those with more stable funding sources and better risk management, tend to lower the amplitude changes in international shock transmission to borrowers. But some activity has also shifted outside the banking sector to areas which are less regulated and for which less information is available.

Assessing the welfare effects of global banking requires an appropriate benchmark that recognizes alternative possible systems and the ways that each address distortions and frictions. Yet, such benchmarks are difficult to construct and thus hardly discussed in the research and policy communities. Ultimately, effects of policy changes need to be understood in terms of risk and activity shifting along different dimensions: between credit provision that is funded domestically and that is provided by global banks, between global banks with different attributes, between cross-border and local activity, or between bank and nonbank intermediaries. The roles of nonbanks are still not broadly studied.

Also, it is difficult to account for the stresses during transition periods, which in some cases involve managing the shrinkage of size, activity, or complexity of large global institutions. Such considerations will be relevant for future consequences around digitalization, demographic change, and changing patterns of globalization in the real economy. The need to understand such trends has become even more pressing as the coronavirus pandemic is likely to reinforce structural change. Gravity models can be used to look at the longer-term, structural features of global banking, but they are not the best tools to model dynamic changes in those structures.

Both, policy and research, can benefit from a better understanding and acknowledgment of the role that legal frameworks have for the structure and effects of global capital flows. Pistor (2018) forcefully argues that legal systems have important implications for the definitions and rights attached to assets, including financial assets. This has implications for the structure of global finance and the ability of investors to absorb shocks. This important role of the legal system is not very well reflected in much of the current research on global banking. Gravity models have certainly shown in a very stylized form that legal systems, regulations, and legal origins matter. More needs to be done to bring together and rigorously model the links between law and finance.

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[48] The Financial Stability Board is currently conducting large-scale evaluation projects, based on a framework for the post-crisis evaluation of financial sector reforms (FSB 2017).

From a policy perspective, effective recovery and resolution of global banks is constrained by the lack of an international bankruptcy framework. Some other policy measures might be motivated by lack of trust and expectations of defense of national interests in times of stress. This supports the need for cooperation and coordination and more research on the mechanisms that can mitigate these constraints.

d. Improving infrastructure

Research and policy communities around global banks also have unfinished business in terms of providing the public goods of improved infrastructure to support policymaking and evaluation. Access to granular data, repositories of evaluation studies, and frameworks for international collaborations by researchers are relevant aspects of such infrastructures. Micro-data can provide key insights for relevant policy and academic discussions, and the use of such data has indeed been one of the key innovations in the academic literature on global banks and firms.

Structured case studies of multinational firms can provide interesting insights into globalization patterns of banks and firms. Tracking these activities is not easy though, and it requires a significant amount of investment into statistical procedures and organizational adjustments in terms of "large case units (LCUs)" and "legal entity identifiers" (LEIs).[49] Hence, while micro-level data allowed peeking into the black box of aggregate data, more granular information might be needed to unpack the black box of multinational firms.

We consider it fruitful to use and advance technical and statistical solutions to overcome these obstacles. If granular data cannot be shared and merged for reasons and data confidentiality, there are other ways of sharing results that are non-confidential. International collaboration on methods and effectiveness of instruments is achievable, even when data cannot be shared across borders. The International Banking Research Network (IBRN) provides a possible template for coordinating analytical work across jurisdictions. Its empirical approach is to jointly pose policy-relevant questions and construct testing methods, compile data needed for common implementation, independently analyze confidential data at the country level, and write cross-country papers with deeper exploration.

For sharing knowledge, the Bank for International Settlements (BIS) has recently established an online repository of studies on the effects of financial regulations "FRAME" as discussed in Boissay, Cantu, Claessens and Villegas (2019).[50] Repositories of that type significantly

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[49] See, for example, recent initiatives of Eurostat as described in Hussain, Peltola, and Mahajan (2019). On LEIs, see the Financial Stability Board Thematic Review (2019).

