Global Banks and Systemic Risk: The Dark Side of Country Financial Connectedness

Ping McLemore Atanas Mihov Leandro Sanz *

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Abstract

We study the relation between country financial connectedness and systemic risk for U.S. banking organizations with global exposures. We find that banks with more foreign claims in countries that are well connected to global financial markets contribute more to U.S. systemic risk. We document specific bank-level (systemic importance and leverage) and country-level (financial crises) channels that amplify these effects. We also document the roles different forms of connectedness, and types and sectors of foreign claims, play for cross-border risk propagation. Our findings are particularly relevant for macro-prudential policy given the concentration of U.S. financial claims in well-connected markets.

JEL Classifications: G15, G21, G28

Keywords: Systemic risk; Financial connectedness; Financial integration; Global banking; Foreign claims

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*Ping McLemore is a Financial Economist at the Quantitative Supervision & Research group, Federal Reserve Bank of Richmond and can be reached at ping.mclemore@rich.frb.org. Atanas Mihov is an Associate Professor of Finance at the School of Business, University of Kansas and can be reached at amihov@ku.edu. Leandro Sanz is a Graduate Research Associate at the Fisher College of Business, the Ohio State University and can be reached at sanz.8@osu.edu. The authors thank Azamat Abdymomunov, Allen Berger, Mehdi Beyhaghi, Martin Brown, Cahn Christophe, Ricardo Correa, Isil Erel, Scott Frame, Jeff Gerlach, Victoria Ivashina, Leming Lin, Elena Loutskina, Robert McCauley, John Sedunov, Phil Strahan, Renè Stulz, Alvaro Taboada, Judit Temesvary, Mihail Velikov, Ursula Vogel, and conference participants at the 4th BIS-CGFS workshop and the 17th Paris December Finance Meeting for helpful comments. They also thank Frank Diebold and Kamil Yilmaz for providing country financial connectedness data and Chris Hajzler for providing FDI expropriation data. All remaining errors are those of the authors alone. The views expressed in this paper do not necessarily reflect the position of the Federal Reserve Bank of Richmond or the Federal Reserve System.

1 Introduction

Many countries around the world liberalized their financial markets over the last half a century, adopting policies that promote free capital flows and removing trade barriers in financial assets. As a result, the global financial system has become increasingly more integrated and connected (Stulz (2005)). Financial integration has been a particularly important factor in the context of global banking that explains cross-border asset holdings of banking organizations (Focarelli and Pozzolo (2005)). Figure 1 illustrates this point for U.S. bank holding companies (BHCs), suggesting that U.S. BHCs held nearly twice as much foreign claims in countries that are well-connected to global financial markets relative to other less-connected countries over the period [2005:Q1-2016:Q4].

[Insert Figure 1 about here]

The rise of global banking over the past two decades (McGuire and Tarashev (2008)) and the concentration of foreign claims in countries that are well-connected to global financial markets has added a sense of urgency to studying the effects of connectedness on risk, and systemic risk in particular, given its large economic costs (e.g., Bernanke (1983) and Dell'Ariccia et al. (2008)). Financial integration may improve the allocative efficiency of capital and create opportunities for risk-sharing across countries (e.g., Obstfeld (1994) and Acemoglu and Zilibotti (1997)). On the flip side, the concentration of claims in highly financially connected countries might reduce such benefits through the enhancement of mechanisms for risk transmission due to the de-segmentation of financial markets (e.g., Stiglitz (2010)). In the wake of the 2007-09 financial crisis, there has been an intensive regulatory discussion about the impact of financial connectedness on systemic risk and cross-country contagion. However, this discussion seems to be relatively uninformed since direct empirical evidence on the subject is scarce.

This paper empirically examines whether the financial connectedness of foreign countries where U.S. global banks have exposures affects U.S. systemic risk. To study this question, we utilize the full dimensionality of the Country Exposure reports, a unique supervisory dataset on individual U.S. banks' foreign claims that provides more granular and broader-in-scope information than any publicly available data. We construct an unbalanced panel of globally active U.S. financial institutions' foreign claims at the bank-quarter-country level over the period [2005:Q1-2016:Q4]. By focusing exclusively on global banks, we enhance the homogeneity of the companies in our sample and eliminate selection issues related to the choice of having global exposures. We subsequently merge information on cross-country financial connectedness, which we measure with the Diebold and Yilmaz (2014) index that summarizes the expected transmission of financial market volatility across countries. In addition, we employ two recent systemic risk measures that have been widely accepted and used in the literature: the marginal expected shortfall (*MES*) from Brownlees and Engle (2016) and the delta conditional value-at-risk (ΔCoVaR) from Adrian and Brunnermeier (2016). *MES* measures how vulnerable a bank is to a systemic event and $\Delta CoVaR$ estimates the externality posed to the entire financial system if a particular institution goes into distress.

We find a significant positive relation between country financial connectedness and U.S. global banks' contribution to systemic risk: banking organizations with foreign claims in countries that are well connected to global financial markets contribute more to U.S. systemic risk. Financial connectedness is statistically and economically significant, even after controlling for an extensive set of country-level characteristics and bank-level correlates of systemic risk. On average, we estimate that a one standard deviation increase in connectedness corresponds to an increase of 14.3% in *MES* and a 7.7% in $\Delta CoVaR$ relative to their mean values. Importantly, this statistically and economically significant finding is robust to estimation techniques that account for potential endogeneity, reverse causality, and selection concerns.

Our baseline results are subject to three types of identification concerns. First, omitted country characteristics could be correlated with both bank risk and financial connectedness. Second, there may be reverse causation since a systemic event in the U.S. could spill over to foreign markets. Third, the documented association reflects a global bank's foreign claims location choices, which raises concerns that such choices are related to global banks' contribution to U.S. systemic risk (beyond country financial connectedness).

To ensure that our results are not driven by omitted country-level variables or reverse causation, we use foreign direct investment (FDI) expropriations by host-country governments and lagged (as of 1975) capital controls of neighboring countries as instruments for financial connectedness and find results that are consistent with our baseline specifications. To alleviate location selection concerns, we use two separate approaches. First, we use stringent fixed effects schemes (i.e., bank×country fixed effects) that account for potential matching between banks and their foreign claim locations. Second, we adopt an approach similar to Lamont and Polk (2002), which captures systemic risk effects of changes in financial connectedness that filter out changes in a global banks' foreign claims location choices. Both approaches confirm our baseline results.

In a last test to address identification issues, we examine how global banks' contributions to systemic risk change around entries in foreign markets. Market entries introduce variation in the financial connectedness of banks' foreign portfolios. To the extent that latent bank characteristics that drive foreign location choices are stable around market entries, such variation should be useful in identifying the systemic risk effects of country financial connectedness. Using an event-study approach, we find that banks' contribution to systemic risk increases when they enter more financially connected markets.

We then investigate the financial connectedness and foreign claim dimensions that drive the systemic risk effects. First, a decomposition of financial connectedness into "from" and "to" foreign countries suggests that the effect of financial integration "from" foreign countries on U.S. systemic risk seems to dominate that of financial integration "to" foreign countries.

Second, a decomposition of foreign claims into direct cross-border claims (claims of U.S. banks' domestic affiliates on foreign entities and individuals) and local claims (claims of the banks' affiliates in a foreign country on entities and individuals located in the foreign country) provides some (weak) evidence of larger risk effects through direct cross-border exposures. Finally, a sectoral decomposition of foreign claims into claims to the banking, non-bank private (e.g., corporates and households), and public sectors suggests that foreign claims to the banking and non-bank private sectors in financially connected countries account for a large portion of the increase in U.S. banks' contribution to systemic risk.

To better understand the nature of the association between foreign country financial connectedness and U.S. systemic risk, and identify channels through which financial connectedness may amplify risk effects, we additionally explore interactions of financial connectedness with banking organization characteristics and country financial conditions. First, at the bank-level, we show that the systemic footprint and leverage amplify the systemic risk effects associated with global banks' claims in financially connected countries. Second, at the foreign country-level, we document increased spillover effects to the U.S. from countries that experience financial crises particularly when they are well financially connected.

Our study contributes to several research streams. First, we extend the literature on the effects of international financial integration and connectedness. Second, we contribute to the literature on cross-country financial linkages, shock propagations, and risk spillovers. Third, we advance the discussion around risk channels in global banking as well as the nature of systemic risk and its determinants. Moreover, our study is relevant to the policy debate around international banking regulation following the global financial crisis. Our results highlight a systemic risk externality that arises from significant foreign banking exposures in countries that are well-connected to global financial markets, and are generally aligned with frameworks aimed at restricting cross-country and inter-market shock transmission channels. They also suggest the potentially important role of domestic prudential regulation in mitigating system-level risks arising from the financial globalization channel. Mechanisms to improve the strength and resiliency of the banking system can help in dampening a crisis.

2 Related literature

Our study bridges several literature streams in economics and finance. First, we contribute to the literature on the effects of international financial integration and connectedness. Mendoza et al. (2009) suggest that financial integration may contribute to global financial imbalances, especially when countries differ in financial markets development. Kalemli-Ozcan et al. (2013a) and Kalemli-Ozcan et al. (2013b) identify a strong negative effect of banking integration on country output synchronization (i.e., divergent economic activity as a result of higher integration), but this relation is much weaker (close to zero) during periods of financial turmoil. Bekaert et al. (2011a), Bekaert et al. (2005), and Bekaert et al. (2006) show that equity market liberalization and financial openness increase factor productivity growth and real economic growth, and lower consumption growth volatility. Further, Bekaert et al. (2011b) provide evidence that market integration is essential for aligning growth opportunities with FDI. Levine and Zervos (1998), Henry (2000b), and Henry (2000a) show that liberalizing restrictions on foreign equity transactions and flows boost domestic equity market liquidity, stock prices, and investment.

Different from the above studies, we examine how cross-country financial connectedness affects the systemic risk contributions of U.S. global banking organizations. In contrast to the documented benefits of financial openness, our study identifies a significant externality: concentrated exposures in financially integrated markets increase global banks' systemic risk contributions. In doing so, we use granular and detailed data at the individual banking organization level, which allows us to conduct a sharper and deeper analysis of the underlying channels relative to the vast majority of studies in this area, which use macro-level data

(Claessens et al. (2012)).

We also contribute to the literature on cross-country and cross-market financial linkages, shock propagations, and risk spillovers. Forbes and Rigobon (2002) show that dramatic movements in one stock market can have a powerful impact on markets of very different sizes and structures across the globe. Allen and Gale (2000) model financial contagion and how it spreads across banks and regions conditional on the occurrence of a shock. Peek and Rosengren (2000) study the transmission of the 1990s Japanese crisis to the United States by investigating the real estate activity in the U.S. states where Japanese banks are present. Kaminsky and Reinhart (2000) and Cetorelli and Goldberg (2012) focus on the role played by banks in spreading shocks through cutting bank lending during the 1982 debt crisis, the 1997 Asian crisis, and the 2007-09 financial crisis. Billio et al. (2012) emphasize the importance of banks in shock propagation relative to other financial institutions, while Cetorelli and Goldberg (2011) highlight the importance of multinational banks for risk transmissions across borders.

In addition to shedding light on the role of banks in cross-border risk linkages, we contribute to this literature by highlighting that the transmission of risk across borders crucially depends on the specific characteristics, such as the financial connectedness, of the country destinations where bank hold claims. Our analysis identifies specific bank-level (systemic importance and leverage) and country-level (financial crises) channels that amplify risk transmission effects. We also examine the roles that connectedness directionality, foreign claim types, and foreign claim sectors play for our systemic risk results, and find important differences that could inform supervisory risk assessment and regulatory policy.

Finally, while an abundance of research examines the determinants of bank risk, most studies largely ignore the effects of internationalization (Beltratti and Stulz (2012)). Amihud et al. (2002) examine the effects of cross-border mergers and report that, on average, neither the total risk nor the systematic risk of acquiring banks changes significantly. Similarly, Buch et al. (2013) document only a weak link between internationalization and German bank risk. In contrast, Berger et al. (2017) find a strong positive relation between internationalization and U.S. bank risk. Wagner (2010) and Ibragimov et al. (2011) argue that diversification reduces firm-specific idiosyncratic risks, but increases the risk of systemic failures. Although we do not analyze the link between internationalization and risk directly, our findings highlight financial connectedness between countries as an important channel through which banking globalization may impact financial system risk. By specifically focusing on systemic risk, our study also contributes to the broader debate on the nature of systemic risk and its determinants (De Bandt et al. (2012) and Benoit et al. (2017)).

