

Channels and determinants of foreign bank lending

Torsten Ehlers and Philip D Wooldridge¹

Abstract

Recent crises invigorated debate about the financial stability risks associated with different forms of foreign bank lending. Would a more decentralised model of international banking – in which a greater proportion of international banking business is carried out in the country where banks operate rather than across borders – be more desirable from a financial stability point of view? This paper sheds light on aspects of this debate by using the BIS international banking statistics to investigate the channels through which foreign banks might transmit shocks across borders and to analyse the determinants of banks' decision whether to lend locally or cross-border. Focusing on the Asia-Pacific region, we find increasing concentration among foreign bank creditors, owing in part to the rising market share of banks headquartered within the region. Thus the region continues to be vulnerable to shocks in individual creditor countries. That said, foreign banks' share of aggregate bank credit is low in all but a few Asia-Pacific countries. We also find that the state of the banking system in the borrower country has a significant influence on the form of foreign lending. Intermediation by foreign banks takes the form of local lending where banking systems are relatively more fragile or less developed, and cross-border lending where banking systems are relatively more stable or advanced.

Keywords: Global banks; international lending; financial integration

JEL classification: F34, F36, F65, G21

¹ Respectively, Economist, BIS Representative Office for Asia and the Pacific, and Head of International Banking and Financial Statistics, Monetary and Economic Department, Bank for International Settlements. We thank Bat-el Berger, Steven Kong and Siew Koon Goh for research assistance, and Stefan Avdjiev, Jennifer Corbett, Cathérine Koch, Chen Lin, Patrick McGuire, Frank Packer, Hyun Song Shin and participants in the 2014 RBNZ-BIS Conference on Cross-border financial linkages for valuable comments. Views expressed are those of the authors and do not necessarily reflect those of the Bank for International Settlements.

1. Introduction

Banks' and regulators' responses to the global financial crisis of 2008–09 and the subsequent euro area crisis are reshaping international banking. In response to deficiencies in their operations and risk management, as well as changes in supervision and regulation, banks are reconsidering their business models. Consequently, some banks are retrenching from international business, others are expanding, still others are restructuring their international operations, and many are adjusting their risk management. In this paper, we seek to illustrate how international banking is changing and what these changes might imply for risks to financial stability. In particular, we attempt to shed light on a question that has received much attention from policymakers since the 2008–09 crisis: would a more decentralised model of international banking – in which a greater proportion of international banking business is carried out in the country where banks operate rather than across borders – be more desirable from a financial stability point of view?

We adopt a broad definition of international banking, which encompasses business conducted locally via banks' affiliates in host countries as well as that conducted from abroad, across national borders. Since the mid-1990s, international banking has increasingly taken the form of local lending in preference to cross-border lending, especially in emerging markets (CGFS (2004), McCauley et al (2002)). Recent crises invigorated debate about the relative benefits of different forms of international banking, particularly whether greater reliance on local funding sources could help to reduce vulnerability to external shocks while still providing the benefits of international banking (Fiechter et al (2011)). Indeed, some have called for tighter capital and liquidity requirements on international banks' affiliates (PRA (2014), Tarullo (2014)). Such reforms would weaken intragroup and thus cross-border links, but also potentially hinder the efficient flow of funds across borders (CGFS (2010)).

This paper contributes in two ways to the debate about the optimal form of international banking. First, we consider how the role of international banks in transmitting shocks across borders might have changed since 2007, drawing insights from the Asia-Pacific region. Studies of spillovers during recent crises highlighted the significance of funding structures. McGuire and von Peter (2009) show how shortages of US dollar funding drove cross-border banking flows in 2008. Ivashina and Scharfstein (2010) and de Haas and van Lelyveld (2014) find that reductions in credit were a function of banks' reliance on wholesale funding. Cetorelli and Goldberg (2012) conclude that when subject to a funding shock, parent banks reallocate liquidity within the group according to the differing funding and investment roles of their international affiliates.

However, funding structures are not the only channel through which international banks transmit shocks. We consider other channels to assess borrower countries' vulnerability to shocks, including the diversity of creditors. Focusing on the Asia-Pacific region, we find increasing concentration among foreign bank creditors, owing in part to the rising market share of banks headquartered within the region. That said, foreign banks' share of aggregate bank credit is low in all but a few Asia-Pacific countries.

