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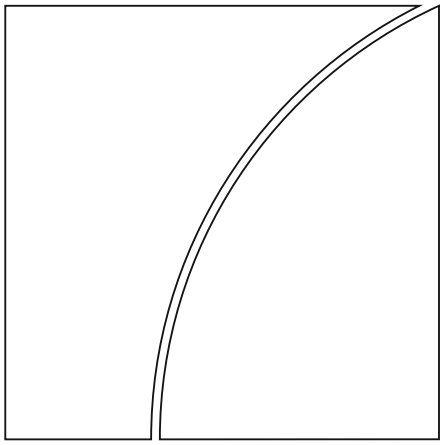

BIS Working Papers

No 853

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Monetary and Economic Department

April 2020

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Keywords: International banking, prudential policy, international policy coordination and transmission, currencies, international spillovers.

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This publication is available on the BIS website (www.bis.org).

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Home sweet host: Prudential and monetary policy spillovers through global banks[1]

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April 2020

Abstract

Prudential regulation of banks is multi-layered: policy changes by home-country authorities affect banks' global operations across many jurisdictions; changes by host-country authorities shape banks' operations in the host jurisdiction regardless of the nationality of the parent bank. Which layer matters most? Do these policies create cross-border spillovers? And how does monetary policy alter these spillovers? This paper examines the effect that changes in home- and host-country prudential measures have on cross-border credit, and how these interact with monetary policy. We use a novel approach to decompose growth in cross-border bank lending into separate home, host and common components, and then match each with the home or host policies that affect this component. Our results suggest that prudential policies can have spillover effects, which depend on the instrument used and on whether a bank's home or host country implemented them. Home policies tend to have larger spillovers on cross-border US dollar lending than host policies, primarily through substitution effects. We also find that a tightening of US monetary policy can compound the spillovers of certain prudential measures.

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[1] The views expressed here are those of the authors and not necessarily those of the Bank for International Settlements. Deimante Kupciuniene provided excellent research assistance. We are grateful to our discussants Galina Hale and Friederike Niepmann for insightful comments. We also thank Stefan Hohl, Bruno Tissot and IBRN meeting participants and seminar participants at the BIS for helpful comments and suggestions. All errors are our own.

1. Introduction

Global finance operates in a complex web of regulation enacted by regulators in different jurisdictions. There is a long tradition of consolidated bank regulation by home regulators (ie where the bank is headquartered), key examples being the Basel regulatory frameworks I, II and III. But countries also apply local regulation on a jurisdictional basis (ie the host-country where the bank operates), eg liquidity standards, subsidiarisation and ring-fencing. While many papers study the effects of financial regulation, few address the complex home-host overlay.[2] Which layer –home or host – matters more?

We focus on cross-border bank credit to study *international spillovers* of prudential policies and their interaction with monetary policy. As with monetary policy, the intended scope of prudential policy is the domestic market and the health of the banks operating there. When a country tightens loan-to-value limits, for instance, the intent is to restrict domestic real-estate related borrowing. This reasoning also applies to policies that aim to strengthen banks' resilience, which may induce banks to reduce leverage by raising capital or by shedding assets. Cross-border credit per se is generally not the *target* of such policies (indeed, supervisors often prefer to see capital-raising instead of asset-shedding).[3] But cross-border credit can be affected, and thus act as a *channel* through which spillovers occur. While a large literature studies the intended primary effect on credit and the economy, this paper studies the unintended spillovers affecting other borrowers abroad.

Our work is part of a broader initiative of the International Banking Research Network (IBRN) to explore the interaction between monetary and prudential policies and their international spillovers through banks. It is natural to focus on the role of banks: prudential policies are almost exclusively imposed on banks,[4] monetary policy is, to a large extent, transmitted through banks, and the banking sector is a major conduit for international credit flows. Our paper complements the individual country studies of the IBRN with a global perspective that explicitly analyses the home and host dimensions. The advantage of using a global dataset is that policy changes can be observed for many home and host countries simultaneously.

Our empirical setup exploits the home- and host-country dimensions available in our global dataset on international banking. To our knowledge, this is the first paper to analyse prudential measures along both dimensions. We employ a slice of the BIS international banking statistics (IBS) that reveals both a bank's nationality (home country) and where it operates (host country).[5] Our base sample includes 41 bank nationalities with operations in 42 host countries over the period 2000Q1 – 2018Q4.

We take two complementary approaches. First, we run a panel regression comprising both home- and host-country regulation, to examine which layer has a greater effect on cross-border lending (horse race).

[2] The BIS maintains an interactive online repository of the estimated effects of (home country) regulation on bank lending, funding costs and loan rates, as well as GDP, investment and other macroeconomic outcomes. See Boissay et al (2019), and https://stats.bis.org/frame/.

[3] Instances in which policies explicitly discouraged foreign/cross-border assets are rare, and essentially limited to bank rescue operations during the crisis and the conditions attached (eg Borio et al 2010).

[4] This is also the case for macroprudential measures, eg see BIS (2018) and ESRB (2019).

[5] Specifically, the BIS locational banking statistics by nationality (LBSN) track the asset and liability positions for a banks headquartered in a given country (eg UK banks) separately for each of its local operations in each host location (eg UK banks home offices in the UK separate from their branches and subsidiaries operating in Germany). For each bank nationality-host location pair, the LBSN provide data on the currency and counterparty sector for both assets and liabilities (and limited information about the location of the counterparty).

Since global banking is highly concentrated, we estimate the model by weighted least squares to ensure that the results are relevant for aggregate cross-border lending.[6]

In a second and novel approach, we first decompose the growth in credit into home-country, host-country and common components, and then match each component with policies that affect it (eg home prudential policies with the home country component). The methodology follows Amiti and Weinstein (2018). But, in our context, it isolates the variation specific to individual home countries from that specific to particular host countries, while stripping out the common growth component. US monetary policy mostly affects the common component, leaving variation across home and host countries to be explained by home or host regulation. We further use this decomposition approach to improve identification: applying it to other IBS datasets that contain the borrower-country dimension, we extract borrower country components to control for demand.

To organize the results, we group tools by those intended to reduce the cyclicality of credit and those intended to enhance the resilience of banks. The former group includes LTV caps, local currency reserve requirements and foreign currency reserve requirements. The latter group includes interbank exposure limits and concentration limits. We focus our analysis on cross-border credit denominated in USD.

Our results suggest that certain prudential policies have significant spillover effects via cross-border dollar credit. Home country policies are more consistently associated with spillovers, but the measured effects depend on the particular policy tool and the jurisdiction (home or host) that implements it. Our horse race approach reveals that interbank exposure and concentration limits of the home country may be important sources of spillovers, while LTV caps stand out amongst host policies. In our decomposition approach, we find that most home policies generate spillovers, primarily through substitution effects. For host country regulation, resilience-enhancing policies tend to increase spillovers, while LTV caps tend to reduce them.

We also find evidence that the interaction of certain prudential policy instruments and US monetary policy shapes cross-border US dollar-denominated lending. More concretely, our results suggest that the tightening of US monetary policy intensifies the negative impact of home country interbank exposure limits and capital requirements as well as host country concentration limits. This is consistent with Takáts and Temesvary (2019), who document that monetary policy interacts with an aggregate index of macroprudential policies. However, in contrast to their paper, our work includes both home and host countries, and is based on a much longer sample.[7]

We view a primary contribution of this paper to be methodological. Home and host regulations present banks with a complex overlay of legal and institutional factors. This paper discusses the dimensions, identifies the required data, and develops a methodology to differentiate between the effects of home and host policies. It sets the groundwork for further research to distinguish between, account for, and identify the effects of these overlapping policies. However, this overlay affects branches and subsidiaries differentially in a way that cannot possibly be fully captured by dummy variables and aggregated data. Thus, this paper is certainly not the last word on the direction and magnitude of international spillovers. There is much scope for future research.

The paper is organised as follows. The next section explains how the data and methodology capture the three geographical dimensions of global banking: home, host and borrower country. Section 3 presents

[6] Global banking is dominated by large global banks headquartered in a few developed countries (home countries) with operations in multiple host countries, each lending to counterparties in many borrower countries. Concentration is high in any of these dimensions, with aggregate credit being driven by a small subset of offices.

[7] In addition, we unbundle the different policies and allow each type to have a separate effect. We run weighted regressions to account for concentration, while they winsorize and focus on mean responses across (possibly small) lender-borrower pairs. Finally, our decomposition provides a novel and alternative methodology for analysing the cross-border lending in different dimensions.

the direct panel regression results, while Section 4 explains how the decomposition allows us to tackle one dimension at a time. Section 5 concludes with policy implications and directions for further research.