3 Hypotheses

Early studies argue that more interconnected financial networks are associated with increased risk sharing and enhanced financial stability (Allen and Gale (2000)). Recent theoretical advances in the network literature, however, counter these conclusions and show that the rate at which network shocks average out depends on the structure of the network. For example, Acemoglu et al. (2015) illustrates that when shocks are sufficiently large or sufficiently numerous, a financial network characterized by dense interconnections can serve as a mechanism for the amplification of systemic risks. These findings are echoed by other studies showing complete networks may have lower systemic resiliency (e.g., Brusco and Castiglionesi (2007), Gai et al. (2011), and Zawadowski (2013)).

In our specific context, country financial connectedness may contribute to U.S. systemic risk if it affects any of the two main channels (as discussed, for example, in Elliott et al. (2020)) known to contribute to systemic risk. The first mechanism is comprised of linkages between financial institutions, including risks that propagate from an individual banking organization to the financial system through contagion. The second mechanism includes institutional investment exposures to common shocks and correlated risk-taking by banking organizations.

Related to the first mechanism, we note U.S. global banking organizations tend to have large systemic footprints due to their sizes and complexities. Some of them are central to the U.S. financial system. A shock to a single such entity could cause a cascading failure, spilling over to the rest of the U.S. financial institutions due to direct financial linkages. Cross-country financial connectedness effectively reduces diversification benefits across a global bank's geographic exposures and increases the bank's risk of failure, which consequently increases systemic risk because of the global bank's large systemic footprint.

Related to the second mechanism, country connectedness practically increases risk exposures commonality across banks. Country connectedness is associated with lower market segmentation and higher asset return correlations across markets. U.S. global banks' exposure to common risk factors effectively increases due to their asset holdings in financially integrated countries with rates of return that are highly correlated. These arguments are similar in nature to those in Wagner (2010), Ibragimov et al. (2011), and Allen et al. (2012) on the positive systemic risk effect of enhanced bank portfolio similarities. The systemic risk arising from real investment similarities and risk correlations may be further magnified by the incentives of banks to choose financial counterparties that share real investment exposures (Elliott et al. (2020)).

Hypothesis: *U.S. global banks with foreign claims in countries that are well-connected to world financial markets have higher contribution to U.S. systemic risk.*

It is important to note, however, that global bank characteristics (e.g., systemic importance and capitalization) and foreign markets (e.g., foreign market conditions) could amplify or moderate the relation between the systemic risk contribution of these institutions and the financial integration of their foreign portfolios (Nier et al. (2007), Wagner (2010), and

Acemoglu et al. (2015)). We thus not only test our main hypothesis but also explore the heterogeneity of the relation between BHCs' contribution to systemic risk and financial connectedness with respect to BHC characteristics and foreign market conditions.

4 Data, variable definitions, and descriptive statistics

4.1 Sample construction

Banks can gain foreign exposure through direct cross-border or foreign affiliate activities and through targeting different sectors of investment. We obtain confidential supervisory information on the distribution, by country at the quarterly frequency, of claims (loans, bonds, stocks, guarantees, etc.) on foreign residents held by individual U.S. banking organizations from the Federal Financial Institutions Examination Council (FFIEC)'s 009 report. Respondents include U.S. banks, savings associations, bank holding companies, savings and loan holding companies, and intermediate holding companies with $30 million or more in claims on residents of foreign countries.[1] We use foreign exposure data that is reported on an immediate-counterparty basis (i.e., country of residence of the borrower).

Using these data, we construct an unbalanced panel of U.S. banking organizations' foreign claims reported separately for each bank-quarter-host country combination. We then obtain and merge data from several other sources, including data on systemic risk measurement (Section 4.3), cross-country financial connectedness (Section 4.4), as well as other data (Section 4.5). The intersection of these databases yields our main sample that consists of 26,307 bank-quarter-host country observations (45 unique U.S. banking organizations with exposures to 41 unique countries) during the period [2005:Q1-2016:Q4]. We emphasize that while our sample comprises only 45 banks, these institutions account for the majority of U.S. banking industry assets (78% as of 2016:Q4) and include the largest and most systemically

[1] More information on FFIEC 009 can be found at: https://www.ffiec.gov/forms009_009a.htm.

important U.S. banking organizations (e.g., J.P. Morgan Chase, Bank of America, Citigroup, Wells Fargo, Goldman Sachs, and Morgan Stanley). Furthermore, the 41 countries represented in our final sample capture a substantial amount of U.S. banks' foreign exposures (79% as of 2016:Q4).

4.2 Foreign claims

Table 1 reports a breakdown of foreign claims by host country, where claims are summed across banks in our sample in every quarter and then averaged across quarters. While our foreign claims capture exposures to a total of 41 countries, a relatively small number of countries account for the majority of U.S. global banks exposures. For example, on average, the top ten countries by exposure account for nearly 70% of foreign claims in our sample. The constituents of this list are no surprise. These are mostly large economies with developed financial markets – a likely destination for U.S. banking organizations' financial claims. The top three countries are United Kingdom, Japan, and Germany.

[Insert Table 1 about here]

FFIEC categorizations allow us to decompose foreign claims into direct cross-border and local claims. Direct cross-border claims are extended by U.S. banks, and their affiliates in countries other than the country of the borrower, on foreign residents. By contrast, local claims are claims of U.S. BHCs' foreign affiliates on residents located in the same foreign country. Figure 2, Panel A presents the share of direct cross-border vis-á-vis local claims. On average, cross-border claims made up around 47.3% of total foreign claims over the sample period, while claims held through local representation constituted the remaining 52.7% share.

[Insert Figure 2 about here]

FFIEC categorizations also allow us to decompose foreign claims by target sector of investment: the banking, non-bank private, or public sector. Figure 2, Panel B shows that around 19.5% of U.S. banks' foreign claims are on foreign banks, 70.7% on non-bank private entities, and 9.8% on foreign public entities, on average, over the sample period.

4.3 Systemic risk

Systemic risk can be broadly defined as the risk of failure of multiple financial institutions due to common shocks, herding in correlated risks, and cross-institution contagion (Nier et al. (2007), Allen et al. (2012), and Benoit et al. (2017)). The 2007-09 financial crisis provided specific examples of severe financial shocks and correlated risk-taking, and illustrated some of the inter-linkages and interdependencies that ultimately undermined the stability of the entire financial system. Multiple measures to quantify systemic risk, including both micro- and macro-prudential approaches, have been offered in the finance and economics literature.[2] In this paper, we focus on two micro-prudential, cross-sectional measures that have been widely accepted by and extensively used in prior research: the marginal expected shortfall or *MES* (Brownlees and Engle (2016)) and the delta conditional value-at-risk or $\Delta CoVaR$ (Adrian and Brunnermeier (2016)). These measures capture distinct aspects of systemic risk.

MES measures how vulnerable a bank is to a systemic event (or exposure to common sources of risk) and, specifically, estimates how individual institutions' stock returns react relative to those of the entire market when aggregate returns are low. We follow Acharya et al. (2016) and estimate *MES* as BHC's average return during the worst 5% market return days during a given quarter. We linearly transform the variable so that larger *MES* values correspond to a higher level of systemic risk and divide it by one hundred for ease of presentation.

$\Delta CoVaR$ estimates the externality posed to the entire financial system if a particular

[2] See Bisias et al. (2012) and Benoit et al. (2017) for surveys of systemic risk literature and measures.

institution goes into distress. More formally, $\Delta CoVaR$ is the value-at-risk of the banking system conditional on a bank being in distress (95% quantile of quarterly equity return losses) relative to the value-at-risk of the banking system conditional on a bank being in a normal (median) state. We calculate $\Delta CoVaR$ following the quantile regression methodology of Adrian and Brunnermeier (2016). We obtain a quarterly measure of $\Delta CoVaR$ by averaging weekly $\Delta CoVaR$ observations within a quarter. Similar to *MES*, larger $\Delta CoVaR$ values indicate a higher level of systemic risk.

4.4 Country financial connectedness

We measure country financial connectedness with directional connectedness measures proposed and developed in Diebold and Yilmaz (2009), Diebold and Yilmaz (2012), and Diebold and Yilmaz (2014). The measure captures volatility spillovers derived from forecast error variance decompositions of vector autoregressions (VARs). Here, the Diebold-Yilmaz methodology is applied to daily stock market index return volatilities from 45 countries. The measure uses daily range volatilities (i.e., volatilies in the difference between closing and opening prices in a given day). Time-variation in these spillovers is obtained by estimating the VAR over 150-day rolling windows. We use the quarterly average of the daily measures in our estimations. Intuitively, these measures represent the fraction of a country's innovations in stock market volatility due to innovations in other countries' stock market volatility and vice versa. The higher the co-dependence in volatility innovations, the more financially connected countries are. Technical details are presented in Appendix A.

An important aspect of the connectedness measures is directionality (i.e., isolating the effect of shocks from one country to other countries). For example, connectedness "transmitted" from country i to the rest of the countries in our sample (denoted $C_{i \rightarrow world}$) is distinct from connectedness "received" by country i from the rest of the countries in our sample (denoted $C_{i \leftarrow world}$). To calculate total connectedness for country i, we sum $C_{i \rightarrow world}$ and

$C_{i \leftarrow world}$. Table 1 and Figure 3 present average financial connectedness by country.

[Insert Figure 3 about here]

European countries such as France, the Netherlands, Germany, and the United Kingdom are well integrated with global markets. In contrast, countries in South America (e.g., Argentina) and Asia (e.g., China) are comparatively less financially integrated with the rest of the world.

Variance decomposition connectedness measures based on stock market data are appealing for several reasons. First, they have obvious intuitive interpretation with regards to directional financial connectedness between countries. Second, relative to balance sheet measures, stock return information is more current and relevant for the transmission of cross-country shocks. Third, equity markets account for a large fraction of global financial market activity and the information contained in stock market data allow us to capture broad aspects of financial integration. Finally, the use of stock market data for the calculation of connectedness measures ensures a broad cross-section and representation of countries in our sample. Despite the appeal of these financial connectedness measures, we also confirm the robustness of our results to several other financial connectedness measures used in prior research as discussed in Appendix B.

4.5 Other determinants of BHC systemic risk

In our multivariate regression analysis, we include a number of country- and bank-level controls. First, we include a set of country-level risk-relevant controls that capture a host country's institutional and economic environments (Anginer et al. (2014) and Kalemli-Ozcan et al. (2013b)). These include the natural logarithm of GDP per capita, a country's credit-to-GDP ratio, the number of listed firms in a country's stock exchange, and a measure of output synchronization. Separately, we control for the level of U.S. national economic activity as measured by the Chicago Fed National Activity Index (CFNAI).

We also control for bank-level characteristics. Prior research has highlighted size and leverage as important determinants of banks' contribution to systemic risk (Brunnermeier et al. (2012), Acharya et al. (2016), and Brownlees and Engle (2016)). We thus control for bank asset size and the ratio of bank total assets to total equity capital. Prior studies have also linked non-interest income and non-deposit funding to systemic risk (Demirgüç-Kunt and Huizinga (2010) and Brunnermeier et al. (2012)). Consequently, we control for the ratio of non-interest to interest income and the ratio of deposits to total assets. To control for potential international diversification effects on systemic risk (Wagner (2010) and Ibragimov et al. (2011)), we include the number of countries where a banking organization has foreign claims. Some studies also suggest that banks may contribute more to systemic risk when they have higher credit losses (e.g., Anginer et al. (2014)). Hence, we control for credit loss allowances as a share of total assets. Finally, we control for bank liquidity risk and susceptibility to bank runs by including in our estimations the ratio of high quality liquid assets to total net cash outflows over a 30-day stress period. To mitigate the effects of outliers and potential data errors, we winsorize bank-level variables at the 1^{th} and 99^{th} percentiles. Detailed variable definitions are presented in Appendix C.

4.6 Summary statistics

Table 2 reports summary statistics for all variables described above. The mean and standard deviation of MES are 9.4% and 7.8%, and that the mean and standard deviation of $\Delta CoVaR$ are 1.5% and 0.6%. These summary statistics, combined with the ranges of the two variables (37.6% for MES and 3.0% for $\Delta CoVaR$), suggest substantial variation of bank contribution to systemic risk in our sample. The summary statistics similarly suggest significant in-sample variation for our financial connectedness measure, *Financial Connectedness*.