A second contribution of this paper is to distinguish the determinants of local lending from those of cross-border lending. To this end, we are especially interested

in the relative importance of banking system factors versus trade and macroeconomic factors in banks' decision whether to lend locally or cross-border. Banking characteristics allow us to investigate whether countries with more stable, more profitable, or more efficient banking sectors exhibit different patterns of foreign bank intermediation.

Previous studies of international banking either did not distinguish between local and cross-border lending, or were narrow in their country coverage. For example, Buch (2003) and Focarelli and Pozzolo (2005) examine the decision of banks to expand overseas. Houston et al (2012) analysed the impact of cross-country differences in regulations on banks' international assets. García-Herrero and Pería (2007) study the determinants for intermediation through local claims, but they do not consider banking system factors and use data for only three creditor banking systems. Buch et al (2011) look at individual banks' productivity and find a pecking order in foreign banking activities, whereby more productive banks are more likely to lend through subsidiaries or branches. Yet their study is limited to German banks.

Our estimations take advantage of data for 31 creditor banking systems and more than 800 country pairs over a 13-year period through 2013. This large cross-section of data allows us to identify patterns in the data that are widely applicable. Also, the long time series enables us to identify how the variation in the determinants of the two forms of foreign lending – cross-border versus local – contributes to the observed dynamics in aggregate foreign lending growth over time.

We find that banking system factors have a significant impact on the form of international banking. In our sample, banking system characteristics explain as much of the observed variation in foreign lending growth as trade, gravity and macro factors combined. Overall, our results indicate that intermediation by international banks takes the form of local lending in borrower countries where banking systems are relatively more fragile or less developed, and cross-border lending where banking systems are relatively more stable or advanced.

The remainder of the paper is organised as follows. Section 2 documents changes in international banking activity since 2007, focusing for illustrative purposes on developments in the Asia-Pacific region. Section 3 explains the model and data used to distinguish the determinants of local lending from those of cross-border lending. Section 4 summarises the key results, and section 5 concludes with a discussion of the potential implications of the results for financial stability.

2. International banking in Asia-Pacific

The global financial crisis of 2008–09 triggered a discussion about a potential reversal in the tremendous expansion of international banking that had begun in the 1960s and accelerated in the late 1990s (Buch et al (2013), CGFS (2010), ECB (2012)). To illustrate how international banking has evolved since 2007, we focus on developments in a region that was less affected by recent crises and where financial integration continues to advance: Asia and the Pacific.

We view developments through the lens of the BIS international banking statistics, which are the most comprehensive dataset available for monitoring banks'

international activities. The BIS compiles two sets of international banking data: the consolidated statistics, which exclude positions between affiliates of the same banking group, and the locational statistics, which include intragroup positions. Both sets consist of country-level rather than bank-level data.² The consolidated statistics capture the assets of all banks of a given nationality – all banks headquartered in a given “home” country – including the assets of their affiliates worldwide, whereas the locational statistics capture the assets of banks located in a given country, regardless of the nationality of those banks. Both sets distinguish between cross-border and local business. However, in the consolidated statistics local claims denominated in non-local currencies – for example, US dollar loans to residents of Japan – are included with cross-border claims.³ The reason for this treatment is that such claims are typically funded from abroad, often via the head office of the bank (BIS (2013)).⁴ Examples of the different forms of foreign lending are shown in Table 1.

Forms of foreign lending

Distinguishing between cross-border and local claims in the BIS international banking statistics

Table 1

Creditor	Borrower	Currency of loan	Locational banking statistics	Consolidated banking statistics ¹
Bank's head office in country <u>A</u>	Corporation in country <u>B</u>	Currency of country <u>A</u>	Cross-border claim	Cross-border claim
Bank's head office in country <u>A</u>	Bank's affiliate in country <u>B</u>	Currency of country <u>A</u>	Cross-border claim	Not reported (intragroup position)
Bank's affiliate in country <u>B</u>	Corporation in country <u>B</u>	Currency of country <u>A</u>	Local claim in non-local (foreign) currency	Included with cross-border claim ²
Bank's affiliate in country <u>B</u>	Corporation in country <u>B</u>	Currency of country <u>B</u>	Local claim in local currency	Local claim in local currency

¹ In the consolidated statistics, total claims (cross-border plus local claims) on residents of countries other than the “home” country of the bank are referred to as “foreign” claims. ² In the consolidated statistics on an immediate borrower basis, the sum of cross-border claims and local claims in non-local currencies is referred to as “international” claims. In the consolidated statistics on an ultimate risk basis, local claims in non-local currencies are included with local claims in local currency. For simplicity, in this paper we refer to “international” claims as cross-border claims.