2. Regulation, concentration and the dimensions of global banking

Previous IBRN initiatives explored the effect of monetary policies on global bank flows, and showed that cross-border lending responded differentially to policy changes in the country where the borrower resides, or where the bank operates, or in the currency in which lending was denominated (Avdjiev et al, 2018). Differentiating the spillover effects of home- and host-country prudential policies requires an equally nuanced treatment. This section explains how the BIS international banking statistics (IBS) capture the geographic dimensions relevant to measuring policy spillovers through global banks.

2.1 Home vs host regulation

For institution-specific regulation, a consolidated view is the most natural perspective. Much of the Basel framework applies on a global consolidated basis with the purpose of strengthening the resilience of the entire banking group (BCBS, 2017). More than 100 jurisdictions have adopted risk-based capital regulation and other aspects of the Basel framework (Hohl et al, 2018).[8] A country that raises capital requirements will affect the consolidated group headquartered in that country along with its branches and subsidiaries abroad. Even if branches themselves need not hold capital, the consolidated group still must allocate capital to the risk assets its branches hold abroad.

However, countries also apply regulation on a jurisdictional basis, notably to foreign subsidiaries. The trend toward local regulation in fact strengthened following the global financial crisis, eg in the form of ring-fencing or liquidity standards. Indeed, liquidity supervision is typically considered a host country responsibility (BCBS, 2008).[9] Some prudential measures are naturally local in scope in particular instruments or types of borrowing (eg ESRB, 2018). When a country tightens loan-to-value limits and debt-service to income caps, the scope is the domestic market where both domestic and foreign banks operate.

This implies that foreign subsidiaries face an overlay of home- and host-country regulations in the jurisdiction they operate in. The complex array of applicable regulation and supervision is costly for banks to manage, and a concern for regulators favouring consistent rules on a level-playing field (IIF, 2019, and FSB, 2019). Analysing possible spillovers in this context thus requires data and empirics that distinguish nationality from location of banking activity. That, in turn, calls for a departure from the "residence perspective" that pervades international finance thanks to the availability of balance-of-payments statistics (eg Lane and Milesi-Ferretti, 2001).[10]

[8] The scope of application goes far beyond BCBS member countries: Hohl et al (2018) survey 100 countries and jurisdictions outside the BCBS that implemented parts of the Basel framework, notably the risk-based capital regime, leverage rules, large exposures, and liquidity standards (the liquidity coverage ratio and the net stable funding ratio).

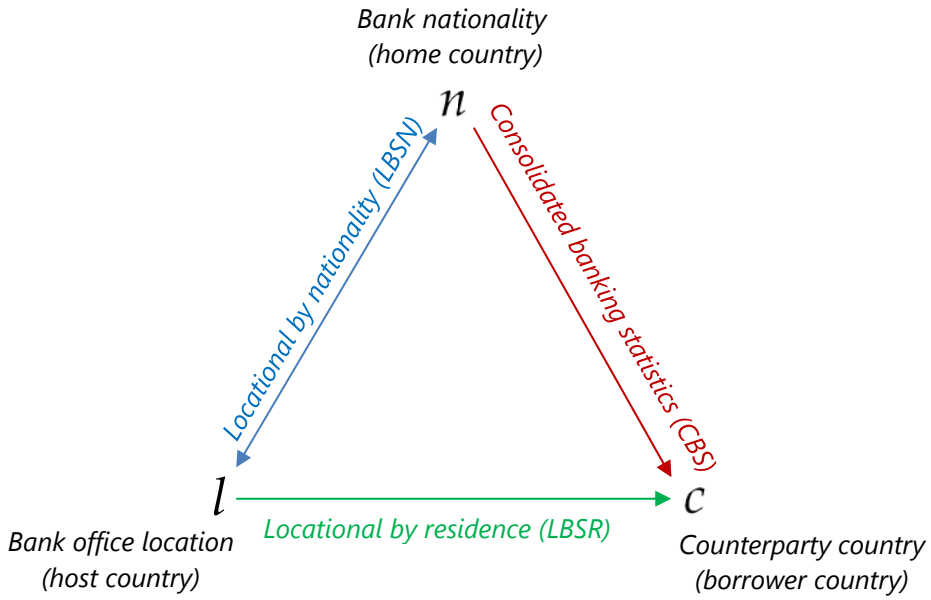
[9] Liquidity is more local in nature than capital; for liquid assets to be judged adequate and immediately available, they need to have a local component. Separately, foreign currency risk is regarded as a source of liquidity risk. UK liquidity standards are a prominent example, which require self-sufficiency and adequacy of liquid resources for UK entities, including subsidiaries and branches of foreign banks (FSA 2009).

[10] By custom or ease, theoretical work tends to follow this perspective (eg Devereux et al, 2010), even as some of the limitations have become more apparent (eg McGuire and von Peter, 2012, and Avdjiev et al, 2016). Indeed, it can be argued that the deglobalisation apparent in cross-border banking is better understood as a problem of European banks, whose balance sheet condition led to wide-spread shedding of foreign assets (McCauley et al. 2019). This only becomes apparent in data that capture both bank residence and bank nationality.

2.2 Three dimensions of global banking

Consolidated banking groups have affiliates in host countries around the world. They borrow and lend cross-border from their branches and subsidiaries, each with counterparties in many countries. A full picture of this structure requires data that capture three dimensions: the *home* country where the consolidated group is headquartered; the *host* countries where the affiliates of the banking group operate, and the *counterparty* countries where their respective borrowers reside.

Geographical dimensions of global banking — Graph 1



Note: The nodes (*n, l, c*) represent the three geographical dimensions in the BIS international banking statistics (IBS). Two of the three dimensions are observables in the respective IBS dataset shown in colour; eg the Locational banking statistics by nationality (LBSN) record banks' international assets and liabilities booked in location *l*, broken down by bank nationality *n* (as determined by their headquarters).

Taken together, the IBS capture all three dimensions. But only two dimensions at a time can be observed before 2014.[11] To illustrate, consider the example of a German bank's cross-border claims booked by its offices in the United Kingdom on counterparties in Brazil. How would these claims be captured in the various IBS datasets?

- The consolidated banking statistics (CBS) track banks' worldwide consolidated claims on counterparties in a particular country. The CBS thus capture the *home*- and *counterparty*-country dimensions (red in Graph 1). The claims of the German bank in the United Kingdom on borrowers in Brazil are lumped together with German banks' total consolidated claims on Brazil, regardless of where the claims are booked (no host country dimension is available).
- The locational banking statistics by residence (LBSR) track the claims of all bank affiliates located in one jurisdiction on counterparties in any particular country; the LBS the *host*- and *counterparty*-country dimensions (green in Graph 1). In the LBS, the German banks' claims on

[11] The IBS enhancements in 2014 make it possible to view all three dimensions simultaneously. These data are not used in this study because of the short sample period.

Brazil booked in the United Kingdom are lumped together with those of all bank affiliates in the United Kingdom, regardless of where they are headquartered (no bank nationality dimension).

- Finally the locational banking statistics by nationality (LBSN) record the claims of banks in a particular host country for each nationality separately, ie the *home* and *host* country dimensions (blue in Graph 1). In the LBSN, the German bank's claims booked in the UK on borrowers in Brazil are lumped together with all cross-border claims that German affiliates book in the United Kingdom, regardless of where the borrower is (no counterparty country dimension).

To assess whether home and/or host prudential policy leads to cross-border spillovers, and how monetary policy shocks affect these spillovers, our analysis focuses on nationality and location, the two dimensions captured in the LBSN.[12] The unit of observation is therefore the group of affiliates of nationality *n* located in a given host country *l* (eg German banks in the United Kingdom). We restrict the analysis to the most relevant measure for this paper: the year-on-year growth in US dollar-denominated cross-border claims.[13] The focus on cross-border credit is due to our interest in spillovers, and the choice of dollar-denominated positions is to assess whether prudential policy spillovers vary with monetary policy shocks in the dominant global currency.

This selection puts the emphasis on spillovers rather than on the domestic effectiveness of policies. Fluctuations in cross-border US dollar positions reflect the "pulse" of the global financial system, more so than credit to the real sector. More than 50% of cross-border USD claims are interbank positions, with substantial intragroup positions and short-term repo. And while positions with non-banks include long-term loans, they also include short-term financing to corporates and investments in liquid dollar bonds. Banks can adjust all of these positions quickly in response to market conditions or regulatory changes. Cross-border dollar claims are a good candidate to tease out international spillovers.

2.3 Concentration

Global banking is highly concentrated in a few banking systems and host countries. This can be problematic when using growth rates as the dependent variable in any empirical analysis. Concentration means that small growth rates on large positions drive the aggregate growth rate, while many high growth rates on small positions influence the estimates. And since we are primarily interested in whether prudential policies matter in the aggregate, and not only *on average,* it is critical that we take this concentration into account in our empirical setup.