[50] https://stats.bis.org/frame/

reduce the costs for individual researchers and policymakers to keep up to date on relevant research and base conclusions on a comprehensive set of evidence.

Given the centrality of banking for modern economies, with both the benefits that efficient banking can bring and the significant costs involved when major disruptions occur, it is important to move issues related to global banking to the center of attention of research and policy. Our understanding of global banking has advanced significantly over the past decades, but much remains to be done to complete the jigsaw of the many insightful and useful studies that have been produced. Investment into the necessary analytical and research infrastructure is needed to allow insights from this work to contribute to a better understanding of the costs and benefits of global banking and the channels through which policy can tilt this balance.

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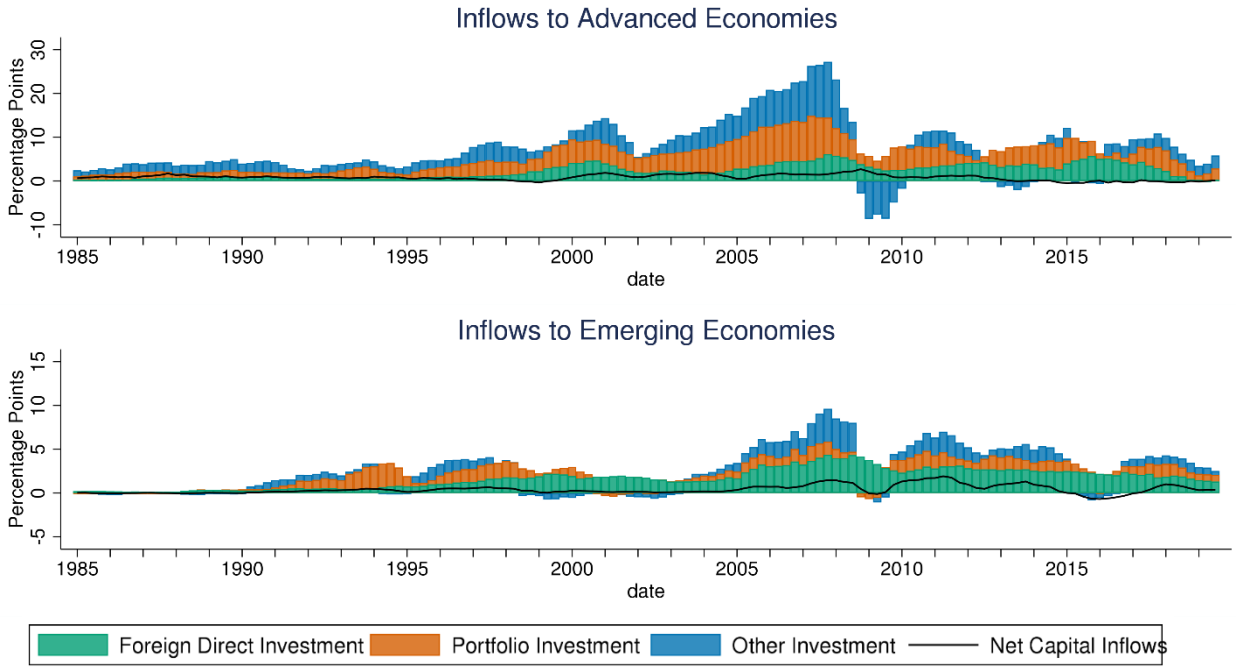
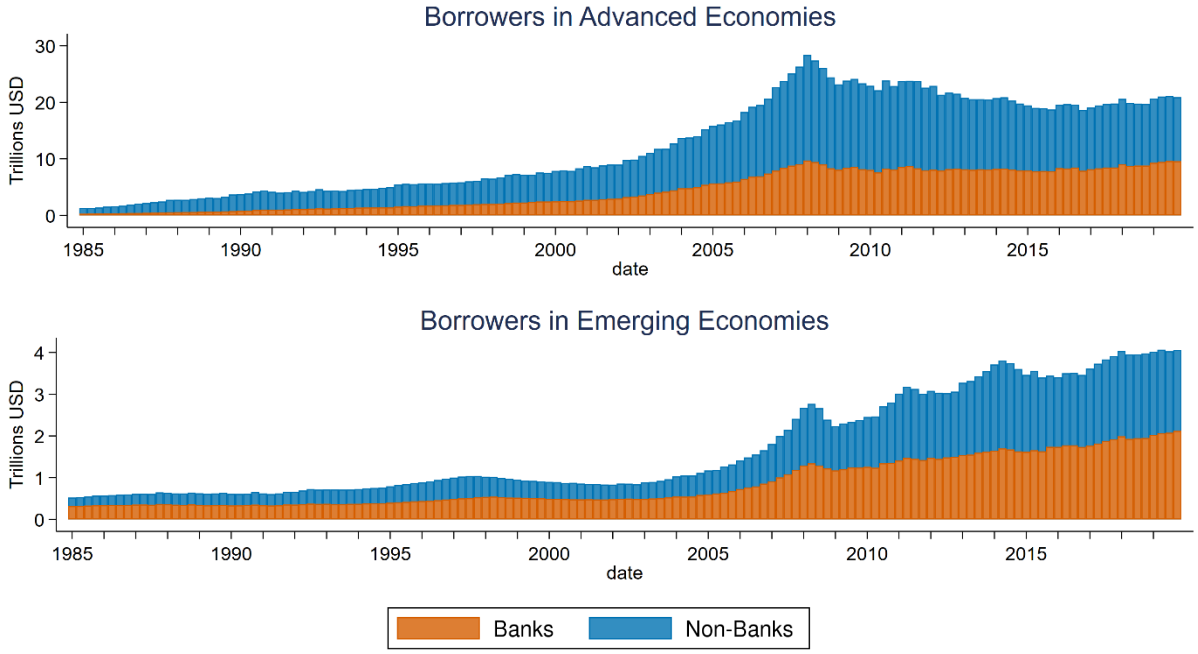
Figure 1 Composition of Annualized Net Capital Flows for Advanced and Emerging Economies (1985 Q1—2019 Q3)