2.1 Asia-Pacific in context

We define Asia and the Pacific as the 18 countries in the region that demonstrate some level of openness to foreign investors. We proxy for openness by limiting our sample to countries included in either the MSCI All Country World equity index or

² Central banks collect data from the banks in their jurisdiction, compile national aggregates, and then send the national data to the BIS to calculate global aggregates.

³ For simplicity, in this paper we do not distinguish between cross-border claims and the sum of cross-border claims and local claims denominated in non-local currencies; we refer to both measures as cross-border claims. In the BIS international banking statistics, the sum is labelled “international” claims.

⁴ This approximation is not valid for dollarised economies, where deposits by local residents are likely to account for a large share of banks’ foreign-currency funding.

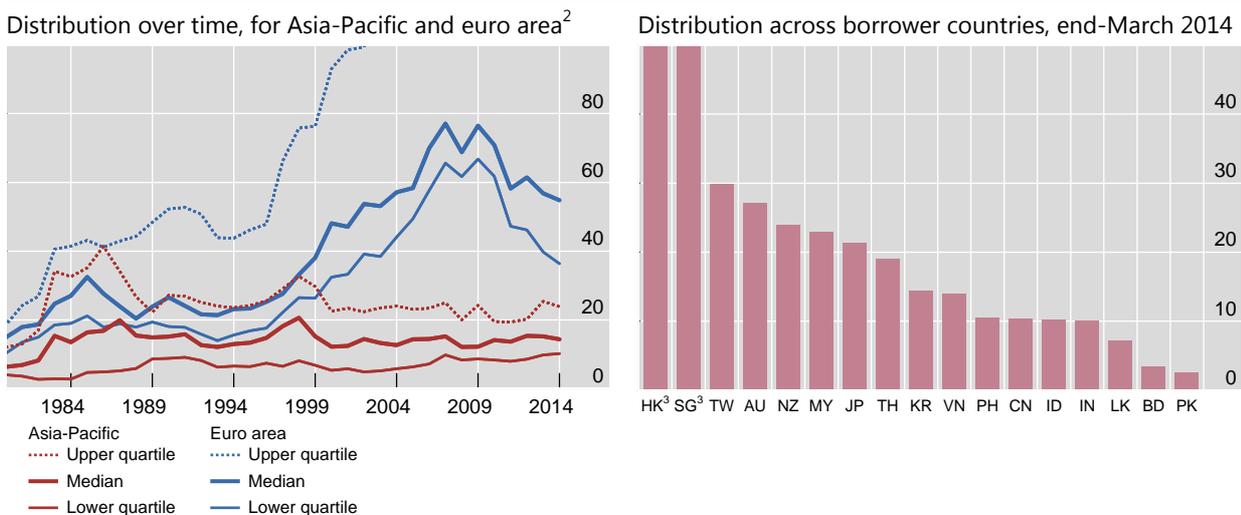
the MSCI Frontier Markets index. Within the region, MSCI identifies five developed markets (Australia, Hong Kong SAR, Japan, New Zealand, Singapore); eight emerging markets (China, Chinese Taipei, India, Indonesia, Korea, Malaysia, Philippines, Thailand); and four frontier markets (Bangladesh, Pakistan, Sri Lanka, Vietnam). We also include Macao SAR in our sample because it reports to the BIS international banking statistics.

As an example of how international banking is changing, Asia-Pacific has three advantages. First, by some measures financial integration is less advanced in Asia-Pacific than in other regions, which leaves open many possibilities for the eventual shape of international banking in the region. The left-hand panel of Figure 1 shows cross-border liabilities to banks as a percentage of borrower countries' GDP for our sample of Asia-Pacific countries plus the euro area. In Asia-Pacific the median value has fluctuated around 15% of GDP since the mid-1980s. This level and trend contrast with the euro area, where the median value rose steadily between the mid-1990s and 2007 to a peak of 77% of GDP. There are large differences across countries, as shown in the right-hand panel of Figure 1. Nevertheless, the upper and lower quartiles track the median reasonably closely.