Graph 2 shows just how concentrated global banking is. Banks headquartered in just three countries – Japan, the United States and China – accounted for over 40% of total cross-border dollar claims in 2018Q4 (top left panel), and the top eight banking systems accounted for a full 80%. Similarly for host countries, banking affiliates located in the United States, United Kingdom and Japan booked roughly half of global cross-border claims, with the other 42 reporting countries making up the remainder. Crossing the home and host dimensions only compounds the extent of concentration: the largest 10 home-host pairs booked more than 50% of cross-border credit (bottom panel).

The LBSN data consist of over 600 home-host pairs (offices). Most of these offices are small, have erratic swings in their data, or are based on low quality data, all of which lead to noisy growth rates. We select the sample by dropping small offices with total assets always less than $1 billion over 2000 Q1-2018 Q4. We also manually drop offices with questionable data quality (eg irregular jumps, gaps, inconsistent data). We are left with a base sample of 42 host and 41 home countries, and 381 offices over the 2000 Q1-2018 Q4 period. After dropping the problematic observations, we still cover over 97% of the total cross-

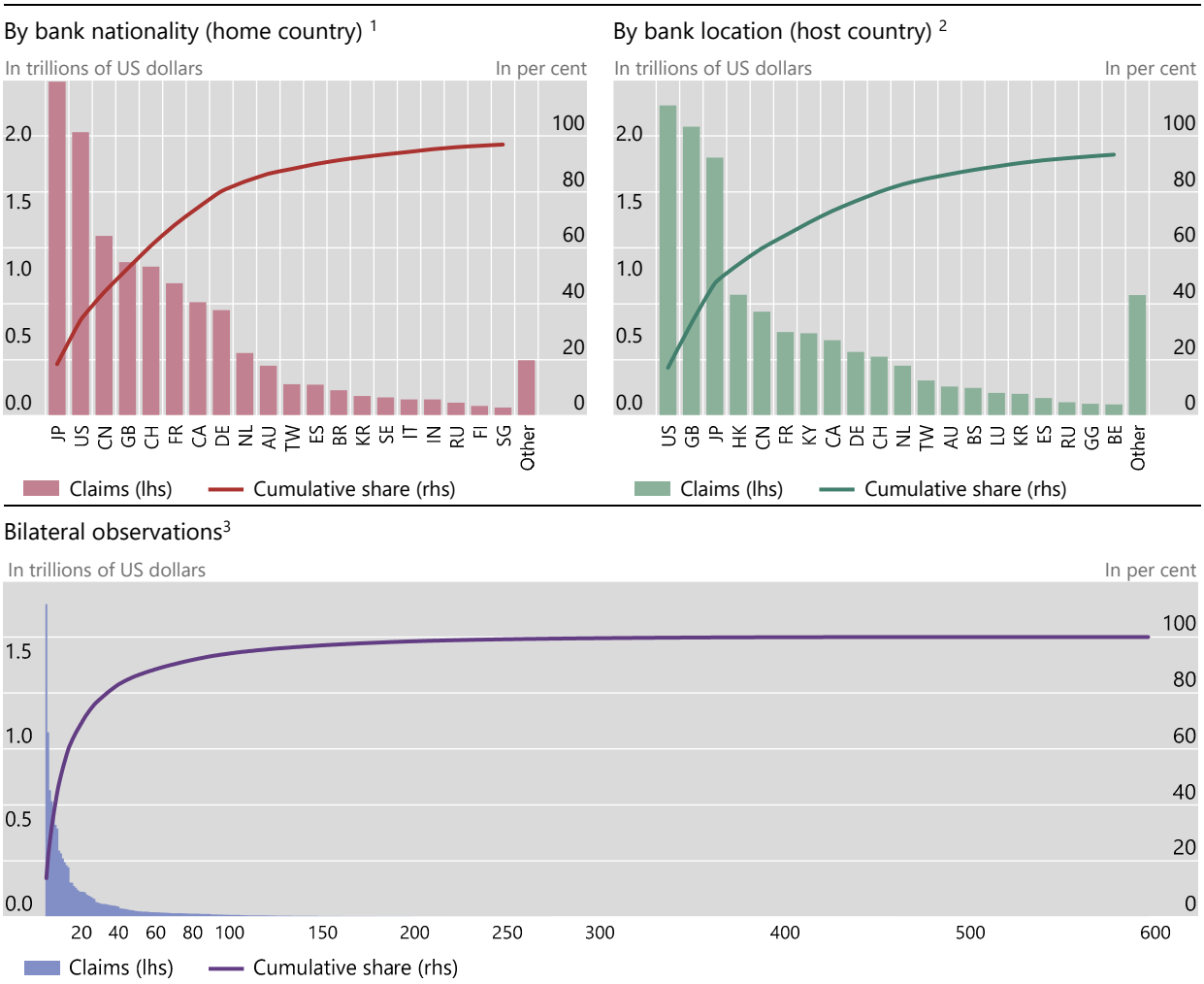
[12] We make use of the LBSR and CBS as well, as described below.

[13] This measure is adjusted for breaks in series as well as exchange rate movements (though exchange rate adjustments are not applicable in the case of US dollar claims expressed in US dollars).

border USD claims in the LBSN data. We compute annual growth rates using changes in the stocks that have been adjusted for exchange rate movements and for breaks in series, by adding the next 4 quarters of changes to the initial stock.

Concentration in cross-border USD-denominated claims

At end-Q4 2018 Graph 2



[1] Bars show the total claims across all host countries for the banking system listed on the x-axis. The red line shows the cumulative share in all banking systems' claims booked in all host countries. [2] Bars show all banking systems' combined claims booked in the host country listed on the x-axis. The red line shows the cumulative share in all banking systems' claims booked in all locations. [3] Bars show bilateral claims (ie banks of a particular nationality located in a given host country) ordered from largest to smallest, while the red line depicts the cumulative share in all banking systems' claims booked in all host countries.

Source: BIS locational banking statistics by nationality (LBSN).

2.4 The policy measures

The data on the use of prudential policies are taken from the IBRN Prudential Instruments Database, described in Cerutti et al (2017). The database covers different prudential policy actions in 64 countries for the period 2000 Q1-2017 Q4. For each type of instrument, a tightening is coded as "+1" in the quarter the prudential measure takes effect, a loosening as "–1", and "0" if no change takes place. Unfortunately, datasets that record the *intensity* of prudential instruments are unavailable (other than for few countries and shorter periods). The instruments include general capital requirements, interbank exposure limits

and concentration ratios, as well as loan-to-value (LTV) caps and reserve requirements in local currency or in foreign currency. Policy actions are slow-moving and infrequent. Thus, to obtain a measure of the extent of prudential policy interventions, we cumulate policy actions over two-year windows for each prudential policy instrument.

Within our sample, prudential policies exhibit low correlations across instruments in a given country (Table 1). However, implementations of a specific prudential action can correlate across countries (Graph 3). Authorities may share similar responses to fluctuations in global liquidity, or coordinate the implementation of regulation (eg Basel II and Basel III). These correlations across countries highlight the promise of distinguishing between home and host policies. Both home and host authorities may implement similar policies simultaneously, which would confound identification when analysing only home or host policies (as a German bank in the UK is subject to home German policies and host UK policies). Further, as we describe in the next section, we separate out the common component of banking flows, which further accounts for the effects of coordinated policy actions.

Correlation of prudential instruments

Simple correlations, 34 countries over 2002q1-2017q4 Table 1

	Cap. Req.	Con. Lim.	IB Ex.	LTV Cap	RR FX	RR LC
Capital Requirements	1					
Concentration limits	-0.03	1				
Interbank exposure limits	0.04	0.16	1			
Loan-to-value caps	0.12	0.09	-0.04	1		
Reserve requirements (foreign currencies)	0.05	-0.01	-0.02	0.05	1	
Reserve requirement (domestic currency)	-0.10	0.02	0.11	0.08	0.18	1

Prudential policies are the cumulated prudential policy actions over 2 years. Prudential policy action measures are from the IBRN prudential policy database (Cerutti et al. 2017, updated). The sample consists of the 34 host countries in our cleaned data, shown in Table A1.