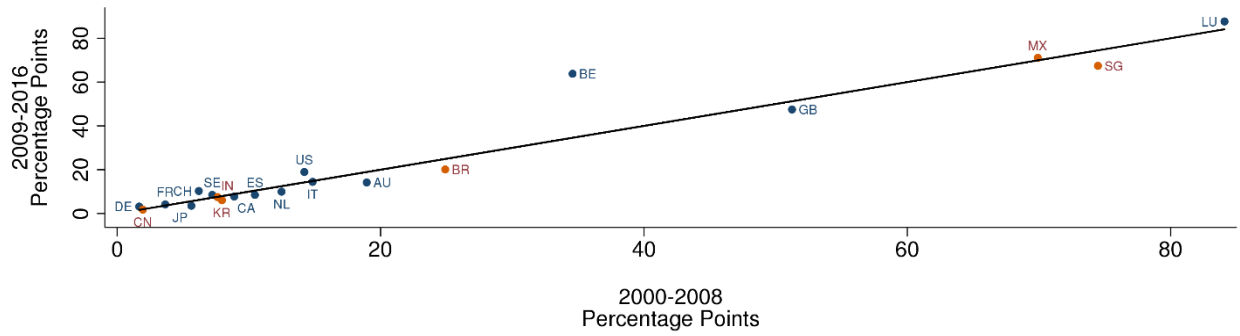
Note: Figure represents private net capital inflows, excluding currency reserves and derivatives transactions, as a percentage of aggregate advanced or emerging economy GDP. Series annualized as a four-quarter rolling sum. Includes 35 advanced and 36 emerging market economies for which data were available.
Source: IMF International Financial Statistics and World Economic Outlook data via Haver.