Cross-border borrowing from banks¹

As a percentage of the borrower country's GDP

Figure 1



AU = Australia; BD = Bangladesh; CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; JP = Japan; KR = Korea; LK = Sri Lanka; MY = Malaysia; NZ = New Zealand; PH = Philippines; PK = Pakistan; SG = Singapore; TH = Thailand; TW = Chinese Taipei; VN = Vietnam.

¹ Outstanding cross-border claims of BIS reporting banks, including banks' holdings of securities issued by residents of the borrower country. ² Euro area comprises the 18 countries that were members of the euro area as of 1 January 2014. Cross-border claims include positions between members of the euro area. The upper quartile peaks at 178% in 2007 and declines to 125% at end-March 2014. ³ For HK, 217%; for SG, 202%.

Source: BIS locational banking statistics by residence (Table 6); IMF World Economic Outlook database; authors' calculations.

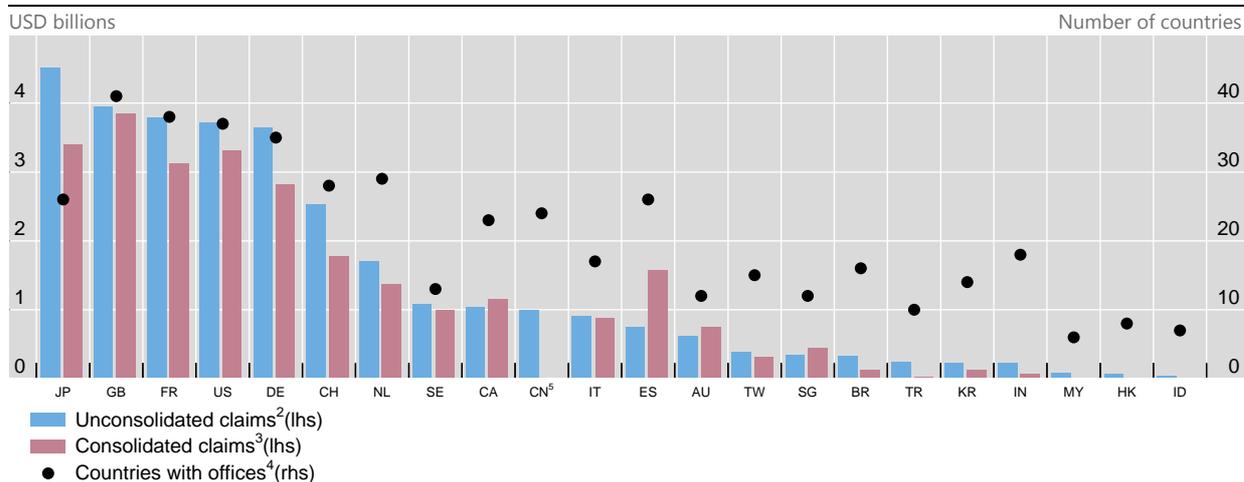
Second, economies and financial systems in Asia-Pacific are developing rapidly, and this dynamism creates many opportunities (as well as risks) for international banks. Indeed, owing to this dynamism, the 2008–09 crisis seemed not to disrupt the growth of international banking in Asia-Pacific. Whereas in the euro area 2008 marked a clear inflection point in cross-border lending, in Asia-Pacific there was no noticeable change in trend (Figure 1, left-hand panel).

Third, banks headquartered in Asia-Pacific are expanding their presence in foreign markets and thus are likely to have an increasingly large influence on the process of financial integration in the region. At a minimum, they will influence the relative importance of regional versus global integration in Asia-Pacific, each of which potentially brings different benefits (Corbett and Findlay (2010), García-Herrero and Wooldridge (2007)). Japanese banks have long been among the banking systems with the largest international assets (Figure 2). While comparable balance sheet data are not reported to the BIS for Chinese banks, available information indicates that Chinese banks are moving up the ranks of the most active international lenders (CGFS (2014), McGuire and van Rixtel (2012)). For example, Chinese banks have entered new markets in recent years and are now present in about as many markets as Japanese banks (Figure 2). Among Asia-Pacific banks, Australian and Singaporean banks also have sizable international assets, although not as large as those of Japanese and Chinese banks.