[Insert Table 2 about here]

5 Regression results

5.1 Country financial connectedness and systemic risk

In this section, we study the relation between country financial connectedness and the systemic risk contribution of U.S. banking organizations with global exposures using multivariate regressions. Because our data has multiple instances per bank-quarter (one observation for every country a bank operates in), we employ two approaches to handle the high dimensionality of the data. In our first approach, we reduce the dimensionality of the data to the bank-quarter level by taking a weighted average of *Financial Connectedness* and other country-level variables across all countries where a bank has exposure to in a given quarter. We use the proportion of a bank's foreign claims in a country-quarter as the weight for averaging with. We estimate the following model specification:

$$Systemic\ Risk_{i,t} = \alpha_i + \beta Financial\ Connectedness_{i,t-1} + \gamma W_{i,t-1} + \delta X_{i,t-1} + \zeta Z_{t-1} + \epsilon_{i,t} \quad (1)$$

where i indexes banks and t indexes quarters. *Systemic Risk* is a bank's contribution to U.S. systemic risk as measured by MES or $\Delta CoVaR$. *Financial Connectedness* is the (weighted) total financial connectedness of the foreign countries where a bank operates to the rest of the world. W is a vector of weighted host country-level controls. X is a vector of bank-level controls. Z measures U.S. economic activity. α_i denotes bank fixed effects. All explanatory variables are lagged one quarter. Standard errors are clustered at the BHC level.

In our second and preferred approach, we employ a Weighted Least Squares (WLS) estimator where we use the full (bank-quarter-country) dimensionality of our data. Each country exposure within a bank-quarter is weighted proportionately to a bank's foreign claims in that country in that quarter, and then bank-quarters are weighted equally among each other. A significant advantage of this second approach is that we are able to control for country fixed effects (in addition to bank fixed effects). Country fixed effects are particularly important to account for selection concerns, because countries that are generally financially well-connected to rest of the world tend to attract banking organizations that contribute more to systemic risk. In equation form, we estimate the following WLS model:

$$\begin{aligned}\sqrt{\omega_{j,t}}Systemic\ Risk_{i,j,t} &= \sqrt{\omega_{j,t}}\alpha_i + \sqrt{\omega_{j,t}}\lambda_j + \beta\sqrt{\omega_{j,t}}Financial\ Connectedness_{j,t-1} \\ &+ \gamma\sqrt{\omega_{j,t}}W_{j,t-1} + \delta\sqrt{\omega_{j,t}}X_{i,t-1} + \zeta\sqrt{\omega_{j,t}}Z_{t-1} + \sqrt{\omega_{j,t}}\epsilon_{i,j,t}\end{aligned} \quad (2)$$

where i indexes banks, j indexes countries, and t indexes quarters. ω is the proportion of a bank's foreign claims in a country-quarter. λ_j denotes country fixed effects and the other variables are defined similar to before. Standard errors are clustered at the BHC and country levels. Table 3 presents results. The coefficient estimates in Columns (1) and (3) correspond to Equation 1, while those in Columns (2) and (4) correspond to Equation 2.

[Insert Table 3 about here]

Across all specifications, the financial connectedness of countries where U.S. global banks hold claims is significantly positively related to the banks' contribution to U.S. systemic risk. Based on Columns (2) and (4), a one standard deviation increase *Financial Connectedness* is associated, on average, with a 14.3% increase in *MES* and a 7.7% increase in $\Delta CoVaR$ relative to their mean values. The coefficients are significant at the 1% level. The coefficient estimates in Columns (1) and (3), which correspond to the model in Equation 1, are similar in magnitude to those of our main specification and remain significant at the 1% level. Because this three-dimensional estimation mitigates potential selection bias, we continue to use Equation 2 as our main specification going forward. The control variable coefficients are largely consistent with prior literature. We find that larger banks, banks relying on non-deposit funding, and banks with more loan loss allowances tend to contribute more to systemic risk. Banks' contribution to systemic risk also tend to be higher during macroeconomic downturns. Finally, our results are robust to using alternative measures of financial connectedness that have been used in the literature. To conserve space, we present and discuss these additional analyses in Appendix B.

5.2 Endogeneity

5.2.1 Omitted variables and reverse causality

One may naturally be concerned that omitted variables or reverse causality are biasing the empirical relations in Table 3. For example, a systemic event in the U.S. may trigger higher volatility in global financial markets, which may in turn increase cross-country financial connectedness. Alternatively, an omitted country-level factor may be driving both financial connectedness between countries and banks' contributions to U.S. systemic risk. We use instrumental variables (IV) to address such concerns. For robustness, we use two different instruments.

Our first instrument is based on the idea that FDI expropriation by governments deters investments and curbs capital flows (Lin et al. (2019) and Azzimonti (2018)), which affects the financial connectedness of the countries that engage in expropriations. We argue that FDI expropriations arise as politically idiosyncratic events that are not directly related to U.S. systemic risk. We operationalize this idea with data on FDI expropriations from Hajzler and Rosborough (2016) and define an indicator that captures the incidence of recent FDI expropriations in a given country.

Our second instrument is motivated by findings in the prior literature that capital controls should deter financial integration and limit a country's connectedness to global financial markets (e.g., Forbes et al. (2016)). We refine this idea with findings from Buera et al. (2011) and Masciandaro and Romelli (2018), who emphasize the importance of regulatory spillovers from a country's neighbors to the country's own institutional environment. The conjecture here is that the breadth of capital controls used by a country is influenced by the regulatory choices of its neighbors (e.g., due to social and political relations), and this could serve as a plausible source of exogenous variation to that country's financial connectedness. Our instrument is thus defined as neighboring countries' median breadth of capital controls. To eliminate the possibility of reverse causation whereby the realization of U.S. systemic risk affects cross-country capital controls, we lag country capital controls and measure them as of 1975, thirty years prior to the beginning of our sample. Because institutions and regulatory policies are persistent over time, neighboring countries' lagged capital controls should be significantly correlated with a country's financial connectedness. They should not, however, have a direct effect on U.S. systemic risk.[3] Table 4 reports instrumental variables regression results.

[Insert Table 4 about here]

The first stage estimations in Panel A show that the IVs have highly significant coefficients, consistent with the expectation that FDI expropriations and capital controls are associated with weaker financial connectedness. The adjusted R^2s are high, and the F-statistics are well above the threshold of 10 prescribed by Stock et al. (2002), which suggests our estimations do not suffer from weak instrumental variable problems. The second stage estimations in Panel B show that the coefficient of *Financial Connectedness* retains its positive sign and is significant at the 1% level. The association between U.S. global banks' contribution to systemic risk and the financial connectedness of the countries holding their exposures is thus statistically and directionally robust to accounting for endogeneity (e.g.,

[3]Because our neighboring countries capital controls instrument is time-invariant, we omit country fixed effects from the IV regressions using that instrument.

due to omitted vairables) and reverse causality concerns.

5.2.2 Selection

A second potential source of endogeneity is banks' selection of their foreign exposures. Specifically, the concern is that banks' foreign claims destination choices are related to systemic risk through channels other than financial connectedness. While the use of country fixed effects in Equation 2 go some way to mitigate such concerns, we employ two alternative approaches to further confirm that our results are not driven by BHCs' endogenous location decisions. First, we modify Equation 2 to include bank×country fixed effects instead of separate bank and country fixed effects. Conceptually, coefficient estimates derived from within bank-country variation should be mostly free of selection bias, particularly in a relatively short sample. Table 5, Panel A reports the results and show that our baseline specifications are robust to the more stringent bank×country fixed effects scheme. *Financial Connectedness* is associated with higher BHC systemic risk contributions with coefficients positive and statistically significant at the 1% level.

[Insert Table 5 about here]

In an alternative approach (aimed at addressing potential selection concerns), we adopt a methodology similar to Lamont and Polk (2002) to capture exogenous changes in a country's financial connectedness to global markets. We decompose changes in bank-level financial connectedness into two components: an exogenous component that reflects changes in the financial connectedness of countries and an endogenous component that reflects changes in foreign claims locations. Specifically, for every bank i in quarter t, we keep only the countries which the bank has exposure to in both quarter t and quarter $t-1$. Countries which the firm is exposed to in quarter t, but not quarter $t-1$, are dropped from our estimation because they reflect discretionary decisions (by bank management) on location changes of foreign claims, which are potentially endogenous in nature. We thus measure only the exogenous shock to financial connectedness originating from country j which is simply the change in financial connectedness in country j from quarter $t-1$ to quarter t. We then estimate a first-difference specification of banks' contributions to systemic risk on financial connectedness. This empirical strategy should capture the effect of changes in country financial connectedness, not reflecting changes in banks' foreign claims locations.

Table 5, Panel B reports the results. An increase in country financial connectedness is related to an increase in BHC systemic risk contributions. Coefficients of (Δ) *Financial Connectedness* are statistically significant at least at the 5% level. Overall, both sets of tests further mitigate concerns that our results in Section 5.1 are driven by selection issues related to how banks choose the foreign locations where they hold claims.

5.2.3 Additional analysis: Evidence from foreign market entries

We next examine changes in banks' exposures to foreign country financial connectedness as a result of entries in new foreign markets to further support the causal interpretation of our results in Section 5.1. Absent first-order selection issues (see previous section), whereby a global bank's decision to gain exposure to a foreign country is related to a time-varying latent characteristic driving systemic risk contribution, new market entries can be treated as a relatively exogenous source of variation in the bank's foreign portfolio's financial connectedness.

We define foreign market entries as events where U.S. banks' foreign claims change from zero to positive within a country-quarter pair. We then create *Post Entry* indicator variables that equal 1 for quarters following a new foreign market entry and 0 otherwise. We use window lengths of four, eight, and twelve quarters around entry events. For every event, we average data into one pre-entry and one post-entry observations. Finally, we interact the *Post Entry* indicators with all country-level variables, including *Financial Connectedness*.

Table 6 presents results.

[Insert Table 6 about here]

The coefficients of *Post Entry* × *Financial Connectedness* are positive and significant across all specifications. These results thus suggest that systemic risk increases during post-market-entry periods when foreign countries are more financially connected. Moreover, the increase in risk is persistent, with a statistically significant relationship still observable at eight and twelve quarters following a new foreign market entry. These findings corroborate the previously documented relation that the financial connectedness of foreign markets where U.S. global banks have exposures contributes to U.S. systemic risk.

5.3 Financial connectedness decomposition by directionality

As discussed in Section 4.4, an important aspect of financial connectedness is directionality. So far, we have used total connectedness in our analyses, which combines connectedness "transmitted" from country i to the rest of the world ($C_{i \rightarrow world}$ or "from") as well as connectedness transmitted from the rest of the world to country i ($C_{i \leftarrow world}$ or "to"). One might conjecture that the relation between U.S. systemic risk and cross-country financial connectedness differs depending on the direction of connectedness. Particularly, connectedness might pose a more serious threat to U.S. systemic risk when countries where U.S. banks hold claims are connected to the rest of the world through transmission rather than reception of volatility. In this section, we empirically examine the relative importance of the different directions of connectedness. To do so, we split *Financial Connectedness* into *Financial Connectedness (From)* and *Financial Connectedness (To)*, and estimate specifications similar to Equation 2. Table 7, Panel A presents results.

[Insert Table 7 about here]

We find that U.S. systemic risk significantly increases through either direction ("to" or "from") of financial connectedness. However, the effect of financial integration "from" foreign countries on U.S. systemic risk seems to dominate that of financial integration "to" foreign countries. Based on specifications in Columns (1), (2), (4), and (5), a one standard deviation increase in *Financial Connectedness (From)* increases *MES* and $\Delta CoVaR$ by 12% and 6.4%, respectively, relative to their means, whereas a one standard deviation increase in *Financial Integration (To)* increases those measures by 12.7% and 6.7%, respectively, relative to their means. Columns (3) and (6) show a somewhat stronger effect of the "from" connectedness component (relative to the "to" component), though we note the marginal insignificance (p-value of 0.102) of *Financial Connectedness (From)* in Column (3).

5.4 Foreign claims decomposition by type and sector

As discussed in Section 4.2, foreign claims are comprised of cross-border and local claims as well as claims to different sectors of the economy, such as banks, non-bank private entities (e.g., corporates and households), and public institutions. One might naturally expect the relation between U.S. systemic risk and financial integration to differ depending on the type of financial linkages that exist between a U.S. bank and a foreign country. For instance, financial connectedness may matter less as a risk transmission channel if banks only have local claims in a country because these are typically assets of subsidiaries locally incorporated in those foreign markets, which parent BHCs have limited liability to. Likewise, financial connectedness may be particularly important as a conduit for systemic shocks from and to countries where BHCs have large banking sector exposures. As noted in prior research (e.g., Billio et al. (2012)), banks play a particularly important role in systemic risk propagation due to their interconnectedness.