Figure 2 Composition of Cross-Border Bank Claims by Borrower Type, for Advanced and Emerging Economies (1985 Q1—2019 Q4)



Note: Figure depicts outstanding dollar amounts of cross-border bank claims by borrower sector, aggregated over borrower region.
Source: BIS Locational Banking Statistics

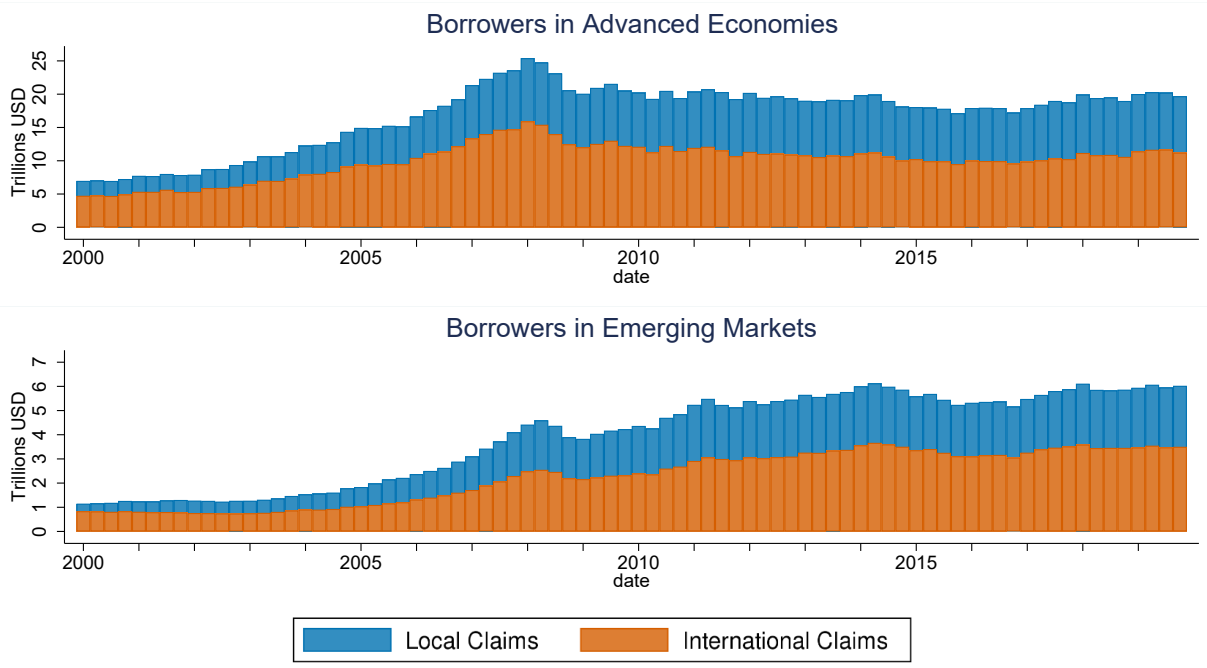
Figure 3 Foreign-Owned Banks' Share of Host Banking System Assets, Advanced and Emerging Economies



Note: Figure plots average annual values of the share of assets in each host country's banking system held by foreign-owned banks in the post-crisis period (2009-2016) against average annual values of that share in the pre-and-during-crisis period (2000-2008), with a 45-degree line. Includes 14 advanced (blue) and 6 emerging market (orange) economies for which data are available.

Source: BIS CGFS (2018), "Structural changes in banking after the crisis," Annex Table 1.26