International business of banks

By nationality (or “home” country) of the bank¹

Figure 2



¹ “Home” country is usually synonymous with the country where the parent bank (or the financial group of which the bank is a part) is headquartered. It captures the nationality of BIS reporting banks, as opposed to their residence. ² Claims booked by banking offices located in the 44 countries that report the BIS locational banking statistics (ie the BIS reporting area), including intragroup positions and excluding local claims denominated in local currencies. ³ Claims booked by BIS reporting banks’ offices worldwide, excluding intragroup positions and claims on residents of the home country of the parent bank. ⁴ Number of countries in the BIS reporting area where a parent bank has at least one office (subsidiary, branch or representative office). ⁵ For Chinese banks, unconsolidated claims are approximated as the claims of offices located inside the BIS reporting area whose home country is in Asia-Pacific but outside the BIS reporting area.

Sources: BIS consolidated banking statistics on an immediate borrower basis (Table 9B); BIS locational banking statistics by nationality (Table 8); authors’ calculations.

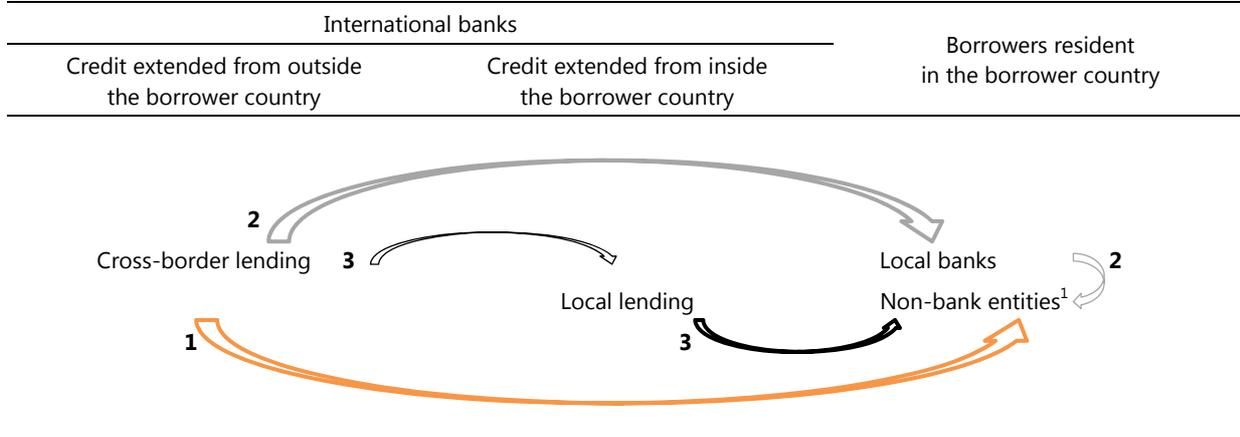
2.2 Transmission channels

To illustrate how international banking in Asia-Pacific is changing, we consider channels through which it might impact a country’s vulnerability to cross-border spillovers. Similar to Cetorelli and Goldberg (2011), we examine three transmission channels: (1) a contraction in direct lending by international banks induced by an exogenous shock beyond the borrower’s control; (2) a contraction in cross-border interbank lending, which might trigger a shock to local banks’ funding; and (3) a

contraction in local lending by international banks' affiliates. Figure 3 provides a visual representation of these channels.

Transmission of shocks via international banks

Figure 3



¹ Non-bank financial institutions, non-financial corporations, households and governments.

2.2.1 Common lender channel

If the same banks dominate cross-border lending to borrowers in different countries, then even in the absence of other economic or financial ties an adverse shock experienced by one country can trigger outflows from other countries. In particular, an unexpected loss in one country may lead creditors to reduce their exposure to other countries so as to restore capital adequacy ratios, meet margin calls, or adhere to the dictates of banks' value-at-risk or similar models. This is known as the common lender effect (Kaminsky and Reinhart (1999)).

Whereas prior to recent crises analysis focused on adverse shocks emanating from borrowing countries, subsequently attention turned to shocks from creditor banks' home countries. International banks were previously seen as a source of strength to their affiliates, which helped to stabilise credit growth during periods of turmoil in the borrower country (De Haas and van Lelyveld (2010)). Events in 2008–09 demonstrated that international banks can have a destabilising impact if their parent is weak (De Haas and van Lelyveld (2014)). For example, parents that experience funding problems might scale back their international business and thereby increase the risk of a credit crunch in the borrower country.