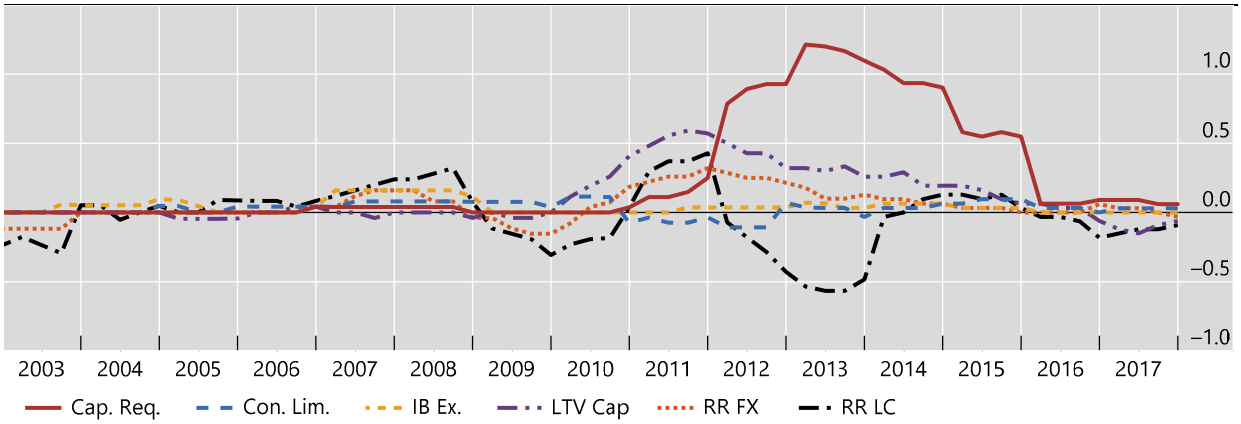
Source: IBRN prudential policy database, authors' calculations.

In line with IBRN guidance, monetary policy changes are measured by an estimated structural shock from a VAR identified using high-frequency monetary policy surprises three months ahead (updating Gertler and Karadi (2015)). By construction, the policy shock should not capture the systematic component of monetary policy; as a result, the US monetary policy shock is positive (ie signals tightening) at times during the global financial crisis of 2008-9, presumably because the dismal economic conditions would have warranted even more easing than the Federal Reserve provided at the time.

Both policy datasets have a quarterly frequency and are available up to 2017 Q4. We merge these with our cleaned LBSN data, and we drop all countries for which we do not have prudential data. This yields a sample of 34 host and 24 home countries that covers 77% of total cross-border USD claims in the LBSN data (Table A1).

Prudential policies over time[1]

2-year cumulated policy actions, index average across countries Graph 3



[1] Each line refers to prudential policy actions cumulated over 2 years, where: Cap. Req. = capital requirements; Con. Lim. = concentration limits; IB Ex. = interbank exposure limits; LTC Cap= loan-to-value caps; RR= reserve requirements in foreign currency (FX) or local currency (LC). Prudential policy action measures are from the IBRN prudential policy database (Cerutti et al. 2017, updated), measured as a +1 for a policy tightening and -1 for policy loosening. The sample consists of the 34 host countries in our cleaned data (Table A1).

Source: IBRN prudential policy database, authors' calculations.

2.5 Methodology

Our analysis makes use of two alternative empirical approaches; both weight the observations to account for concentration. Weighting the observations by size means that our empirical estimates capture the aggregate effect of policy changes, not the average effect across individual home and host countries. The remainder of this section describes the two empirical approaches, and Sections 3 and 4 present the respective results.

2.5.1 The direct panel regression approach

We first employ a direct regression approach that includes the dimensions of interest: home and host countries. We regress the growth in cross-border US dollar claims booked by banks from country *n* located in country *l* on the corresponding home- *and* host-country policy changes, US monetary policy shocks and their interactions (see Section 3). One can think of this approach as a horse race, where the significant estimates of the separate coefficients on the home- and host-country policies will indicate which of the two has a larger effect on cross-border dollar claims. This way, we let the data speak to the spillovers from regulatory overlay.

To obtain results that are consistent with the *aggregate* evolution of cross-border lending, we use weighted least squares (WLS). If all home-host pairs were of equal size, the *average* response estimated by OLS would also match the observed growth in the aggregate claims. But since banking positions are highly concentrated, the response of the *average* home-host pair may tell us nothing about how policies affect cross-border lending in the aggregate, since the aggregate is driven primarily by a few large home-host pairs (Graph 2, lower panel).[14] Larger home-host pairs thus get more weight in the determination of the estimates, and predicted growth rates are consistent with the growth in aggregate claims. WLS

[14] Clearly, 2% growth in a stock of $200 billion (top 15 home-host pairs) contributes far more to overall growth than does 20% growth in a $1 billion stock (just above the median in the dataset).

also reduces the noise from very small offices with volatile growth rates that arise from the booking of single loans being extended or repaid (see Amiti et al, 2019).

Even so, the direct panel regression approach is open to another, more conceptual problem to do with how different types of policies affect lending in various ways. Prudential policies are specific to individual home or host countries, and thus limited in scope. By contrast, US monetary policy acts more broadly on all dollar-denominated credit, and we would not expect a policy change to explain much variation in *bilateral* growth rates across home-host pairs. This concern motivates an alternative and complementary approach that focuses on each dimension of interest, one at a time.

2.5.2 A growth decomposition approach

We decompose growth in cross-border USD credit into 3 components: a common component, a home-specific component and a host-specific component. The methodology was developed by Amiti and Weinstein (2018) (hereafter AW), and is detailed in section 4.1. The AW decomposition isolates the variation in growth coming from each of the available dimensions in the data (Graph 1) and a common component. This common component will reflect general growth happening globally (common to all home-host pairs), and so will be highly correlated with global drivers of capital flows (such as US monetary policy) but less affected by individual countries' prudential policies. We then use the home and host components in separate second-stage regressions, each matched with the corresponding policy: prudential policies implemented by the home country with the home-country component of growth, and prudential policies of the host country with the host-country component.

The methodology has at least four advantages over the direct panel regression. First, it isolates the variation specific to a home- or host-country after stripping out the variation due to the common component, and separates the home and host variation from each other. AW show that the decomposition is exact: the three components sum to overall growth.[15]

Second, applying the AW decomposition separately to each of the three datasets of Graph 1 allows us to back out demand shocks to counterparty countries, and control for them in regressions. Using only the LBSN data, we can extract common, home and host components, but the borrower-country component cannot be identified because the LBSN data do not capture this dimension. As a result, borrower-specific movements may affect the home or host components extracted from the LBSN. To control for demand in our second-stage regressions, we apply the AW decomposition to the other datasets (CBS for home, LBSR for host) to obtain the corresponding borrower component of growth, measured independently from the home (in the case of CBS) or host (in the case of LBSR) components. We then include the borrower component estimated from these decompositions as a control in our home and host component regressions.

Finally, the same logic allows us to improve the direct panel regressions (Section 3), by controlling for demand components not visible in the LBSN data. The direct panel regressions focus on home-host pairs, but the LBSN data have no information on the borrower country (Graph 1). But the other two datasets do, and allow us to estimate demand components for each home and host jurisdiction, by applying the AW decomposition the other two datasets (CBS and LBSR). We use a simple average of these borrower components (for the home and host jurisdictions of each observation) to control for demand shocks.

[15] More precisely, the decomposition yields components such that the predicted growth (the sum of the components) in total claims of any one bank nationality exactly matches the observed growth in total claims for that bank nationality. Likewise, the predicted growth in claims of all banks in any given host country exactly matches the observed claim growth of banks in that host country.

3. "Home and host": direct panel regressions

The direct approach includes home and host countries simultaneously using the LBSN data on cross-border dollar credit (Graph 1). Compared with single-country studies in the IBRN initiative, the advantage of using a global dataset is that policy changes can be observed for *many* home *and* host countries (as in Avdjiev et al 2017). In other respects, our specification is a simple version of the IBRN baseline without bank-level characteristics, since the IBS are at the country level.

3.1 Specification

We regress the break-adjusted rate of growth in dollar-denominated cross-border claims on policy changes in both the home and host countries of the bank affiliates that book those claims. Home and host are understood from the perspective of the bank: for the German bank extending credit on Brazil from its London office, the home-country policy is that of Germany and the host policy is that of the United Kingdom. Our specification can be thought of a horse race in the policy variables of interest. It relates cross-border credit growth (ΔY) in dollars booked by banks from home country *n* located in host country *l* on changes to US monetary policy (*M*) and to the prudential policy regimes (*P*) of the respective home (*n*) and host (*l*) countries. Using bold face to represent vectors and *f* for fixed effects,

$$\Delta Y_{lnt} = f_l + f_n + \boldsymbol{\omega D_{lnt}} + \boldsymbol{\lambda' P_{lt}} + \boldsymbol{\sigma' P_{nt}} + \boldsymbol{\mu' M_t} + \boldsymbol{\alpha'}(\boldsymbol{P_{lt}} * \boldsymbol{M_t}) + \boldsymbol{\beta'}(\boldsymbol{P_{nt}} * \boldsymbol{M_t}) + \varepsilon_{lnt}. \qquad (1)$$

$\boldsymbol{M_t}$ contains the past 4 quarters of US monetary policy shocks (defined in Section 2.4). The reported coefficient is the sum of the 4 coefficients on the monetary policy shock and lags, $\sum_{k=0}^{3} \mu_k$, with the associated joint significance test determining the reported significance. $\boldsymbol{P_{lt}}$ and $\boldsymbol{P_{nt}}$ are prudential regime indicators cumulated over two years lagged by 4 quarters. The coefficients $\boldsymbol{\sigma}$ and $\boldsymbol{\lambda}$ represent the effects of home and host prudential policies on credit growth, and $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ capture possible interactions with US monetary policy shocks (where the reported term is the sum of the coefficients on the interaction of the individual prudential policy p_{lt} or p_{nt} with the 4 quarters of monetary policy shocks ($\sum_{k=0}^{3} \alpha_l^p * \alpha_k^m$ for host country prudential policies, similarly for home policies). D_{lnt} is the demand control estimated as explained in Section 2.5. Lastly, f_l and f_n are fixed effects for each location and each nationality, to absorb structural differences in growth rates.