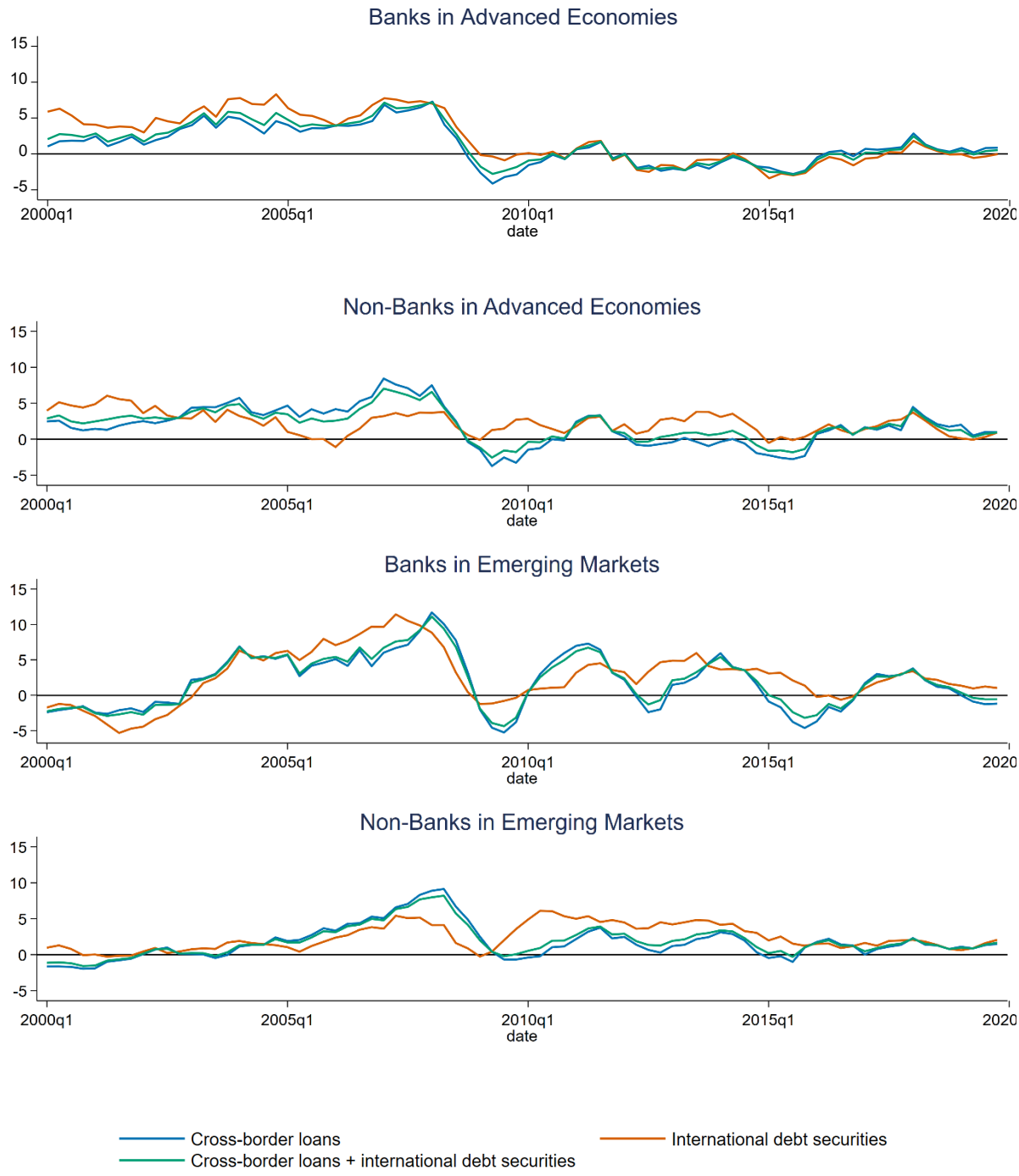
Figure 4 Composition of International and Local Claims, Advanced and Emerging Economies (2000 Q1—2019 Q4)



Note: Figure depicts outstanding dollar amounts of all bank claims by claim type, excluding domestic positions of domestic banks, aggregated over borrower region. "Local claims" refer to local positions denominated in the currency of the country in which the counterparty resides, and "international claims" to the sum of cross-border claims in all currencies and local claims in foreign currencies.