To explore these channels, we decompose U.S. bank foreign claims into different types and sectors. First, we split foreign claims into cross-border and local claims and create indicator variables for each. Specifically, we create the indicator variables *Foreign Claims (Cross-Border)* and *Foreign Claims (Local)* that equal 1 if a country-quarter has positive cross-border and local claims, respectively, and 0 otherwise. Separately, we also split foreign claims into claims to banks, non-bank private entities, and public institutions. Specifically, we create the indicator variables *Foreign Claims (Banking)*, *Foreign Claims (Non-Bank Private)*, and *Foreign Claims (Public)*. *Foreign Claims (Banking)* equals 1 if a country-quarter has positive claims to commercial banks, savings banks, and other depository institutions, and 0 otherwise. *Foreign Claims (Non-Bank Private)* equals 1 if a country-quarter has positive claims to corporations and households, and 0 otherwise. *Foreign Claims (Public)* equals 1 if a country-quarter has positive claims to foreign governments and official institutions, including government owned banks that serve official functions such as central banks, and 0 otherwise. We then interact these indicators with *Financial Connectedness* and estimate specifications similar to Equation 2. Table 7, Panel B presents results.

In Columns (1) and (3), the estimated coefficients on *Foreign Claims (Cross-Border)* × *Financial Connectedness* are larger than those of *Foreign Claims (Local)* × *Financial Connectedness*. However, the coefficients are only statistically significant at conventional levels in Column (3), but not in Column (1). We interpret these results as weak evidence suggesting that the link between U.S. systemic risk and financial integration may be driven to a larger extent by U.S. BHCs' direct cross-border exposures rather than local ones. In Columns (2) and (4), the estimated coefficients on *Foreign Claims (Banking)* × *Financial Connectedness* and *Foreign Claims (Non-Bank Private)* × *Financial Connectedness* are robustly positive and significant, while those of *Foreign Claims (Public)* × *Financial Connectedness* are indistinguishable from zero. This finding highlights the importance of foreign exposure sectors in our context and suggests that while exposures to foreign banks and non-bank private entities in countries that are more financially connected are important for U.S. banks' contribution to systemic risk, exposures to foreign public institutions are not significantly so.

5.5 Potential channels

5.5.1 Systemically important banks

Certain banking organizations are so central to the U.S. and global financial systems that their failure could cause devastating damage, both to financial markets and the larger economy. These institutions are often referred to as "Global Systemically Important Banks" or GSIBs. A number of institutions in our sample could be considered GSIBs given their size, complexity, and global footprint. In light of our findings that cross-country financial connectedness increases U.S. global banks' contribution to systemic risk, this motivates us to examine if an individual bank's systemic importance further amplifies this relation.

To test this, we interact measures of systemic importance with *Financial Connectedness* and estimate a model similar to Equation 2. More specifically, we define *GSIB* as equal to 1 if a BHC is designated as a global systemically important bank by the Federal Reserve System, and 0 otherwise (Federal Reserve System (2015)). Table 8, Columns (1) and (4) present results.

[Insert Table 8 about here]

The positive impact of country financial connectedness on global banks' contribution to systemic risk is driven by systemically important financial institutions. The interaction terms *GSIB*×*Financial Connectedness* are positive and significant (at the 1% level) in both specifications.[4] These findings are overall consistent with the notion that GSIBs pose significant risks for financial system stability, and support regulatory policy of heightened resiliency requirements for these firms.

[4] Due to the inclusion of bank fixed effects, we are unable to identify the coefficients on *GSIB* individually.

5.5.2 Bank leverage

Cross-country shock propagation could have systemic consequences particularly if the affected banks are vulnerable. Because bank capital serves to absorb unexpected losses, the risk of banks crucially depends on their capital buffers. In the context of our prior findings that cross-country financial connectedness has risk-increasing effects, it is expected that higher leverage particularly at banks with exposures in countries that are well connected to world financial markets might amplify risks posed to the U.S. financial system. Banks that are better capitalized (i.e., have lower leverage) should be more resilient against risks arising from international financial integration.

To test this channel empirically, we measure leverage with the ratio of bank total assets to bank total equity capital (*Leverage*). We then interact *Leverage* with *Financial Connectedness* and estimate a model similar to Equation 2. Table 8, Columns (2) and (4) present results. The interaction terms *Leverage*×*Financial Connectedness* are positive and significant (at least at the 10% level). Consistent with expectations, bank leverage amplifies the risk-increasing effects associated with higher financial connectedness of foreign exposure destinations.

5.5.3 The transmission of foreign crises

As theoretically modeled in Allen and Gale (2000), a significant financial shock in a given market may trigger financial contagion across markets, with financial linkages serving as a conduit for the cross-market risk spillovers. In this section, we build on these theoretical findings and empirically examine whether U.S. banks with exposures to countries that are well connected to global financial markets contribute more to systemic risk when those countries experience financial turmoil.

In our tests, we leverage data from Laeven and Valencia (2012) to identify the timing of financial crises across different countries. We define an indicator variable, *Foreign Financial*

Crises, equal to 1 if a foreign country experienced financial dislocations in the previous year due to systemic banking, currency, and sovereign debt crises, and 0 otherwise. We then include interaction terms between *Foreign Financial Crises* and *Financial Connectedness* in a model similar to Equation 2. Table 9, Columns (1), (2), (5) and (6) present the results.

[Insert Table 9 about here]

The effect of foreign crises on U.S. systemic risk come is more pronounced when crises occur in countries that are financially connected. The interaction term *Foreign Financial Crises*×*Financial Connectedness* are positive and significant at the 1% level. These results highlight that U.S. bank foreign exposures to countries that are well financially integrated serve as a conduit for cross-country financial contagion and transmission of systemic risks.

In additional analysis, we also test whether foreign country financial connectedness played a significant role during the 2007-09 financial crisis. For this purpose, we define an indicator variable, *2007-09 Financial Crisis*, equal to 1 over the period [2007:Q4-2009:Q3], and 0 otherwise. We calculate interaction terms between *2007-09 Financial Crisis* and *Financial Connectedness* and test their significance. Table 9, Columns (3), (4), (7) and (8) present the results. While financial crises in well-connected foreign countries pose significant risk to the U.S. financial stability, financial connectedness did not play a significant role during the 2007-09 crisis. The positive coefficients on *2007-09 Financial Crisis*×*Financial Connectedness* are statistically insignificant at conventional levels.

6 Policy implications

Since the 2007-09 financial crisis, policymakers have significantly reoriented their focus toward financial stability, often expressing the willingness to trade-off beneficial financial system characteristics for stability. For example, Tarullo (2012) notes that the primary goal of the Dodd-Frank Act is to contain systemic risk, even if this cuts back on the competitiveness and efficiency of U.S. banking organizations. Other central banks around the world have similarly made financial stability their priority.

For global banks, multinational exposures require dealing with the trade-off between risk sharing and the risk of contagion. On the one hand, global diversification could reduce risk through eliminating the idiosyncratic losses embedded in banks' individual portfolios (e.g., Samuelson (1967)). On the other hand, the cross-border financial linkages resulting from global diversification enable and facilitate the propagation of system-level shocks across countries (e.g., Stiglitz (2010)). In these arguments, the extent of connectedness among markets play a crucial role for the risk outcomes, and should thus be an important consideration in the supervision and regulation of globally active banks.

Our results provide empirical evidence of a significant systemic risk externality associated with global banking exposures in countries that are well-connected to the world financial markets. Our results are thus generally aligned with frameworks aimed at managing cross-country connectedness and restricting inter-market shock transmission channels. For example, some national regulatory authorities have advocated for "ring fencing" and "local liquidity pools" as restrictions on banks' global liquidity management (Goldberg and Gupta (2013) and Claessens (2017)). Others have suggested that well-designed capital controls could be used to prevent contagion during crisis episodes (e.g., Stiglitz (2010)). In each of these cases, our results indicate that regulatory frameworks for global BHCs could be fine-tuned to the host-country characteristics of host countries where global banks operate (e.g., financial connectedness).

We are careful to note, however, that designing and implementing such mechanisms is very challenging in practice. They come with their own set of frictions, inefficiencies and risk externalities (e.g., Cerutti et al. (2011) and Frame et al. (2020)). The optimal level of integration necessarily depends on the likelihood of large shocks (and ensuing systemic failure) relative to the level of country-specific risks and the associated costs. Moreover, a careful consideration of the types and severity of informational and other frictions in different markets, as well as the potential financial stability effects on those same markets (e.g., Karolyi et al. (2018)), is essential for the proper understanding the trade-offs and benefits of capital market integration and resulting connectedness.

Our results also suggest that prudential regulation can improve financial system stability. Specifically, we show that higher connectedness increases systemic fragility specially when bank leverage is high. Hence, strong capital standards may increase systemic resilience. Furthermore, our results highlight global systemically important banks as a key channel for the destabilizing effects of connectedness. Our findings broadly support the U.S. banking regulatory agencies' approach to allow capital expectations to vary with the size, scope of operations, activities, and systemic importance of firms. Specifically, our results are consistent with the regulators' significantly heightened expectations for the largest and most systemically important U.S. financial institutions.

7 Conclusion

Global banking continues to be at the forefront of the current policy and academic debate in the aftermath of the 2007-09 financial crisis. While global banking has strong benefits, banks' concentrated exposures in deeply integrated international markets can amplify the propagation of cross-country financial shocks.

This paper studies the relation between country financial connectedness and systemic risk for U.S. banking organizations with global exposures. Using granular supervisory data on the distribution of U.S. banks' foreign claims and recent systemic risk and financial connectedness measures, we find that banks with more foreign claims in countries that are connected to global financial markets contribute more to U.S. systemic risk. This relation is robust to accounting for endogeneity concerns. Further, we document specific bank-level (systemic importance and leverage) and country-level (country crises) channels that amplify these effects. Finally, we also examine the roles directional financial connectedness ("from" and "to" foreign countries), foreign claim types (direct cross-border and local), and foreign claim sectors (banking, non-bank private and public) play for the cross-border transmission of risk.

We conclude that, in the context of global banking, cross-country financial integration is an important amplification channel for U.S. systemic risk. Our results could inform the assessment of system-level risks that arise as by-products of global banking exposures and financial market connectedness. They are particularly relevant for macro-prudential policy given the concentration of foreign financial claims in well-integrated markets, and the significant regulatory focus toward improved financial stability.

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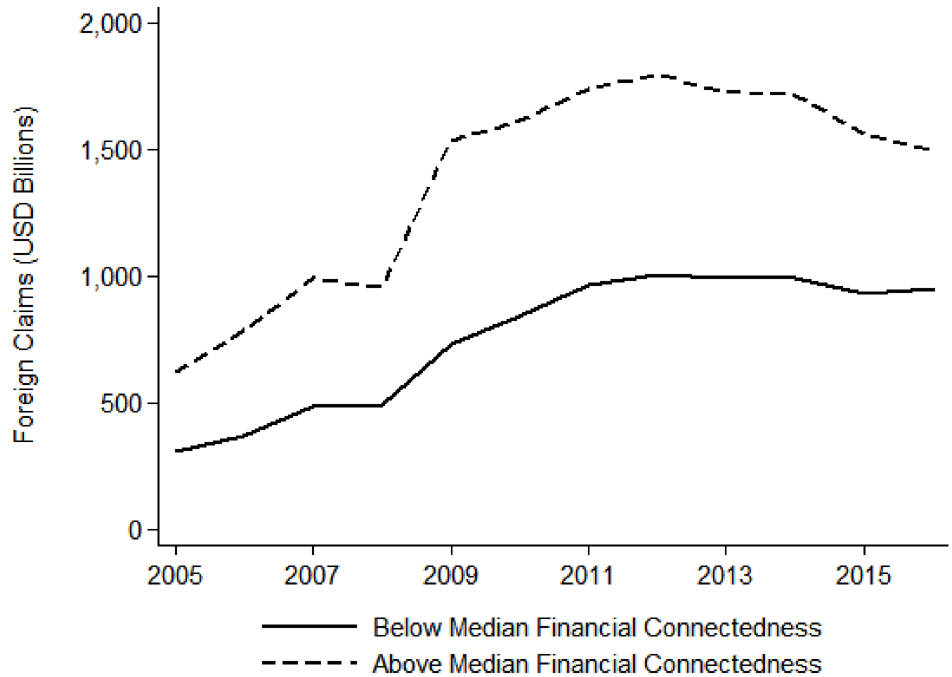

Figure 1: U.S. BHC Foreign Claims and Country Financial Connectedness
This figure shows U.S. BHC foreign claims (USD billions) in countries above and below median *Financial Connectedness*. The sample comprises 41 countries with *Financial Connectedness* data over the period [2005:Q1-2016:Q4]. Foreign claims data are from the Bank of International Settlements consolidated banking statistics on an immediate counterparty basis. *Financial Connectedness* measures a country's connectedness to global financial markets.