The focus on US monetary policy is natural given that the bulk of cross-border lending is in US dollars. From Avdjiev et al (2018) and Takáts and Temesvary (2020) we also know that the monetary policy that matters most is that of the currency in which lending is denominated. The former paper showed that monetary policy tightening in a global currency produces a contraction in cross-border bank lending denominated in that currency, in many ways a conventional effect (funding costs in the bank lending channel). At the same time, tightening in other monetary policies – those in the lender or borrower country – led to weaker and less significant effects. We thus limit our specification to US monetary policy, matching our use of dollar-denominated data.

As for prudential policies, changes in home- and host-country regulations enter simultaneously, and we allow each type of policy to have a separate effect. Given the complexities of regulation and its home-host overlay, it is not a priori clear which of these prudential measures are applied to the consolidated group, which ones are jurisdictional in scope and what spillovers each may generate. By including each instrument separately, we let the data detect spillovers in a fairly flexible way.

Because banking is so concentrated, we estimate the model by WLS which yields predicted growth rates that track the growth in aggregate cross-border lending. Each regression table presents two columns (one with and one without policy interactions), for three samples. Columns (1)-(2) contain all home-host pairs. For sharper identification, columns (3)-(6) exclude all offices located in the United States and US

banks' offices worldwide.[16] For this subsample, the US dollar is a foreign currency *and* the affiliates have no direct access to dollar funding from the Federal Reserve. Columns (5)-(6) further exclude all "home offices", ie offices that are headquartered in that location ($n=l$). That subsample therefore only includes *foreign* banks (including branches and subsidiaries) outside the United States. The home office tends to be the largest observation for a given country (along either home or host dimension) and, where included, factors heavily in the coefficient estimates. The sample that excludes home offices puts home and host regulation on the same footing.

3.2 Results

The results from the direct panel regressions are presented in Table 2. Note that our constructed borrower controls are significant and have the correct sign across all specifications, indicating that they capture relevant demand-side variation in the dependent variable.

Overall, the results suggest that several home-country prudential policies intended to strengthen the resilience of banks have statistically significant spillover effects. Namely, a tightening in a country's concentration limits is associated with an increase in cross-border US dollar-denominated lending by banks headquartered in that country. By contrast, when the home country tightens interbank exposure limits, cross-border lending contracts. Both results are highly significant across all benchmark specifications. Home-country LTV caps have a positive impact when home offices are excluded from the sample (columns 5 and 6), but not in the other samples in Table 2.

The interactions of US monetary policy with a couple of home-country prudential policy variables have significant spillover effects. First, US monetary policy tightening reinforces the negative impact of tighter interbank exposure limits on cross-border US dollar lending. Second, when coupled with a tightening of US monetary policy, a loosening of local currency reserve requirements is associated with a decline in cross-border US dollar lending.

The picture is more mixed when it comes to host-country prudential policies.[17] A tightening in a country's LTV caps and local currency reserve requirements is associated with a decline in dollar cross-border lending of banks located in that country. Nevertheless, the significance of the respective coefficients disappears in the specifications that include interactions with US monetary policy. The full sample estimates (in columns 1 and 2) also suggest that US dollar cross-border lending contracts when the host country tightens capital requirements and when it eases interbank exposure limits. However, both estimated effects vanish when US banks and offices are excluded (columns 3-6).[18]

Finally, the estimated impact of US monetary policy on cross-border US dollar lending is negative and strongly significant in all specifications. Furthermore, the implied size of this effect is economically large. In contrast to prudential policies, which are specific to individual home or host countries, US monetary policy acts more broadly on all dollar-denominated credit. We would not expect it to explain a significant portion of the variation in affiliate-level growth rates across home-host pairs. Thus, the results obtained from the direct panel regression beg the question of whether monetary policy instead relates to the financial cycle that makes bilateral growth rates move in lockstep. This concern motivates the complementary approach that disentangles the different dimensions shown in Graph 1.

[16] For all but US banks, the US dollar is a foreign currency. Most global banking groups from other countries have offices in the US with access to dollar liquidity either from the Federal Reserve or from local retail operations.

[17] Note that the BIS data do not distinguish branches and subsidiaries, but the bulk of the activity reflects entities affected by (host country) regulation. When branches reach considerable size, host country regulators typically require the branch to incorporate as a subsidiary or otherwise submit to local regulation.

[18] Our key results are robust to excluding the Great Financial Crisis (2008 Q1-2009 Q4) from the sample. Also, our results remain largely unchanged when the dependent variable is changed to credit growth in *all* currencies (not just US dollar-denominated claims).

Direct panel regression results

Growth in US dollar cross-border claims on all counterparties

Table 2

	Full sample		Excluding US banks and offices		Excluding home offices	
	(1)	(2)	(3)	(4)	(5)	(6)
Demand	0.788**	0.733**	0.712**	0.659**	0.907**	0.871*
Home Cap. Req.	-1.131	-0.993	-2.322	-2.160	-0.875	-1.506
Home Con. Limit	6.993**	5.164**	6.469***	5.041*	6.587**	5.314*
Home IB Ex.	-7.095***	-8.541***	-7.183***	-8.570***	-8.898***	-9.724***
Home LTV Cap	1.553	1.673	2.240	2.145	5.226***	5.439**
Home RR FX	-0.350	0.184	0.0321	0.0247	2.048**	2.204
Home RR LC	-0.186	0.198	-0.647	-0.479	2.067*	2.354
Host Cap. Req.	-3.252*	-3.724*	-2.475	-2.781	0.432	-0.286
Host Con. Limit	-0.665	0.173	-0.288	0.720	2.130	-2.181
Host IB Ex.	8.992***	7.252**	7.912*	6.988	4.095	2.557
Host LTV Cap	-2.808**	-2.471	-3.587*	-3.206	-3.343***	-0.862
Host RR FX	0.391	0.709	-0.199	0.881	4.436	5.438
Host RR LC	-4.004***	-3.099	-3.466**	-2.387	-3.146	-2.933
USMP	-14.785***	-12.023**	-19.411***	-16.265***	-29.163***	-24.655***
HomeCAPREQxUSMP		0.619		0.356		-9.588
HomeCONLIMxUSMP		-12.123		-13.489**		-9.818
HomeIBEXxUSMP		-26.536***		-21.889**		-14.958**
HomeLTVCAPxUSMP		7.854*		7.718		9.982*
HomeRRFORxUSMP		-3.731		-1.177		-3.587
HomeRRLOCxUSMP		11.877***		12.242***		8.750**
HostCAPREQxUSMP		2.869		-0.735		2.776
HostCONLIMxUSMP		-6.008		-0.729		-22.992
HostIBEXxUSMP		3.148		5.237		-8.402
HostLTVCAPxUSMP		-2.749		-0.885		13.526***
HostRRFORxUSMP		-0.933		-3.178		-7.217
HostRRLOCxUSMP		2.267		0.207		-2.482
HomeFE	Yes	Yes	Yes	Yes	Yes	Yes
HostFE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11773	11773	9912	9912	8663	8663
R^2	0.145	0.169	0.175	0.194	0.168	0.184

Dependent variable is claim growth in USD, expressed in percent. Prudential policies are the cumulated prudential policy actions over 2 years, lagged by 4 quarters. Prudential policy action measures are from the IBRN prudential policy database (Cerutti et al. 2017, updated). US MP Shock is the structural US monetary policy shocks from the IBRN, based on the methodology of Gertler and Karadi (2015). The reported coefficient is the sum of the coefficients on the current value and 3 lags. Home (Host) PPxUSMP is the sum of the interactions of the indicated Home (Host) prudential policy with USMP and its 3 lags. Demand is the simple average of home and host demand shocks, extracted from the CBS and LBSR (respectively) using the methodology of Amiti, McGuire and Weinstein (2019). Sample spans 2000 Q1-2017 Q4. Standard errors are clustered at the home and host levels. * p < 0.10, ** p < 0.05, *** p < 0.01

Sources: BIS international banking statistics; IBRN prudential policy database; IBRN monetary policy shock data.