Source: BIS Consolidated Banking Statistics

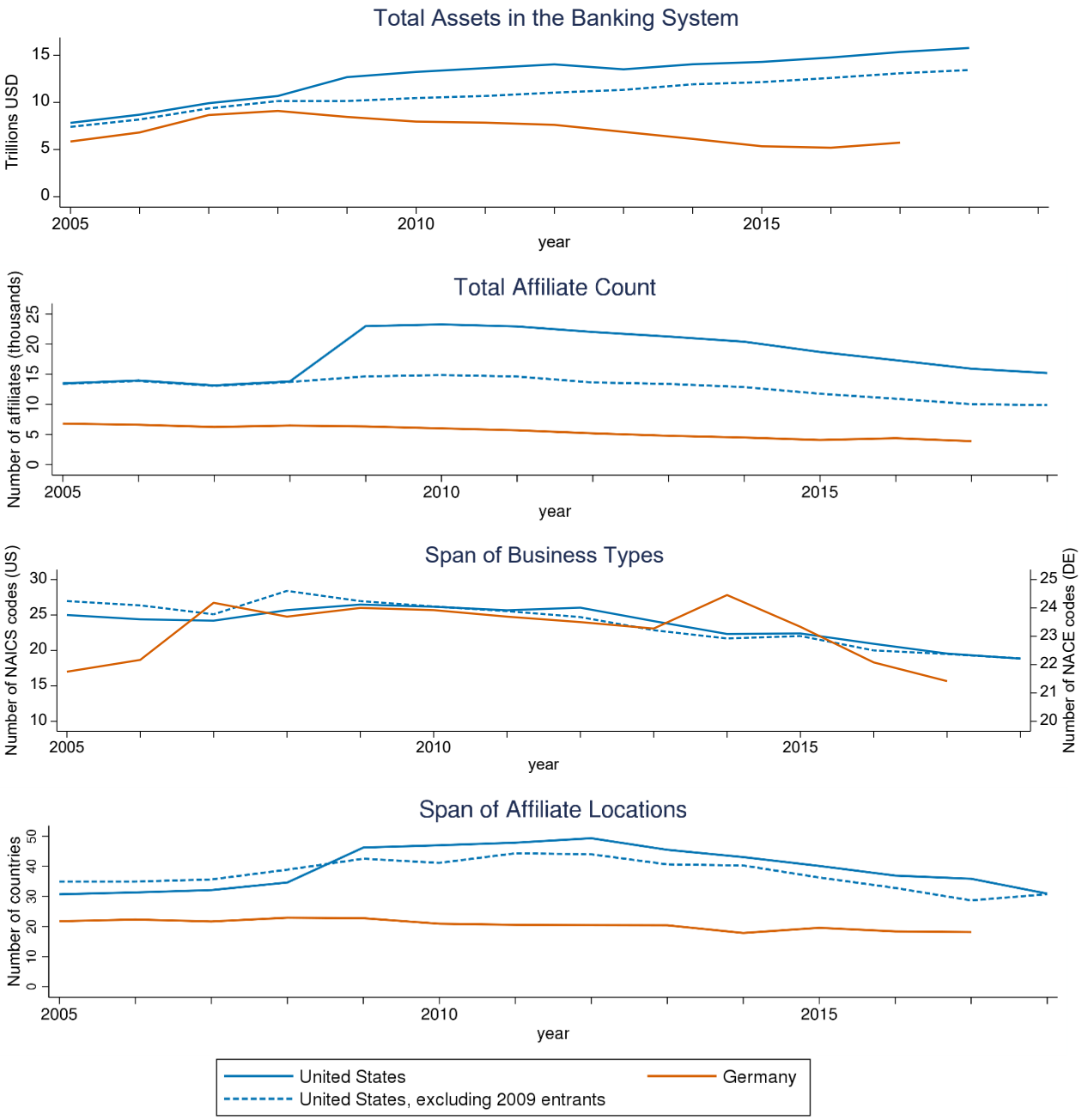
Figure 5 Components of Global Liquidity Growth Rates for Advanced and Emerging Economies (2000 Q1 – 2019 Q4)



Note: This figure presents the 4 quarter moving average growth rates of cross-border loans (XBL) and international debt securities (IDS), in percent. Quarterly growth rates are calculated as $[(Value_t / Value_{t-1}) - 1] \times 100$.