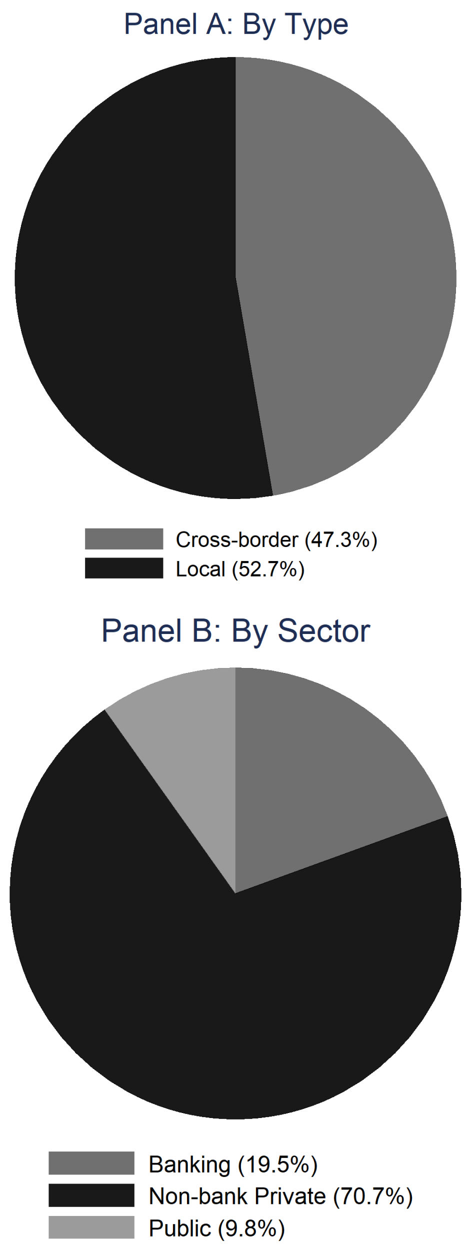

Figure 2: Foreign Claims by Type and Sector
This figure presents U.S. BHC foreign claim decompositions by exposure type and sector. Panel A decomposes foreign claims into cross-border and local claims. Cross-border claims are direct claims of domestic banks, or their foreign affiliates in countries other than the country of the borrower, on foreign entities and individuals. Local claims are claims of domestic banks' foreign affiliates on local entities and individuals. Panel B decomposes foreign claims into claims to banking, non-bank private, and public entities. The sample comprises 45 U.S. BHCs over the period [2005:Q1-2016:Q4] with foreign claims in 41 countries. Foreign claims data are from Federal Financial Institutions Examination Council's 009 report.

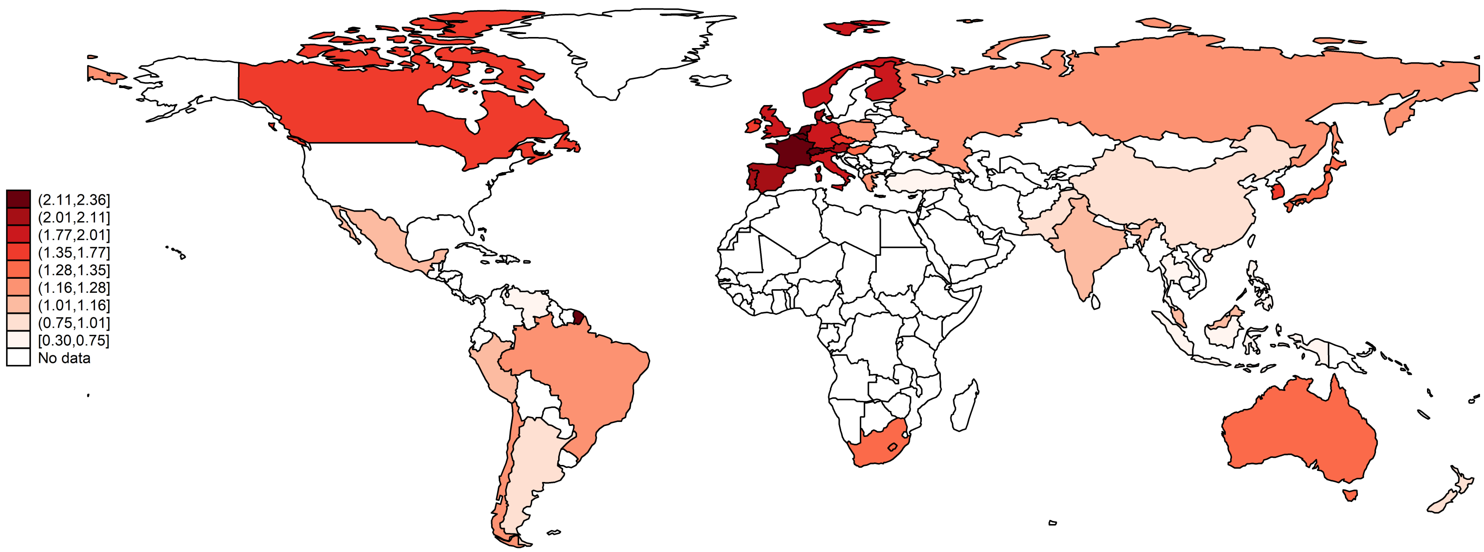

Figure 3: Financial Connectedness across Countries

This figure presents a heat map of average *Financial Connectedness* across the 41 countries in our sample over the period [2005:Q1-2016:Q4]. *Financial Connectedness* measures a country's connectedness to global financial markets. Darker colors indicate higher connectedness.

Table 1: U.S. BHC Foreign Claims by Country

This table sorts the 41 countries in our sample according to U.S. BHC average foreign claims (USD billions) over the period [2005:Q1-2016:Q4]. The table also shows the average of *Financial Connectedness*, which measures a country's connectedness to global financial markets.

Country	Foreign Claims	Financial Connectedness
United Kingdom	431.572	2.041
Japan	238.336	0.893
Germany	141.547	2.210
France	132.741	2.283
Mexico	102.492	1.266
Canada	92.088	1.456
Netherlands	84.829	2.246
South Korea	84.253	0.984
Australia	81.548	0.874
Brazil	61.843	1.287
China	56.870	0.693
India	54.829	0.848
Ireland	52.492	1.491
Singapore	48.851	0.909
Hong Kong	46.864	0.968
Spain	41.795	1.963
Italy	41.649	1.993
Switzerland	41.369	1.901
Belgium	24.242	2.087
Turkey	18.090	1.047
Russia	17.869	1.192
Malaysia	15.848	0.765
Denmark	15.665	1.581
Norway	13.596	1.643
Poland	13.522	1.357
Indonesia	12.375	0.904
Chile	11.850	1.055
Austria	10.014	1.709
South Africa	9.451	1.307
Thailand	9.009	0.763
Greece	8.509	0.979
Finland	7.056	1.840
Argentina	6.974	1.156
Philippines	6.922	0.723
Czech Republic	4.280	1.296
Hungary	4.263	1.136
Portugal	4.213	1.525
New Zealand	4.014	0.679
Peru	3.884	0.837
Venezuela	2.420	0.417
Pakistan	1.482	0.625

Table 2: Summary Statistics

This table presents summary statistics of the main variables in our analysis. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. The sample is a panel of 26,307 BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. Detailed definitions of all variables are presented in Appendix C.

	Mean	SD	10p	90p	Obs.
MES	0.096	0.079	0.028	0.201	26,307
Δ CoVaR	1.564	0.630	0.856	2.389	25,219
Financial Connectedness	1.330	0.590	0.588	2.225	26,307
Ln(GDPPC)	0.096	0.012	0.079	0.108	26,307
Credit-to-GDP	0.958	0.501	0.252	1.641	26,307
Ln(Number of Listed Firms)	−0.008	0.013	−0.025	0.011	26,307
Output Synchronization	−0.022	0.023	−0.050	−0.002	26,307
Ln(Assets)	19.469	1.458	17.628	21.430	26,307
Leverage	10.485	2.568	7.584	13.687	26,307
NII-to-II	1.285	1.217	0.363	3.458	26,307
Deposits Ratio	0.544	0.215	0.140	0.758	26,307
Country Diversification	3.963	0.777	2.996	4.812	26,307
Loan Loss Allowance	0.017	0.012	0.003	0.033	26,307
Liquidity Coverage Ratio	0.521	0.565	0.059	1.401	26,307
CFNAI	−0.290	0.792	−0.977	0.247	26,307

Table 3: U.S. BHC Systemic Risk Contribution and Country Financial Connectedness
This table reports coefficient estimates from panel regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. The sample in Columns (1) and (3) is a panel of 1,173 BHC-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. The sample in Columns (2) and (4) is a panel of 26,307 BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. Detailed definitions of all variables are presented in Appendix C. The specifications in Columns (1) and (3) are estimated via OLS, include BHC fixed effects, and cluster standard errors at the BHC level. The specifications in Columns (2) and (4) are estimated via WLS, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. The specifications include BHC and country fixed effects and cluster standard errors at the BHC and country levels. *p*-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

	MES		Δ CoVaR	
	(1)	(2)	(3)	(4)
Financial Connectedness	0.032***	0.023***	0.213**	0.195***
	(0.001)	(0.000)	(0.010)	(0.000)
Ln(GDPPC)	−0.609	0.480	−8.372**	−0.419
	(0.108)	(0.606)	(0.022)	(0.938)
Credit-to-GDP	0.021	0.012**	0.334*	0.154***
	(0.326)	(0.020)	(0.091)	(0.000)
Ln(Number of Listed Firms)	0.364	0.905	1.335	9.553*
	(0.468)	(0.201)	(0.705)	(0.076)
Output Synchronization	−0.546**	−0.103	−5.028***	−1.000
	(0.028)	(0.338)	(0.005)	(0.160)
Ln(Assets)	0.022***	0.018***	0.059	0.082**
	(0.002)	(0.002)	(0.257)	(0.046)
Leverage	0.004***	0.003**	0.021*	0.017
	(0.005)	(0.020)	(0.073)	(0.120)
NII-to-II	−0.015*	−0.014**	−0.140***	−0.112**
	(0.087)	(0.034)	(0.006)	(0.010)
Deposits Ratio	−0.025	−0.050	−0.747***	−0.846***
	(0.480)	(0.132)	(0.008)	(0.000)
Country Diversification	−0.008	−0.010**	−0.025	−0.051
	(0.152)	(0.033)	(0.582)	(0.280)
Loan Loss Allowance	1.084***	1.310***	0.217	1.246
	(0.000)	(0.000)	(0.863)	(0.314)
Liquidity Coverage Ratio	0.004	−0.005	0.000	−0.030
	(0.574)	(0.379)	(0.996)	(0.653)
CFNAI	−0.057***	−0.057***	−0.385***	−0.384***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,173	26,307	1,137	25,219
Adj. R2	.56	.58	.75	.75

Table 4: Instrumental Variable Regressions

This table reports coefficient estimates from instrumental variable (IV) regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. The sample is a panel of BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. *FDI Expropriation* is an indicator equal to 1 if a foreign direct investment (FDI) expropriation act occurred in a given country during the most recent 3 years, and 0 otherwise. *Capital Controls* is the percentage of capital controls not levied as a share of the total number of capital controls listed by the IMF annual report on exchange agreements and exchange restrictions, multiplied by 10. *Neighbor Capital Controls 1975* measures neighboring countries' median *Capital Controls* as of 1975. Detailed definitions of all variables are presented in Appendix C. We use a weighted IV regression approach, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. When we use *FDI Expropriation* as an instrument, we include BHC and country fixed effects. When we use *Neighbor Capital Controls 1975* as an instrument, we include BHC fixed effects. We cluster standard errors at the BHC and country levels in all specifications. p-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively. Panel A presents first-stage regression results and Panel B presents second-stage regression results.