4. "Home or host": growth decompositions

This section examines one dimension at a time, home or host, to assess whether policies enacted by the home or host country produces spillovers among the banks grouped in this way. The goal is to estimate two separate panel regressions, equations (6) and (7) below, each representing a simple cross-section of home *or* host countries, respectively. To do so consistently, the growth rates must include only variation common to that dimension. This is achieved though the AW growth decomposition.

4.1 The growth decomposition

The methodology was developed by Amiti and Weinstein (2018), and applied to the BIS consolidated banking statistics (CBS) by Amiti et al (2019). Here we also apply this decomposition to the LBSR and to the LBSN which contain the home and host dimensions of interest (Graph 1). The focus shifts from bilateral lending of banks headquartered in *n* to borrower in *c* (CBS data), to lending of bank affiliates located in *l* and headquartered in *n* (LBSN data), eg the UK offices of German banks. This is also the vantage point of McCauley et al's (2019) analysis of banking deglobalisation.

What follows lays out the AW decomposition in the home-host dimensions. Equation (2) relates the bilateral growth in claims of banks from home country *n* booked in host location *l* to a "home-country component" common to bank nationality *n* (α_{nt}) and a "host-country component" that affects all banks operating in location *l* (β_{lt}). These components are time-varying fixed effects that decompose the total variation in growth across affiliates by location and nationality over time,

$$\frac{L_{nlt} - L_{nlt-1}}{L_{nlt-1}} = \alpha_{nt} + \beta_{lt} + \varepsilon_{nlt}. \tag{2}$$

The nationality component α_{nt} captures all factors common to banks of nationality *n*, such as their group-wide business model or home-country regulation as it affects their growth rates in all locations. Likewise, the location component β_{lt} identifies common factors affecting all affiliates operating in a given location *l*, including funding conditions and host-country regulation over time.

As explained in Section 2.5, OLS produces estimates that cannot be aggregated to match the growth rates of any particular home banking system, or of any particular host location, or indeed of global cross-border credit. OLS may also yield biased estimates of the two components in samples where new affiliates enter the dataset since, for such observations, L_{nlt-1} is zero.

The AW decomposition yields a more efficient estimator by exploiting adding-up constraints. To see how these work, define $\emptyset_{nlt-1} \equiv L_{nlt-1}/\sum_l L_{nlt-1}$ as the share of total lending of banks from *n* that is booked in location *l*, in period *t-1*. Multiplying both sides of (2) by $\emptyset_{nlt-1}$ and summing across host countries *l* yields equation (3), where the "common component" γ_t is the *median* growth in lending (of all *n-l* pairs), and variables with tildes are deviations from that median,

$$\sum_{l:L_{nlt-1}>0} \left(\frac{L_{nlt-1}}{\sum_l L_{nlt-1}} \left(\frac{L_{nlt} - L_{nlt-1}}{L_{nlt-1}} \right) \right) = \sum_l \left(\frac{L_{nlt-1}}{\sum_l L_{nlt-1}} \left(\gamma_t + \tilde{\alpha}_{nt} + \tilde{\beta}_{lt} + \varepsilon_{nlt} \right) \right). \tag{3}$$

Arranged this way, $\tilde{\alpha}_{nt}$ represents an idiosyncratic home-country component and $\tilde{\beta}_{lt}$ a host-country component. The left side simplifies to the overall growth of lending of banks from <u>home country</u> *n* (booked anywhere); the right side can be written as the common component plus the home-country component, along with the weighted average of all the host-country components ($\tilde{\beta}_{lt}$),

$$\frac{\sum_{l:L_{nlt-1}>0} L_{nlt} - \sum_l L_{nlt-1}}{\sum_l L_{nlt-1}} = \gamma_t + \tilde{\alpha}_{nt} + \sum_l \left(\emptyset_{nlt-1} \tilde{\beta}_{lt} \right) + \sum_l \left(\emptyset_{nlt-1} \varepsilon_{nlt} \right) \tag{4}$$

One can derive a similar expression for aggregate lending booked in a given <u>host country</u>. Let θ_{nlt-1} be the share of cross-border lending from host country *l* that was booked by banks from home country *n*.

Multiplying both sides of equation (2) by θ_{nlt-1} and summing across nationalities *n* yields the analogue to equation (4) for a given host location *l*,

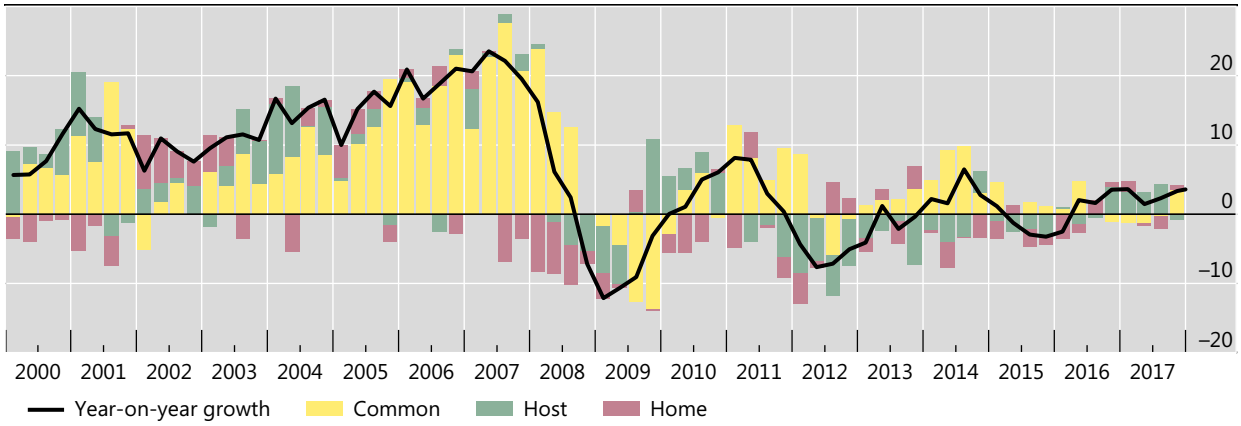
$$\frac{\sum_{n:L_{nlt-1}>0} L_{nlt} - \sum_n L_{nlt-1}}{\sum_n L_{nlt-1}} = \gamma_t + \tilde{\beta}_{lt} + \sum_l (\theta_{nlt-1}\tilde{\alpha}_{nt}) + \sum_l (\theta_{nlt-1}\varepsilon_{nlt}) \quad (5)$$

So chosen, the estimates of the home and host components will be consistent with the growth in lending by nationality *n* (booked anywhere), that of location *l* (booked by anyone), as well as aggregate global lending. The estimation relies on the moment conditions $E[\emptyset_{nlt-1}\varepsilon_{nlt}] = \emptyset_{nlt-1}E[\varepsilon_{nlt}] = 0$ and$E[\theta_{nlt-1}\varepsilon_{nlt}] = \theta_{nlt-1}E[\varepsilon_{nlt}] = 0$, where the equalities use the fact that the shares $\emptyset_{nlt-1}$ and θ_{nlt-1} are predetermined in period *t*.

The result of the AW decomposition applied to the LBSN data is summarised in Graph 4. It aggregates the three components ($\tilde{\alpha}_{nt}$, $\tilde{\beta}_{lt}$ and the common component γ_t) across all home and host countries. The common component (yellow) represents the median growth rate across all home-host pairs. It clearly dominates in the pre-crisis period up to 2008, reflecting the fact that cross-border credit grew at similarly elevated rates for all bank nationalities in all major locations. It is with the onset of the global financial crisis that the AW decomposition assigns greater importance to the granular home- and host country components (as observed by Amiti et al 2019 for the CBS).

Growth in cross-border lending, decomposed

Contributions to growth in US dollar cross-border claims, in per cent — Graph 4



Year-on-year growth of cross-border USD claims, adjusted for exchange rate movements and breaks in series. Decomposition based on algorithm in Amiti, McGuire and Weinstein (2019). The estimated home (host) components are unique to each home (host) country; The home and host components are weighted by claim volume to produce the aggregates shown in the graph.

Source: Locational banking statistics by nationality, authors' calculations.

The AW methodology now allows us to match each policy with the dimension that this policy is expected to affect. The common component (yellow in Graph 3) responds strongly to US monetary policy, as well as to other drivers of the global financial cycle (not shown).[19] More importantly for our purposes, stripping out the common component yields separate components for each home and each host country, that aggregate to the green and red bars in Graph 4 in line with equations (4) and (5). The specific home-country component (for each *n*) is independent of the common component *and* of any host-country components. Likewise, the decomposition delivers a host-country time-series (for each *l*) that is independent of the common component and of any home-country components.