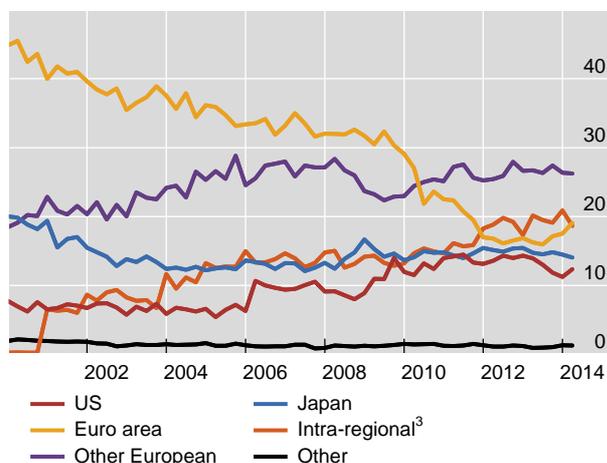
During recent crises, concerns about a retrenchment by European banks were especially acute because of their fragile financial condition and large share of the market for foreign bank lending. At end-2007, European banks accounted for close to 60% of all international banks' cross-border claims on Asia-Pacific (Figure 4, left-hand panel). Among European banks, UK banks had the highest market share at that time, followed by German and Swiss banks (Figure 4, right-hand panel). In the face of funding difficulties and unexpectedly large losses on US and European assets, starting in 2008 European banks scaled back their presence in Asia-Pacific (and other regions). By end-2013 their collective market share had fallen to 44%.

Market share of foreign lending to Asia-Pacific

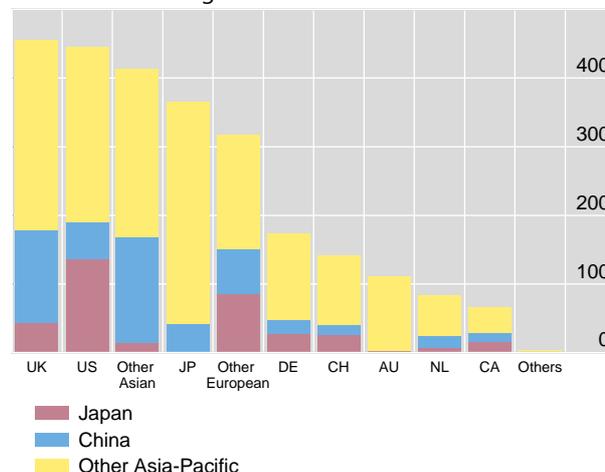
By nationality of the creditor bank¹

Figure 4

Median market share over time²



Claims outstanding at end-March 2014⁴



AU = Australian banks; CA = Canadian banks; CH = Swiss banks; DE = German banks; JP = Japanese banks; NL = Dutch banks; UK = UK banks; US = US banks.

¹ Based on consolidated cross-border (international) claims of BIS reporting banks vis-à-vis residents of 18 Asia-Pacific countries. Excludes local claims denominated in local currencies and claims on the home country of the parent bank (eg excluding claims of Japanese banks on residents of Japan). ² Median for the sample of 18 borrower countries in a given quarter. ³ Australian, Korean, Hong Kong, Indian, Singaporean and Taiwanese banks. ⁴ Sum of claims vis-à-vis China, Japan and 16 other Asia-Pacific countries.

Sources: BIS consolidated banking statistics on an immediate borrower basis; authors' calculations.