Panel A: IV Regressions - First Stage

	Financial Connectedness	
	(1)	(2)
FDI Expropriation	−0.226***	
	(0.000)	
Neighbor Capital Controls 1975		0.038***
		(0.001)
Ln(GDPPC)	30.611***	30.421***
	(0.000)	(0.000)
Credit-to-GDP	−0.324***	−0.034
	(0.000)	(0.601)
Ln(Number of Listed Firms)	0.798**	−8.276***
	(0.044)	(0.000)
Output Synchronization	1.707***	1.524***
	(0.000)	(0.003)
Ln(Assets)	0.023**	0.018
	(0.017)	(0.446)
Leverage	−0.008**	−0.010
	(0.022)	(0.124)
NII-to-II	−0.005	−0.027
	(0.685)	(0.204)
Deposits Ratio	−0.114**	−0.022
	(0.045)	(0.810)
Country Diversification	−0.071***	0.003
	(0.006)	(0.947)
Loan Loss Allowance	3.249***	3.044*
	(0.000)	(0.056)
Liquidity Coverage Ratio	0.062**	0.117**
	(0.013)	(0.020)
CFNAI	−0.087***	−0.091***
	(0.000)	(0.000)
Observations	25,815	24,449
Adj. R2	.35	.38

Panel B: IV Regressions - Second Stage

	IV: FDI Expropriation		IV: Neighbor Capital Controls 1975	
	MES	Δ CoVaR	MES	Δ CoVaR
	(1)	(2)	(3)	(4)
Financial Connectedness	0.100***	0.687***	0.010***	0.799**
	(0.000)	(0.000)	(0.003)	(0.020)
Ln(GDPPC)	−1.648	−15.275**	−0.230**	−24.148**
	(0.114)	(0.016)	(0.011)	(0.038)
Credit-to-GDP	0.042***	0.360***	0.001	0.118***
	(0.000)	(0.000)	(0.264)	(0.002)
Ln(Number of Listed Firms)	0.660	7.037	0.102***	7.619**
	(0.362)	(0.275)	(0.008)	(0.036)
Output Synchronization	−0.284**	−2.298***	−0.099**	−2.231***
	(0.012)	(0.004)	(0.022)	(0.000)
Ln(Assets)	0.020***	0.099**	0.025***	0.104*
	(0.001)	(0.025)	(0.005)	(0.099)
Leverage	0.004***	0.021*	0.003**	0.035***
	(0.010)	(0.057)	(0.037)	(0.001)
NII-to-II	−0.016**	−0.129***	−0.015*	−0.095*
	(0.020)	(0.004)	(0.053)	(0.058)
Deposits Ratio	−0.040	−0.744***	−0.061	−0.694*
	(0.237)	(0.002)	(0.130)	(0.052)
Country Diversification	−0.004	−0.013	−0.009	−0.054
	(0.431)	(0.778)	(0.126)	(0.372)
Loan Loss Allowance	1.101***	0.024	1.389***	0.197
	(0.000)	(0.986)	(0.000)	(0.918)
Liquidity Coverage Ratio	−0.012**	−0.076	−0.001	−0.068
	(0.047)	(0.267)	(0.833)	(0.518)
CFNAI	−0.050***	−0.339***	−0.059***	−0.311***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	25,815	24,835	24,449	23,520
Adj. R2	.57	.75	.58	.73

Table 5: BHC×Country Fixed Effects and Lamont and Polk (2002) Regressions

In Panel A, we estimate panel regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. We include BHC×country fixed effects and cluster standard errors at the BHC and country levels. In Panel B, we estimate panel regressions of changes in U.S. BHC contribution to systemic risk on changes in country financial connectedness and control variables. Differences are taken quarter-over-quarter for each BHC-country pair. Standard errors are clustered at the BHC and country levels. In both panels, we use a weighted regression approach, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. The sample is a panel of BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. Detailed definitions of all variables are presented in Appendix C. *p*-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

Panel A: BHC × Country Fixed Effects		
	MES	Δ CoVaR
	(1)	(2)
Financial Connectedness	0.023***	0.194***
	(0.000)	(0.000)
Ln(GDPPC)	1.079	1.905
	(0.324)	(0.772)
Credit-to-GDP	0.010*	0.156***
	(0.084)	(0.000)
Ln(Number of Listed Firms)	0.491	11.548*
	(0.590)	(0.095)
Output Synchronization	−0.098	−1.081
	(0.390)	(0.166)
Ln(Assets)	0.018***	0.090**
	(0.001)	(0.037)
Leverage	0.003**	0.017
	(0.023)	(0.111)
NII-to-II	−0.015**	−0.115**
	(0.032)	(0.011)
Deposits Ratio	−0.051	−0.889***
	(0.172)	(0.001)
Country Diversification	−0.011**	−0.051
	(0.044)	(0.362)
Loan Loss Allowance	1.285***	1.133
	(0.000)	(0.358)
Liquidity Coverage Ratio	−0.002	−0.012
	(0.735)	(0.864)
CFNAI	−0.057***	−0.380***
	(0.000)	(0.000)
Observations	26,253	25,172
Adj. R2	.57	.74

Panel B: Lamont and Polk (2002) Regressions		
	MES	Δ CoVaR
	(1)	(2)
Δ Financial Connectedness	0.016**	0.395***
	(0.026)	(0.000)
Δ Ln(GDPPC)	0.365***	2.257***
	(0.000)	(0.000)
Δ Credit-to-GDP	−0.002***	−0.006
	(0.000)	(0.337)
Δ Ln(Number of Listed Firms)	0.076**	0.224
	(0.029)	(0.632)
Δ Output Synchronization	0.078	−1.483
	(0.725)	(0.402)
Δ Ln(Assets)	0.073**	0.572***
	(0.034)	(0.005)
Δ Leverage	0.003	−0.057***
	(0.325)	(0.000)
Δ NII-to-II	−0.028**	−0.203**
	(0.016)	(0.012)
Δ Deposits Ratio	−0.189*	−0.501
	(0.060)	(0.366)
Δ Country Diversification	−0.013	0.039
	(0.424)	(0.586)
Δ Loan Loss Allowance	−0.530	14.724***
	(0.670)	(0.000)
Δ Liquidity Coverage Ratio	−0.020	0.101
	(0.506)	(0.328)
Δ CFNAI	−0.015***	−0.266***
	(0.000)	(0.000)
Observations	25,063	24,018
Adj. R2	.06	.26

Table 6: Evidence from Foreign Market Entries

This table reports coefficient estimates from regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables around U.S. BHC foreign market entries. We define foreign market entries as instances where foreign claims change from 0 to a positive value from one quarter to the next. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. *Post Entry* is an indicator equal to 1 post entry, and 0 otherwise. Detailed definitions of all variables are presented in Appendix C. For each foreign market entry, we use observation windows of $+/-$ 4, 8 or 12 quarters around when foreign claims change from 0 to positive over the period [2005:Q1-2016:Q4]. Variables are then averaged into one pre-entry and one post-entry observations for every event. We include BHC fixed effects and cluster standard errors at the BHC and country levels in all specifications. p-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

	MES	Δ CoVaR	MES	Δ CoVaR	MES	Δ CoVaR
	(1)	(2)	(3)	(4)	(5)	(6)
Post Entry × Financial Connectedness	0.007***	0.040***	0.006***	0.018*	0.005***	0.016*
	(0.004)	(0.002)	(0.003)	(0.071)	(0.000)	(0.061)
Post Entry × Ln(GDPPC)	−0.221*	−0.623	−0.236**	−0.088	−0.276***	−0.821**
	(0.070)	(0.147)	(0.017)	(0.779)	(0.000)	(0.049)
Post Entry × Credit-to-GDP	0.005**	0.017	0.004	0.002	0.004	0.007
	(0.017)	(0.328)	(0.122)	(0.849)	(0.119)	(0.565)
Post Entry × Ln(Number of Listed Firms)	0.027	0.882**	0.072	0.806**	0.034	0.219
	(0.731)	(0.026)	(0.216)	(0.032)	(0.437)	(0.472)
Post Entry × Output Synchronization	−0.148**	−0.773**	−0.084**	−0.579**	−0.032	−0.291
	(0.011)	(0.022)	(0.024)	(0.011)	(0.325)	(0.182)
Post Entry	0.004	−0.017	0.010	−0.024	0.018***	0.065*
	(0.744)	(0.663)	(0.236)	(0.269)	(0.004)	(0.090)
Ln(Assets)	0.023***	0.074	0.019***	0.052	0.016***	0.016
	(0.001)	(0.186)	(0.001)	(0.290)	(0.003)	(0.676)
Leverage	0.004***	0.021	0.003**	0.016	0.002	−0.002
	(0.008)	(0.297)	(0.027)	(0.419)	(0.181)	(0.877)
NII-to-II	−0.013*	−0.143	−0.011	−0.124	−0.003	−0.025
	(0.080)	(0.114)	(0.214)	(0.120)	(0.717)	(0.604)
Deposits Ratio	−0.022	−0.776**	−0.005	−0.451	−0.023	−0.544**
	(0.605)	(0.021)	(0.910)	(0.126)	(0.625)	(0.039)
Country Diversification	−0.010	−0.006	−0.010**	−0.014	−0.010**	0.013
	(0.100)	(0.903)	(0.034)	(0.688)	(0.012)	(0.697)
Loan Loss Allowance	1.283***	2.642	1.325***	2.791	1.581***	4.478*
	(0.000)	(0.327)	(0.000)	(0.309)	(0.000)	(0.066)
Liquidity Coverage Ratio	−0.011	−0.098	−0.012	−0.050	−0.018*	−0.041
	(0.202)	(0.350)	(0.215)	(0.583)	(0.079)	(0.594)
CFNAI	−0.065***	−0.458***	−0.068***	−0.499***	−0.068***	−0.499***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	2,178	2,178	2,119	2,119	2,030	2,030
Adj. R2	.83	.89	.88	.93	.92	.96

Table 7: Country Financial Connectedness and Foreign Claims Decompositions

This table reports coefficient estimates from panel regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. The sample is a panel of 26,307 BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. Panel A decomposes country financial connectedness by directionality. *Financial Connectedness* measures a country's connectedness to global financial markets, and is the sum of *Financial Connectedness (From)* and *Financial Connectedness (To)*. *Financial Connectedness (From)* is the connectedness "transmitted" from a foreign country to global financial markets. *Financial Connectedness (To)* is the connectedness "received" by a foreign country from global financial markets. Panel B decomposes foreign claims by type and sector. *Foreign Claims (Cross-Border)* equals 1 if a BHC has direct cross-border claims in a given country-quarter, and 0 otherwise. *Foreign Claims (Local)* equals 1 if a BHC has local claims in a given country-quarter, and 0 otherwise. *Foreign Claims (Banking)* equals 1 if a BHC has foreign claims to banking entities in a given country-quarter, and 0 otherwise. *Foreign Claims (Non-Bank Private)* equals 1 if a BHC has foreign claims to the non-bank private entities in a given country-quarter, and 0 otherwise. *Foreign Claims (Public)* equals 1 if a BHC has foreign claims to governments and official entities in a given country-quarter, and 0 otherwise. Detailed definitions of all variables are presented in Appendix C. We use a weighted regression approach, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. We include BHC and country fixed effects and cluster standard errors at the BHC and country levels. p-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