Our data allow us to examine these decompositions for individual home or host countries. For a given host location, we can see the common component, the host component specific to that location and a

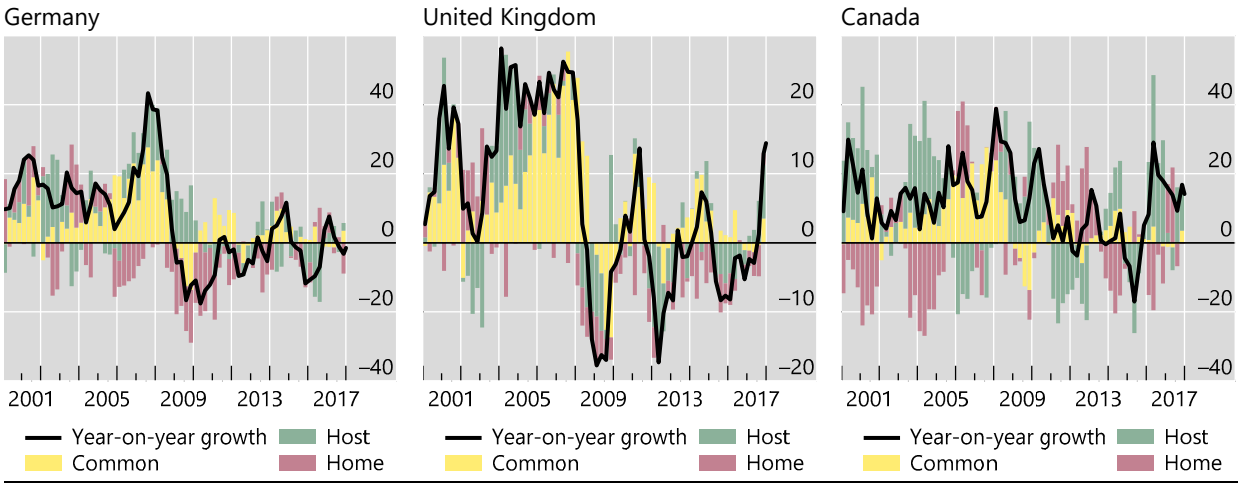
[19] This is in line with Amiti et al's (2019) findings and not reported here.

home component, consisting of a weighted average of all home components for banks operating in the given location (Graph 5, top row). These three factors exactly add up to the overall growth rate for banks in that location. Likewise, for a given home country we have the common component, the component specific to banks headquartered in that home country and a host component, consisting of a weighted average of all host locations where the banks from that home country operate (Graph 5, bottom row).

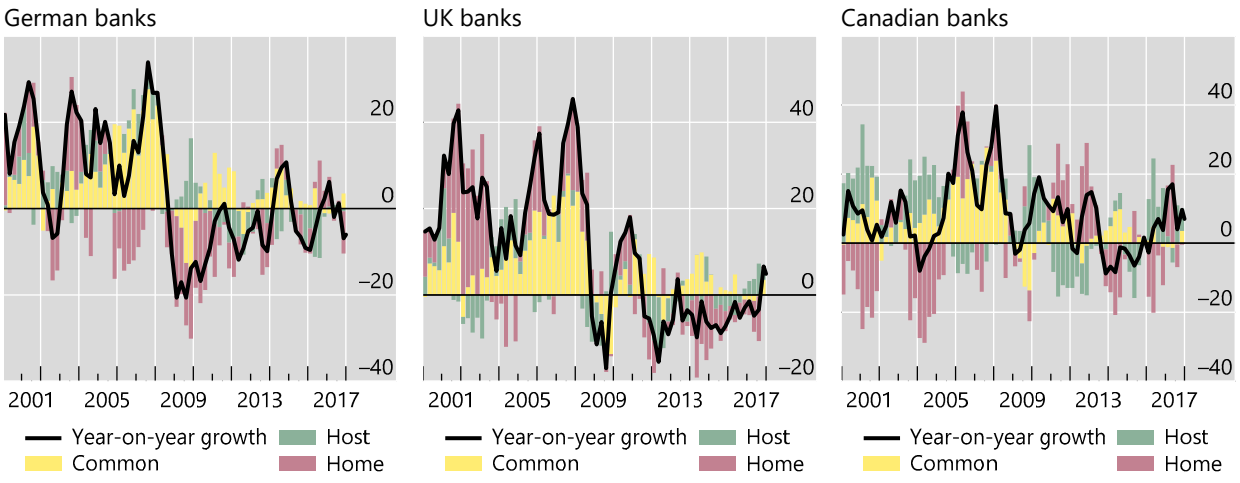
Contributions to growth decomposition in US dollar cross-border claims

In per cent — Graph 5

By host country



By home country



Year-on-year growth of cross-border USD claims, adjusted for exchange rate movements and breaks in series. Decomposition based on algorithm in Amiti, McGuire and Weinstein (2019). Estimated home (host) component unique to each home (host) country. Graph plots the common component, the host component for the indicated country and a weighted average by claim volume across all home countries of banks operating in the indicated host location.

Source: Locational banking statistics by nationality, authors' calculations.

We now use these components as dependent variables in two separate panel regressions to focus on each dimension of interest, home or host, knowing that the decomposition has removed the common element and factors for the other dimension. The regression follows a similar structure as before, but collapsed to either the home or the host dimension:

$$\Delta Home_{nt} = \boldsymbol{\omega D_{nt}} + \boldsymbol{\sigma' P_{nt}} + \boldsymbol{\mu' M_t} + \boldsymbol{\beta'}(\boldsymbol{P_{nt}} * \boldsymbol{M_t}) + \varepsilon_{nt} \quad (6)$$

$$\Delta Host_{lt} = \boldsymbol{\pi D_{lt}} + \boldsymbol{\lambda' P_{lt}} + \boldsymbol{\mu' M_t} + \boldsymbol{\alpha'}(\boldsymbol{P_{lt}} * \boldsymbol{M_t}) + \varepsilon_{lt}\,. \quad (7)$$

The terms $\boldsymbol{D_{nt}}$ and $\boldsymbol{D_{lt}}$ control for demand effects. As described before, the LBSN data do not identify the borrower country, but running the AW decomposition on the other two datasets, CBS and LBSR, delivers the home and host-specific demand components needed to control for demand.

4.2 Results

The results from the regressions based on the decomposition approach are presented in Table 3 (for the Home-country regression) and Table 4 (for the Host-country regression). The first point to note is that the estimated (stand-alone) impact of US monetary policy is no longer significant in either of the decomposition-based regressions (home or host). This is consistent with our reasoning that if US monetary policy is a global factor, then it should be highly correlated with our estimated common component, but explain little of the variability in the host- and home-country specific components.[20]

As in the direct panel results (Section 3), a number of home-country prudential tools have significant spillover effects (Table 3). Again, all major countercyclical instruments used by the home country generate significant spillovers. And a tightening of home country LTV caps is associated with an increase in cross-border dollar lending. This result may reflect a substitution effect – faced with tighter LTV limits on their domestic lending, banks are likely to re-balance their portfolios towards to cross-border dollar lending. Meanwhile, cross-border dollar lending tends to contract in response to a tightening in foreign currency reserve requirements and a loosening in local currency reserve requirements. Intuitively, both of these prudential policy actions make cross-border dollar lending less attractive relative to local currency lending.

Also, the negative effect of looser local currency reserve requirements on cross-border lending in dollars is compounded by a tightening of US monetary policy (mirroring results from the direct panel regressions). While the intuition behind this result is not clear, it may be related to a substitution effect. A tightening of US monetary policy makes dollar funding more expensive, while a loosening of local currency reserve requirements makes lending in local currency more attractive. The combination of these two effects is likely to induce banks to substitute away from US dollar lending (mainly cross-border) and towards local currency lending.

Several resilience-enhancing home-country prudential tools are also associated with spillovers. Cross-border dollar lending expands in response to tighter home-country concentration limits and contracts in response to tighter home-country interbank exposure limits. Since concentration limits may well bind for domestic lending, their tightening induces banks to substitute into cross-border US dollar lending. By contrast, since the interbank market is such a large part of cross-border USD claims, limits on interbank lending are likely to reduce cross-border dollar lending.

Just as in the direct panel regressions, the negative impact of tighter interbank exposure limits on cross-border dollar lending is boosted by tighter US monetary policy. Intuitively, more expensive dollar funding may compound the negative effect of tighter interbank exposure limits on cross-border dollar lending.

[20] If we run the regression with the overall growth for the home or host country on the left hand side, and so include the common component, US monetary policy is again significant.

Finally, the combination of stricter capital requirements and tighter US monetary policy is associated with reduced cross-border dollar lending. Intuitively, costlier US dollar funding increases banks' propensity to meet stricter capital requirements by cutting cross-border dollar lending.[21]

As in the direct panel results, the estimates from the decomposition approach also suggest that host-country prudential policies tend to have less significant spillover effects than their home-country counterparts (Table 4).