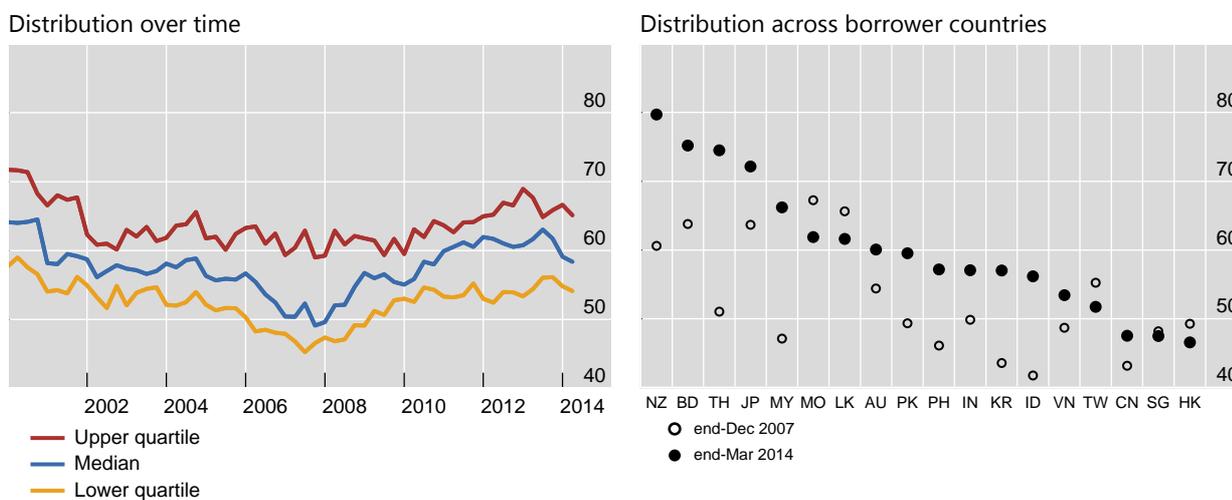
Countries can reduce their vulnerability to common lenders by diversifying their sources of external financing. Diversification can take many forms. Asian Development Bank (2012), BIS (2006) and Dalla (2012) discuss the progress of initiatives to develop domestic bond markets and lengthen debt maturities. We focus on the diversity of bank creditors.

We first consider a simple measure of diversity: market concentration. The BIS consolidated banking statistics show that, in Asia-Pacific, exposure to the largest three creditor banking systems has increased since 2007. The median value of the market share of cross-border lending for the largest three was 50% at end-2007 and increased to 59% at end-2013 (Figure 5, left-hand panel). This trend is not driven by developments in a few countries: the lower and upper quartiles of the sample of 18 countries show a similar increase. This finding is not so surprising when considered in the context of the retrenchment of European banks; US, Japanese and other Asia-Pacific banks increased their market share as European banks retrenched. Countries that experienced especially large increases in concentration include New Zealand, Thailand and Malaysia (Figure 5, right-hand panel).

Concentration of bank creditors in Asia-Pacific

Market share of three largest creditor banking systems¹

Figure 5



AU = Australia; BD = Bangladesh; CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; JP = Japan; KR = Korea; LK = Sri Lanka; MO = Macao SAR; MY = Malaysia; NZ = New Zealand; PH = Philippines; PK = Pakistan; SG = Singapore; TH = Thailand; TW = Chinese Taipei; VN = Vietnam.

¹ As a percentage of the consolidated cross-border (international) claims of all BIS reporting banks on a given borrower country, excluding the claims of banks headquartered outside of the BIS reporting area.

Sources: BIS consolidated banking statistics on an immediate borrower basis; authors' calculations.

To complement the concentration measure, we consider the similarity of creditors across the Asia-Pacific region. Are the largest creditors the same for each country? For each country pair, we calculate a common creditor index (CCI) using the formula of Van Rijckeghem and Weder (2001):

$$CCI_{ij} = \sum_c \frac{(b_{ic} + b_{jc})}{(b_i + b_j)} \left[1 - \frac{\left| \frac{b_{ic}}{b_i} - \frac{b_{jc}}{b_j} \right|}{\left(\frac{b_{ic} + b_{jc}}{b_i + b_j} \right)} \right]$$

where i and j represent borrower countries, c stands for the common creditor, and b_{ic} equals the outstanding claims of creditor c on country i (and b_{jc} of creditor c on country j). The first component of the equation measures the overall importance of creditor c for countries i and j . The second component captures the extent to which countries i and j receive funding from the same creditors. An index value of 1 indicates that the composition of creditors is the same between countries i and j while 0 indicates no common creditor.