Source: BIS Locational Banking Statistics and Debt Securities Statistics

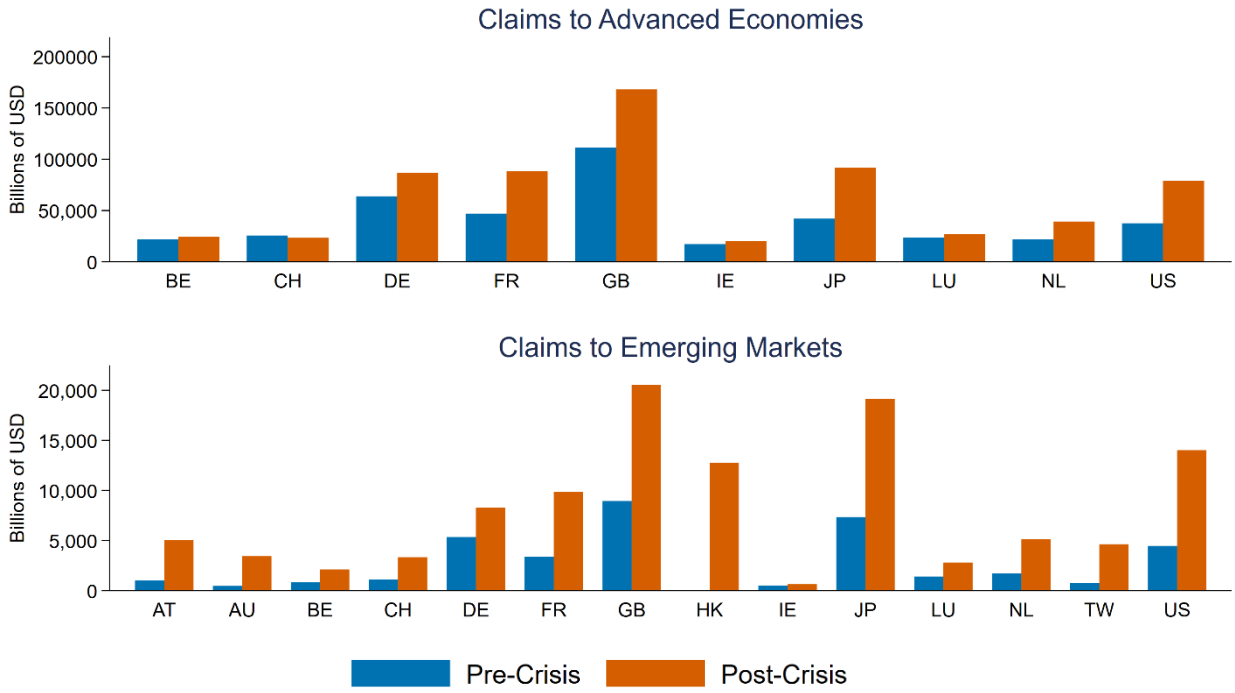
Figure 6 Organizational, Business and Geographic Complexity of US and German Banking Organizations (2005—2018)



Note: For Germany, Total Assets in the Banking System only includes the assets of banks with affiliates. These represent approximately 70% of all banking assets. Total affiliate count is the sum of all bank and nonbank legal entities under all parent banking organizations for the respective countries. Span of Business Types refers to the average number of business types for those banking organizations in the top 10 percent of this form of complexity. For the US, business types are defined as 4-digit North American Industry Classification System (NAICS); for Germany, business types are defined as 3-digit Nomenclature des Activités Économiques dans la Communauté Européene (NAECE) which are not directly comparable. Dashed lines for the United States exclude Goldman Sachs, Morgan Stanley, American Express, GMAC (Ally Financial), CIT Group, Discover Financial Services, and Metlife, seven large financial institutions that were designated as BHCs after 2008.

Source: Buch and Goldberg (2020).