Panel A: Financial Connectedness Decomposition by Directionality						
	MES			Δ CoVaR		
	(1)	(2)	(3)	(4)	(5)	(6)
Financial Connectedness (From)	0.060***		0.046	0.511***		0.408**
	(0.003)		(0.102)	(0.000)		(0.029)
Financial Connectedness (To)		0.028***	0.012		0.236***	0.089
		(0.001)	(0.421)		(0.000)	(0.250)
Ln(GDPPC)	0.737	0.460	0.595	1.752	−0.571	0.653
	(0.456)	(0.628)	(0.545)	(0.753)	(0.920)	(0.904)
Credit-to-GDP	0.013***	0.011**	0.013**	0.168***	0.147***	0.163***
	(0.008)	(0.021)	(0.044)	(0.000)	(0.000)	(0.000)
Ln(Number of Listed Firms)	0.479	1.026	0.683	5.978	10.525*	7.549
	(0.499)	(0.168)	(0.430)	(0.280)	(0.058)	(0.192)
Output Synchronization	−0.094	−0.112	−0.096	−0.921	−1.079	−0.936
	(0.366)	(0.303)	(0.372)	(0.181)	(0.135)	(0.189)
Ln(Assets)	0.017***	0.020***	0.017***	0.070*	0.097**	0.072*
	(0.008)	(0.000)	(0.008)	(0.098)	(0.022)	(0.094)
Leverage	0.003**	0.003**	0.003**	0.019*	0.016	0.018*
	(0.015)	(0.027)	(0.018)	(0.089)	(0.157)	(0.100)
NII-to-II	−0.014**	−0.015**	−0.014**	−0.110**	−0.118***	−0.109**
	(0.038)	(0.028)	(0.038)	(0.012)	(0.007)	(0.013)
Deposits Ratio	−0.049	−0.051	−0.049	−0.836***	−0.856***	−0.838***
	(0.133)	(0.129)	(0.134)	(0.000)	(0.001)	(0.000)
Country Diversification	−0.010**	−0.010**	−0.010**	−0.052	−0.052	−0.051
	(0.032)	(0.033)	(0.032)	(0.267)	(0.277)	(0.274)
Loan Loss Allowance	1.289***	1.344***	1.290***	1.052	1.538	1.058
	(0.000)	(0.000)	(0.000)	(0.403)	(0.222)	(0.399)
Liquidity Coverage Ratio	−0.005	−0.005	−0.005	−0.029	−0.032	−0.029
	(0.384)	(0.360)	(0.389)	(0.662)	(0.636)	(0.663)
CFNAI	−0.057***	−0.058***	−0.057***	−0.385***	−0.387***	−0.384***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	26,307	26,307	26,307	25,219	25,219	25,219
Adj. R2	.58	.58	.58	.75	.75	.75

Panel B: Foreign Claims Decomposition by Type and Industry Sector	MES		Δ CoVaR	
	(1)	(2)	(3)	(4)
Cross-Border Claims × Financial Connectedness	0.009		0.066*	
	(0.212)		(0.080)	
Local Claims × Financial Connectedness	0.003		0.020***	
	(0.140)		(0.007)	
Foreign Claims-Banks × Financial Connectedness		0.003***		0.068***
		(0.003)		(0.000)
Foreign Claims-Public × Financial Connectedness		0.002		0.002
		(0.164)		(0.777)
Foreign Claims-Non-Bank Private × Financial Connectedness		0.004***		0.091***
		(0.001)		(0.000)
Ln(GDPPC)	0.753	0.905*	2.041	−2.320
	(0.477)	(0.056)	(0.736)	(0.424)
Credit-to-GDP	0.011***	0.010**	0.153***	0.088***
	(0.002)	(0.025)	(0.000)	(0.006)
Ln(Number of Listed Firms)	0.829	−0.334	8.608	1.180
	(0.247)	(0.332)	(0.148)	(0.573)
Output Synchronization	−0.114	−0.130**	−1.107	−0.972**
	(0.282)	(0.034)	(0.117)	(0.016)
Ln(Assets)	0.019***	0.020**	0.096***	0.077
	(0.001)	(0.015)	(0.002)	(0.180)
Leverage	0.003**	0.003**	0.015*	0.028***
	(0.029)	(0.023)	(0.054)	(0.005)
NII-to-II	−0.015**	−0.014*	−0.118***	−0.096**
	(0.026)	(0.054)	(0.000)	(0.050)
Deposits Ratio	−0.051	−0.062*	−0.849***	−0.697**
	(0.135)	(0.099)	(0.000)	(0.045)
Country Diversification	−0.012**	−0.008	−0.072*	−0.050
	(0.019)	(0.152)	(0.090)	(0.398)
Loan Loss Allowance	1.384***	1.346***	1.897***	2.186
	(0.000)	(0.000)	(0.000)	(0.133)
Liquidity Coverage Ratio	−0.006	0.000	−0.038*	0.029
	(0.317)	(0.953)	(0.057)	(0.763)
CFNAI	−0.058***	−0.060***	−0.393***	−0.376***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	26,307	26,307	25,219	25,219
Adj. R2	.57	.58	.75	.74

Table 8: BHC Systemic Importance and Leverage

This table reports coefficient estimates from panel regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. The sample is a panel of 26,307 BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. *GSIB* equals 1 if a BHC is designated as a global systemically important bank by the Federal Reserve System, and 0 otherwise. *Leverage* is the ratio of a BHC's total assets to total equity capital. Detailed definitions of all variables are presented in Appendix C. We use a weighted regression approach, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. We include BHC and country fixed effects and cluster standard errors at the BHC and country levels in all specifications. p-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

	MES		Δ CoVaR	
	(1)	(2)	(3)	(4)
Financial Connectedness	0.018***	0.015***	0.149***	0.101***
	(0.000)	(0.004)	(0.000)	(0.007)
GSIB × Financial Connectedness	0.007***		0.073***	
	(0.002)		(0.001)	
Leverage × Financial Connectedness		0.001*		0.007**
		(0.089)		(0.015)
Leverage	0.004**	0.003*	0.029***	0.021*
	(0.016)	(0.082)	(0.004)	(0.072)
Liquidity Coverage Ratio	0.001	0.001	0.031	0.030
	(0.862)	(0.877)	(0.741)	(0.752)
Ln(GDPPC)	0.489	0.505	−4.217	−4.062
	(0.267)	(0.234)	(0.154)	(0.172)
Credit-to-GDP	0.012**	0.011**	0.093***	0.086**
	(0.018)	(0.024)	(0.006)	(0.014)
Ln(Number of Listed Firms)	−0.100	−0.180	2.883	2.007
	(0.724)	(0.546)	(0.166)	(0.307)
Output Synchronization	−0.117*	−0.120*	−0.927**	−0.964**
	(0.056)	(0.051)	(0.022)	(0.019)
Ln(Assets)	0.018**	0.018**	0.082	0.083
	(0.019)	(0.019)	(0.174)	(0.168)
NII-to-II	−0.013*	−0.013*	−0.095*	−0.096*
	(0.078)	(0.077)	(0.056)	(0.052)
Deposits Ratio	−0.059	−0.059	−0.678*	−0.687**
	(0.115)	(0.110)	(0.052)	(0.047)
Country Diversification	−0.007	−0.007	−0.040	−0.038
	(0.194)	(0.210)	(0.499)	(0.524)
Loan Loss Allowance	1.285***	1.295***	1.831	1.926
	(0.000)	(0.000)	(0.203)	(0.180)
CFNAI	−0.059***	−0.059***	−0.371***	−0.370***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	26,307	26,307	25,219	25,219
Adj. R2	.58	.58	.74	.74

Table 9: Transmission of Foreign Crises

This table reports coefficient estimates from panel regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. The sample is a panel of 26,307 BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Financial Connectedness* measures a country's connectedness to global financial markets. *Foreign Financial Crises* equals 1 if a country is in financial crisis during a given year, and 0 otherwise. *2007-09 Financial Crisis* equals 1 over the period [2007:Q4-2009:Q3], and 0 otherwise. Detailed definitions of all variables are presented in Appendix C. We use a weighted regression approach, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. We include BHC and country fixed effects and cluster standard errors at the BHC and country levels. p-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

	MES				Δ CoVaR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Financial Connectedness	0.023***	0.022***	0.012**	0.011**	0.197***	0.192***	0.116***	0.110***
	(0.000)	(0.000)	(0.031)	(0.033)	(0.000)	(0.000)	(0.000)	(0.000)
Financial Crisis × Financial Connectedness		0.024***				0.161***		
		(0.000)				(0.000)		
Financial Crisis	0.040***	0.025			0.296***	0.095		
	(0.000)	(0.253)			(0.000)	(0.637)		
2007-09 Financial Crisis × Financial Connectedness				0.007				0.036
				(0.297)				(0.354)
2007-09 Financial Crisis			0.055***	0.044***			0.386***	0.324***
			(0.000)	(0.003)			(0.000)	(0.000)
Ln(GDPPC)	0.292	−0.153	−0.245	−0.380	−1.765	−3.316	−5.677	−6.434
	(0.762)	(0.792)	(0.694)	(0.546)	(0.784)	(0.406)	(0.210)	(0.183)
Credit-to-GDP	0.015***	0.015***	0.009***	0.008***	0.182***	0.181***	0.134***	0.129***
	(0.000)	(0.000)	(0.001)	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)
Ln(Number of Listed Firms)	−0.490	−0.982	0.719	0.577	−0.785	−2.623	8.397	7.593
	(0.433)	(0.211)	(0.262)	(0.340)	(0.810)	(0.448)	(0.124)	(0.159)
Output Synchronization	−0.103	−0.085	−0.091	−0.094	−0.997	−0.897	−0.923*	−0.942*
	(0.301)	(0.355)	(0.271)	(0.266)	(0.132)	(0.151)	(0.082)	(0.082)
Ln(Assets)	0.018***	0.018***	0.025***	0.025***	0.080**	0.079**	0.127***	0.128***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.017)	(0.016)	(0.001)	(0.000)
Leverage	0.003**	0.003**	0.002	0.002	0.017	0.016*	0.008	0.008
	(0.026)	(0.011)	(0.131)	(0.136)	(0.127)	(0.094)	(0.371)	(0.380)
NII-to-II	−0.011*	−0.010	−0.012*	−0.012*	−0.088**	−0.085**	−0.093**	−0.093**
	(0.084)	(0.103)	(0.054)	(0.057)	(0.031)	(0.042)	(0.018)	(0.019)
Deposits Ratio	−0.040	−0.034	−0.004	−0.005	−0.758***	−0.731***	−0.462***	−0.463**
	(0.154)	(0.235)	(0.872)	(0.863)	(0.000)	(0.000)	(0.010)	(0.010)
Country Diversification	−0.009**	−0.008**	−0.010***	−0.010***	−0.044	−0.042	−0.057	−0.056
	(0.024)	(0.020)	(0.009)	(0.009)	(0.283)	(0.265)	(0.162)	(0.166)
Loan Loss Allowance	1.423***	1.444***	1.563***	1.574***	2.073*	2.190*	3.104**	3.170**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.095)	(0.073)	(0.011)	(0.010)
Liquidity Coverage Ratio	−0.002	−0.001	−0.001	−0.001	−0.009	−0.005	−0.007	−0.007
	(0.676)	(0.831)	(0.825)	(0.829)	(0.881)	(0.929)	(0.883)	(0.886)
CFNAI	−0.056***	−0.054***	−0.040***	−0.040***	−0.378***	−0.369***	−0.261***	−0.262***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	26,307	26,307	26,307	26,307	25,219	25,219	25,219	25,219
Adj. R2	.59	.59	.6	.6	.76	.76	.76	.76

Appendices

A Financial connectedness measure

We employ the financial connectedness measure proposed by Diebold and Yilmaz (2009), Diebold and Yilmaz (2012), and Diebold and Yilmaz (2014). The Diebold-Yilmaz measure of financial connectedness we employ is based on variance decompositions of stock market return volatilities at the country-level. Specifically, financial connectedness captures how the shares of forecast error variation from vector autoregressions (VARs) for a given country co-move with shocks arising in other countries and vice versa. We follow the exposition presented in Diebold and Yilmaz (2009) below.