Home-country regression results

Growth in US dollar cross-border claims on all counterparties — Table 3

	Full sample		Excluding US banks		Excluding home offices	
	(1)	(2)	(3)	(4)	(5)	(6)
$Demand_t$	0.211***	0.179**	0.244**	0.211*	0.622***	0.602***
Cap. $Req._{it-4}$	0.508	0.199	-0.0126	-0.501	1.552	0.744
Con. $Limit_{it-4}$	4.014**	3.242*	4.198***	3.548**	5.271***	4.352**
IB Ex. $Limit_{it-4}$	-7.086***	-7.390***	-7.106***	-7.514***	-8.06***	-7.606***
LTV Cap_{it-4}	3.873***	3.743***	3.763***	3.643***	4.279***	4.123***
RR FX_{it-4}	-2.022***	-2.353***	-1.981***	-2.287***	0.354	-0.892
RR LC_{it-4}	2.028**	2.699***	2.086**	2.800***	2.927**	3.207***
USMP	1.274	4.433**	-0.181	4.019	-3.275	-0.686
CAPREQxUSMP		-6.322**		-8.900**		-4.754
CONLIMxUSMP		-0.556		-0.713		6.093
IBEXxUSMP		-17.765***		-17.652***		-13.103*
LTVCAPxUSMP		-4.100		-3.480		-5.314
RRFORxUSMP		-2.135		-2.011		-9.587***
RRLOCxUSMP		6.276**		5.924**		7.091**
Observations	1408	1408	1347	1347	1232	1232
R^2	0.057	0.084	0.061	0.090	0.139	0.161

The dependent variable is the home component of growth in cross-border US dollar claims for each (home) banking system, extracted from the LBSN using the Amiti- Weinstein (2018) decomposition. The sample spans 2000 Q1-2017 Q4. Prudential policies are the cumulated prudential policy actions over 2 years, lagged by 4 quarters. Prudential policy action measures are from the IBRN prudential policy database (Cerutti et al. 2017, updated). USMP is the structural US monetary policy shocks from the IBRN, based on the methodology of Gertler and Karadi (2015). The reported coefficient is the sum of the coefficients on the contemporaneous value and its 3 lags. Variables of the form PPxUSMP are the sum of the interactions of the indicated Home prudential policy with USMP and its 3 lags. Demand is the estimated demand shock for the home country, estimated from the CBS with the same methodology as the dependent variable. Standard errors are clustered by date. * p < 0.10, ** p < 0.05, *** p < 0.01

Sources: BIS international banking statistics; IBRN prudential policy database; IBRN monetary policy shock data.

The estimated effects of countercyclical host country tools are mostly insignificant. This is the case for both, local and foreign currency reserve requirements. The only exception is LTV caps, whose tightening is associated with a contraction in US dollar cross-border lending. The intuition for this result is not straightforward. One possible explanation is related to a signalling effect. Typically, LTV limits are tightened during the boom phase of a country's financial cycle. As a consequence, such a policy action is likely to prompt banks to revise downwards expected profitability. This, in turn, is likely to prompt them to contract their overall balance sheets, starting with dollar cross-border lending, which, as discussed in the Introduction, represents one of the most nimble portions of their balance sheets.

[21] As in the previous section, our key results are robust to excluding the Great Financial Crisis (2008q1-2009q4) from the sample. Most results are also robust to using claims in *all* currencies (not just US dollar-denominated claims).

Host-country regression results

Growth in US dollar cross-border claims on all counterparties — Table 4

	Full sample		Excluding US offices		Excluding home offices	
	(1)	(2)	(3)	(4)	(5)	(6)
$Demand_t$	0.110	0.122	0.0859	0.0984	0.325***	0.318***
Cap. $Req._{it-4}$	-0.513	-0.798	-0.783	-0.910	1.172	0.362
Con. $Limit_{it-4}$	4.223***	5.446***	4.896***	6.254***	8.948***	4.022
IB Ex. $Limit_{it-4}$	4.099***	2.086*	4.187***	2.437**	1.412	-1.446
LTV Cap_{it-4}	-1.981***	-2.265***	-2.176***	-2.437***	-2.273***	-1.572*
RR FX_{it-4}	-0.707	0.922	-0.738	0.979	2.637*	3.616**
RR LC_{it-4}	0.821	-0.155	0.875	-0.0401	0.207	-0.225
USMP	-1.224	-0.507	-4.926**	-4.180	-3.900	-3.955
CAPREQxUSMP		-2.471		-3.079		-2.012
CONLIMxUSMP		-13.841**		-13.923**		-37.831***
IBEXxUSMP		6.007		7.825*		-7.979
LTVCAPxUSMP		-1.467		-0.563		6.181*
RRFORxUSMP		-2.407		-1.719		-2.862
RRLOCxUSMP		13.541***		12.646***		-2.513
Observations	1781	1781	1720	1720	1607	1607
R^2	0.035	0.052	0.038	0.055	0.073	0.108

The dependent variable is the host component of cross-border USD claim growth for each (host) banking location, extracted from the LBSN using the Amiti- Weinstein (2018) decomposition. The sample spans 2000 Q1-2017 Q4, excludes the US as a home country. Prudential policies are the cumulated prudential policy actions over 2 years, lagged by 4 quarters. Prudential policy action measures are from the IBRN prudential policy database (Cerutti et al. 2017, updated). USMP is the structural US monetary policy shocks from the IBRN, based on the methodology of Gertler and Karadi (2015). The reported coefficient is the sum of the coefficients on the contemporaneous value and its 3 lags. Variables of the form PPxUSMP are the sum of the interactions of the indicated Host prudential policy with USMP and its 3 lags. Demand is the estimated demand shock for the host country, estimated from the LBSR with the same methodology as the dependent variable. Standard errors are clustered by date. * p < 0.10, ** p < 0.05, *** p < 0.01

Sources: BIS international banking statistics; IBRN prudential policy database; IBRN monetary policy shock data.

Only one of the resilience-enhancing host-country prudential instruments is associated with significant spillover effects that have an intuitive explanation. Namely, a tightening of host country concentration limits is associated with an increase in cross-border dollar lending. The intuition is similar to the one for its home-country counterpart: tighter concentration limits, which may well bind for domestic lending, induce banks to substitute into cross-border dollar lending. The above negative effect is dampened by tighter US monetary policy, which curbs banks' incentives to substitute into cross-border dollar lending in response to a tightening of concentration limits.

At the same time, the decomposition-based regressions also mirror the direct panel regressions in generating a positive estimated impact of interbank exposure limits on dollar cross-border lending – even if the result is difficult to interpret.[22]

[22] Once again, our key results are robust to excluding the Great Financial Crisis (2008Q1-2009Q4) from the sample.

5. Conclusions

In this paper, we have examined the cross-border spillovers of home- and host-country prudential policy measures as well as their interactions with US monetary policy. We take advantage of the rich dimensionality of the BIS international banking statistics and apply a novel two-step empirical approach. The first step involves a decomposition of the growth rate into home- and host-country components in a way that ensures that the respective components exactly aggregate up to aggregate growth in cross-border lending. In the second step, we match these home and host components to home and host prudential policy actions, to understand which tools have the largest and most robust impact. Using the same decomposition methodology on other slices of the IBS data allows us to control for demand shocks in the second-stage regressions.

Our findings suggest that home-country prudential policies tend to have greater spillover effects than host-country policies. When a bank's home country tightens prudential policy, concentration limits, LTV caps, and local currency reserve requirements boost cross-border dollar lending. By contrast, tightening interbank exposure limits and foreign currency reserve requirements has contractionary effects. When a bank's host country tightens prudential policy, concentration limits and interbank exposure limits tend to expand cross-border bank lending, whereas LTV caps have a negative effect. We also find that the tightening of home-country interbank exposure limits and capital requirements as well as host country concentration limits compound the negative effect of US monetary policy on cross-border dollar lending.

Home-host regulation is a complex area, with branches and subsidiaries affected differentially depending on each jurisdiction's institutional framework. This paper serves as a first attempt to disentangle the effects of this overlay of regulation. In so doing, it also contributes on the methodological side with a principled approach to analysing the home- and host-country dimensions of global banking.

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Annex: Supplementary material

Home and host countries in the regression

Table A1

Home Countries	Host countries
Austria	Austria
Australia	Australia
Belgium	Belgium
	Brazil
Canada	Canada
Switzerland	Switzerland
Chile	Chile
	China
Germany	Germany
Denmark	Denmark
Spain	Spain
Finland	Finland
France	France
United Kingdom	United Kingdom
	Greece
Hong Kong SAR	Hong Kong SAR
	Indonesia
	Ireland
India	India
Italy	Italy
Japan	Japan
	Korea
Luxembourg	Luxembourg
	Mexico
	Malaysia
Netherlands	Netherlands
	Norway
Portugal	Portugal
	Russia
Sweden	Sweden
Singapore	
Turkey	Turkey
Chinese Taipei	Chinese Taipei
United States	United States
	South Africa

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