Figure 7 Top Global Banking Systems in International Claims, Pre- and Post- Global Financial Crisis (2000Q1 – 2018Q4)



Note: Top global banking systems in providing international claims to advanced economies and emerging markets respectively during the Pre-(blue) and Post-(red) Global Financial Crisis (GFC) periods, which respectively span 2000Q1 - 2008Q4 and 2009Q1 - 2018Q4.The top 10 banking systems accounting for claims to emerging market borrowers change between the pre- and post-GFC periods (additions of TW, HK, AT, and AU in the post-GFC period).

Country abbreviations: AT – Austria, AU – Australia, BE – Belgium, CH – Switzerland, DE – Germany, FR – France, GB – Great Britain, HK – Hong Kong, IE – Ireland, JP – Japan, LU – Luxembourg, NL – Netherlands, TW – Taiwan, US – United States

Source: Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020b) using BIS Consolidated Banking Statistics

Table 1: Global Liquidity Growth Rates for Advanced and Emerging Market Borrowers (2000Q1 – 2018Q4)

		Mean		Standard Deviation	
		Advanced Economies	Emerging Markets	Advanced Economies	Emerging Markets
Pre-GFC (2000-2008)	Cross-Border Claims				
	to Banks	6.08	6.26	6.88	17.95
	to Nonbanks	4.56	4.18	6.20	7.95
	International Debt Securities				
	to Banks	7.63	6.29	10.11	20.91
	to Nonbanks	4.92	3.83	10.56	9.24
Post-GFC (2009-2018)	Cross-Border Claims				
	to Banks	-1.37	1.34	4.69	8.06
	to Nonbanks	0.28	1.72	5.03	6.52
	International Debt Securities				
	to Banks	1.09	5.71	12.53	27.95
	to Nonbanks	2.01	4.73	6.30	19.75

Note: Mean and standard deviation of quarterly growth rates (in percentage points) of cross-border loans (XBL) and International Debt Securities (IDS) for advanced economies and emerging markets, pre- and post-Global Financial Crisis (GFC), as defined by 2000Q1 – 2008Q4 and 2009Q1 – 2018Q4 respectively. Quarterly growth rates at the borrower country-quarter level are calculated as the four quarter moving average of $[(Value_t / Value_{t-1}) - 1] \times 100$.

Source: Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020b) using BIS Locational Banking Statistics and Debt Securities Statistics

Table 2: Cross-Border Claims Growth Rates by Counterparty Sector for Advanced and Emerging Economies (2014 Q1 – 2019 Q4)

	Mean		Standard Deviation	
Counterparty Sector	Advanced Economies	Emerging Markets	Advanced Economies	Emerging Markets
Related Banks	3.89	9.38	12.53	41.60
Unrelated Banks	3.06	-0.40	44.23	7.30
Private Nonbanks	-0.35	0.98	4.98	5.91

Note: Mean and standard deviation of quarterly growth rates (in percentage points) of all cross-border claims in advanced and emerging economies, 2014 Q1 through 2019 Q4. Quarterly growth rates at the borrower country-quarter level are calculated as the four quarter moving average of $[(Value_t / Value_{t-1}) - 1] \times 100$.

Source: Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020b) using BIS Locational Banking Statistics

Table 3: Local Claims Growth Rates by Hosted Foreign Bank Type in Advanced and Emerging Market Economies (2014 Q1 – 2019 Q4)

	Mean		Standard Deviation	
Foreign Bank Type	Advanced Economies	Emerging Markets	Advanced Economies	Emerging Markets
Branch	2.63	3.64	10.43	10.17
Subsidiary	-0.25	0.18	4.83	4.94

Note: Mean and standard deviation of quarterly growth rates (in percentage points) of all local claims denominated in any currency held by foreign banks in advanced and emerging economies, 2014 Q1 through 2019 Q4. Quarterly growth rates at the borrower country-quarter level are calculated as the four quarter moving average of $[(Value_t / Value_{t-1}) – 1] X 100$.

Source: Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020b) using BIS Locational Banking Statistics