Consider 1-step-ahead forecast of a first-order covariance stationary VAR(1) model of stock market volatilities for countries i and j,

$$\mathbf{x}_t = \mathbf{\Phi}\mathbf{x}_{t-1} + \epsilon_t,$$

where $\mathbf{x}_t = (\mathbf{x}_{it}, \mathbf{x}_{jt})$ is the matrix of stock market return volatilities for countries i and j and $\mathbf{\Phi}$ is a matrix of parameters. To focus on orthogonal shocks, let the moving average representation of $\mathbf{x}_t$ be

$$\mathbf{x}_t = \mathbf{A}(L)\mathbf{u}_t,$$

where $\mathbf{A}(L) = \mathbf{\Theta}(L)\mathbf{Q}_t^{-1}$, $\mathbf{\Theta}(L) = (\mathbf{I} - \mathbf{\Phi}L)^{-1}$, $\mathbf{u}_t = \mathbf{Q}_t\epsilon_t$, $E(\mathbf{u}_t\mathbf{u}_t^{'}) = \mathbf{I}$, and $\mathbf{Q}_t^{-1}$ is the lower Cholesky decomposition of ϵ_t. Then, the 1-step-ahead forecast is

$$\mathbf{e}_t(1) = \mathbf{x}_{t+1} - \mathbf{x}_t(1) = \mathbf{x}_{t+1} - \mathbf{\Phi}\mathbf{x}_t = \epsilon_{t+1} = \mathbf{A}\mathbf{u}_{t+1} = \begin{bmatrix} a_{ij} & a_{ii} \\ a_{ji} & a_{jj} \end{bmatrix} \begin{bmatrix} u_{it+1} \\ u_{jt+1} \end{bmatrix}$$

with covariance matrix

$$E\left(\mathbf{e}_t(1)\mathbf{e}_t^{'}(1)\right) = \mathbf{A}\mathbf{A}^{'}.$$

Under this representation, one can define financial connectedness transmitted from country i to j as the contribution of country i to j's variance of the 1-step-ahead forecast error

$$C_{i \to j} = \frac{a_{ji}^2}{a_{ji}^2 + a_{jj}^2} \times 100,$$

Similarly, financial connectedness received by country i from country j can be defined as the contribution of country j to i's variance of the 1-step-ahead forecast error

$$C_{i \leftarrow j} = \frac{a_{ij}^2}{a_{ij}^2 + a_{ii}^2} \times 100.$$

A generalized forecast error variance decomposition that is invariant to ordering is applied to 45 countries using a VAR(2) with a 10-step-ahead forecasts. The generalized version of the forecast error variance decomposition employs the frameworks presented in Koop et al. (1996) and Pesaran and Shin (1998) to allow for correlated shocks using the historical distribution of the errors. The elements of the variance decomposition matrix are normalized by the row sum so that they sum to one. We focus on the total contribution of a country to the forecast errors of all the other countries in our sample. Denoting the elements of the generalized variance decomposition matrix by a^g, one can define the total financial connectedness transmitted by country i to the rest of the countries in the sample as

$$C_{i \to world} = \frac{\sum\limits_{j=1, j \neq i}^{45} a_{ji}^g}{\sum\limits_{j=1}^{45} a_{ji}^g} \times 100.$$

Likewise, one can define the total financial connectedness received by country i from all other countries in the sample as

$$C_{i \leftarrow world} = \frac{\sum\limits_{j=1, j \neq i}^{45} a_{ij}^{g}}{\sum\limits_{j=1}^{45} a_{ij}^{g}} \times 100.$$

Finally, for a given country, one can characterize total financial connectedness as total volatility spillovers from and to other countries by summing over $C_{i \rightarrow world}$ and $C_{i \leftarrow world}$.

B Alternative measures of financial connectedness

In this section, we show that the results presented in Section 5.1 are robust to alternative measures of financial connectedness. We follow prior work (e.g., Edison et al. (2002) and Kalemli-Ozcan et al. (2013b)) and construct financial connectedness measures based on data on the stock of aggregate cross-border financial assets and liabilities between countries from the Bank of International Settlements (BIS) Locational Banking Statistics. The use of BIS data decreases the country representation in our sample from 41 to 24 countries.

More specifically, similar to Kalemli-Ozcan et al. (2013b), we define *Stock of Capital Flows* as the stock of bilateral cross-border assets and liabilities between the U.S. and a foreign country. We also consider *Stock of Capital Inflows*, defined as the stock of bilateral cross-border liabilities between the U.S. and a foreign country since capital inflows are likely a more important source of financial connectedness for emerging markets (Edison et al. (2002). From these we create four variables that capture financial connectedness by normalizing each variable by either the sum of the GDP of the U.S. and the foreign country, or the sum of the population of the U.S. and the foreign country. We also deflate each series with the U.S. CPI and apply a natural logarithm transformation to the stock of assets and liabilities between countries before taking their sum. Higher values of the variables can be interpreted as higher financial connectedness. Table B1 presents the results.

[Insert Table B1 about here]

We find that the previously documented positive association between country financial connectedness and global banks' contribution to U.S. systemic risk is robust to alternative measures of connectedness. The estimated coefficients on *Stock of Capital Flows* and *Stock of Capital Inflows* are positive and statistically significant at the 1% level.

Table B1: Country Financial Connectedness: Alternative Definitions

This table reports coefficient estimates from panel regressions of U.S. BHC contribution to U.S. systemic risk on country financial connectedness and control variables. The sample is a panel of BHC-country-quarter observations over the period [2005:Q1-2016:Q4] of 45 U.S. BHCs. *MES* and $\Delta CoVaR$ measure a BHC's contribution to U.S. systemic risk. *Stock of Capital Flows* is defined as the stock of bilateral cross-border assets and liabilities between the U.S. and a foreign country. *Stock of Capital Inflows* is defined as the stock of bilateral cross-border liabilities between the U.S. and a foreign country. Each measure is normalized by either the sum of the GDP of the U.S. and the foreign country, or the sum of the population of the U.S. and the foreign country. We also deflate each series with the U.S. CPI and apply a natural logarithm transformation to the stock of assets and liabilities between countries before taking their sum. Higher values of the variables indicate higher financial connectedness. Detailed definitions of all variables are presented in Appendix C. We use a weighted regression approach, where we weight each country exposure within a BHC-quarter proportionately to the foreign claims a BHC has in a given country during a given quarter. Then, we weight BHC-quarters equally among each other. We include BHC and country fixed effects and cluster standard errors at the BHC and country levels. P-values are reported in parentheses and ***, **, * denote significance at the 1, 5, and 10 percent significance level, respectively.

	MES				Δ CoVaR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stock of Capital Flows (GDP)	0.023***				0.237***			
	(0.001)				(0.000)			
Stock of Capital Inflows (GDP)		0.027***				0.291***		
		(0.004)				(0.000)		
Stock of Capital Flows (Pop)			0.017***				0.166***	
			(0.000)				(0.000)	
Stock of Capital Inflows (Pop)				0.015***				0.143***
				(0.001)				(0.000)
Ln(GDPPC)	2.001	2.269	1.480	1.854	3.036	5.834	−1.715	1.923
	(0.236)	(0.188)	(0.380)	(0.277)	(0.811)	(0.655)	(0.892)	(0.881)
Credit-to-GDP	0.014	0.014	0.014	0.017	0.164*	0.168**	0.161*	0.193**
	(0.196)	(0.142)	(0.270)	(0.158)	(0.060)	(0.035)	(0.085)	(0.032)
Ln(Number of Listed Firms)	−0.324	−0.098	−0.676	−0.408	−5.587	−3.508	−7.813	−5.118
	(0.768)	(0.929)	(0.567)	(0.730)	(0.477)	(0.660)	(0.354)	(0.549)
Output Synchronization	−0.074	−0.062	−0.091	−0.070	−0.940**	−0.813**	−1.075***	−0.872**
	(0.277)	(0.365)	(0.193)	(0.288)	(0.013)	(0.024)	(0.007)	(0.014)
Ln(Assets)	0.016**	0.016**	0.015**	0.015**	0.061	0.057	0.049	0.050
	(0.016)	(0.019)	(0.036)	(0.042)	(0.121)	(0.137)	(0.237)	(0.243)
Leverage	0.004**	0.004**	0.004***	0.004***	0.024**	0.024*	0.026**	0.026**
	(0.014)	(0.015)	(0.008)	(0.009)	(0.049)	(0.052)	(0.031)	(0.037)
NII-to-II	−0.015**	−0.015**	−0.015**	−0.015**	−0.117***	−0.117**	−0.119***	−0.121***
	(0.030)	(0.029)	(0.029)	(0.027)	(0.010)	(0.010)	(0.008)	(0.007)
Deposits Ratio	−0.049	−0.051	−0.054*	−0.056*	−0.929***	−0.943***	−0.973***	−0.990***
	(0.144)	(0.131)	(0.099)	(0.084)	(0.001)	(0.000)	(0.000)	(0.000)
Country Diversification	−0.009*	−0.009*	−0.010*	−0.009*	−0.050	−0.048	−0.054	−0.050
	(0.060)	(0.066)	(0.050)	(0.063)	(0.337)	(0.359)	(0.304)	(0.348)
Loan Loss Allowance	1.351***	1.367***	1.358***	1.370***	1.182	1.326	1.332	1.450
	(0.000)	(0.000)	(0.000)	(0.000)	(0.461)	(0.396)	(0.407)	(0.365)
Liquidity Coverage Ratio	−0.003	−0.003	−0.003	−0.004	−0.021	−0.022	−0.023	−0.025
	(0.587)	(0.581)	(0.561)	(0.548)	(0.770)	(0.762)	(0.745)	(0.732)
CFNAI	−0.057***	−0.057***	−0.057***	−0.057***	−0.389***	−0.390***	−0.387***	−0.387***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	16,394	16,394	16,394	16,394	15,699	15,699	15,699	15,699
Adj. R2	.57	.57	.57	.57	.75	.75	.75	.75

C Variable definitions

2007-09 Financial Crisis – an indicator variable equal to 1 over the period [2007:Q4-2009:Q3], and 0 otherwise.

Capital Controls 1975 – the percentage of capital controls not levied as a share of the total number of capital controls listed by the IMF annual report on exchange agreements and exchange restrictions in 1975, multiplied by 10.

CFNAI – an index (Chicago Fed National Activity Index) of U.S. economic activity.

Credit-to-GDP – a country's private credit by deposit money banks and other financial institutions as share of GDP.

Country Diversification – the number of unique countries in which a BHC has foreign claims in a given quarter divided by BHC total assets, multiplied by 1,000.

Δ **CoVaR** – a BHC's contribution to systemic risk, defined as the difference between the conditional value at risk (CoVar) of the financial system conditional on an institution being in distress (95% quantile of quarterly equity return losses) and the CoVaR conditional on the median state of the institution (Adrian and Brunnermeier (2016)).

Deposits Ratio – the ratio of BHC total deposits to total assets.

FDI Expropriation – an indicator variable equal to 1 if an FDI expropriation act occurred in a given country during the most recent 3 years, and 0 otherwise. An act of expropriation is defined as the forced transfer of foreign direct investment assets at the country-year level (Hajzler and Rosborough (2016)).

Financial Connectedness – a country's connectedness to global financial markets. The measure is based on country-level variance decompositions with a 10-day forecast horizon obtained from a vector autoregression (VAR) model of daily range volatilities estimated over 150-day rolling windows (Diebold and Yilmaz (2014)). Daily values are transformed to the quarterly level by taking an average over all days in a given quarter. *Financial Connectedness (From)* is connectedness "transmitted" from country i to global financial markets. *Financial Connectedness (To)* is connectedness "received" by country i from global financial markets.

Foreign Claims – the claims of U.S. global BHCs and their foreign affiliates on foreign obligors (USD billions). *Foreign Claims (Cross-Border)* equals 1 if a BHC has direct cross-border claims in a given country-quarter, and 0 otherwise. *Foreign Claims (Local)* equals 1 if a BHC has local claims in a given country-quarter, and 0 otherwise. *Foreign Claims (Banking)* equals 1 if a BHC has foreign claims to banking entities in a given country-quarter, and 0 otherwise. *Foreign Claims (Non-Bank Private)* equals 1 if a BHC has foreign claims to the non-bank private entities (e.g., corporates, households) in a given country-quarter, and 0 otherwise. *Foreign Claims (Public)* equals 1 if a BHC has foreign claims to governments and official entities in a given country-quarter, and 0 otherwise.

Foreign Financial Crises – an indicator equal to 1 if a country is in a systemic, debt restructuring, default, or currency crisis over a given year, and 0 otherwise.

GSIB – an indicator variable equal to 1 if a BHC is designated as a global systemically important bank by the Federal Reserve System (Federal Reserve System (2015)), and 0 otherwise.

Leverage – the ratio of BHC total assets divided to total equity capital.

Liquidity Coverage Ratio – the ratio of high quality liquid assets to total net cash outflows over a 30-day stress period (Basel Committee on Banking Supervision (2013)).

Ln(Assets) – the natural logarithm of BHC total assets.

Ln(GDPPC) – the natural logarithm of a country's real GDP per capita.

Ln(Number of Listed Firms) – the natural logarithm of the total number (in thousands) of domestic companies listed on a country's stock exchange.

Loan Loss Allowance – the ratio of a BHC's allowance for loans and lease losses to BHC total loans.

MES – a BHC's contribution to systemic risk, defined as (-1) times the average stock return of a BHC during the worst five percent market return days in a given quarter (Acharya et al. (2016)).

Neighbor Capital Controls 1975 – neighboring countries' median *Capital Controls 1975*.

NII-to-II – the ratio of non-interest income to interest income.

Output Synchronization – (-1) times the difference in a country's real GDP growth and the U.S. real GDP growth in a given year (Kalemli-Ozcan et al. (2013b)).