Figure 6 shows the CCI for the sample of 18 Asia-Pacific economies. The right-hand panel shows the full matrix of country pairs at end-March 2014, with index values greater than 0.6 highlighted in red. The left-hand panel shows the distribution across borrower country pairs over time. The CCI tended to increase prior to recent crises, reaching a local maximum around the end of 2007. The CCI then declined, suggesting that the diversity of lenders increased after the crisis. Interestingly, the CCI declined most for country pairs at the lower quartile; for country pairs at the upper quartile, the decline was much less pronounced. In other

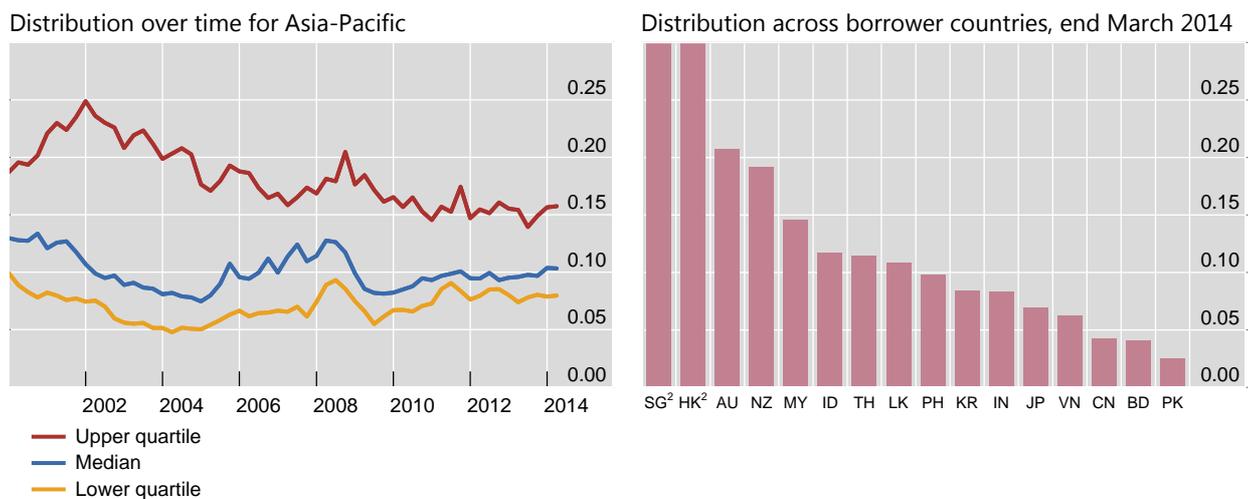
liabilities exhibited more stable lending patterns during the financial crisis. Corbett et al (2010) find that in Asia changes in bank lending during the global crisis varied with the degree of banks' reliance on money market funding and not with their direct exposure to Lehman Brothers.

A key component of non-core liabilities is interbank funding, including from banks abroad. Bruno and Shin (2014) build a "double-decker" model of international banking where regional banks borrow in US dollars from global banks in order to lend to local corporate borrowers. Interbank funding might take the form of unsecured lending, repurchase agreements or purchases of debt securities. History indicates that banks experiencing rapid credit growth often turn to banks abroad for financing. Indeed, Avdjiev et al (2012) find that in many emerging markets in the 2000s the rapid growth of bank credit to non-bank borrowers involved a greater reliance on international credit, including locally extended credit financed with net borrowing from abroad. In recognition of the potential role of cross-border lending in fuelling domestic credit growth, the latest international standards on banks' capital adequacy and liquidity, known as Basel III, expect supervisors worldwide to require their banks to respect countercyclical capital buffers set by authorities in the borrower country (Basel Committee on Banking Supervision (2010)).

Banks' reliance on non-core liabilities

Ratio of cross-border interbank liabilities to customer deposits¹

Figure 7



See Figure 5 for definitions of country codes.

¹ For banks resident in a given country. Interbank liabilities refer to BIS reporting banks' cross-border claims on banks in a given country and include claims unallocated by sector of the counterparty. Customer deposits refer to demand deposits plus time, savings and foreign currency deposits. ² For SG, 1.42; for HK, 0.52.

Sources: BIS locational banking statistics by residence; IMF International Financial Statistics; authors' calculations.

Figure 7 shows cross-border interbank liabilities as a ratio of banks' customer deposits (for banks resident in a given country, ie not by bank nationality). Not surprisingly, the ratio is highest in international financial centres that intermediate flows between countries, eg Hong Kong SAR and Singapore (right-hand panel). It is also high in countries with a recent history of current account deficits, eg Australia and New Zealand. It is low in countries less integrated with the global financial system, eg Bangladesh and Pakistan. For our sample of Asia-Pacific countries, the median value of the ratio fell in late 2008, during the convolutions in global

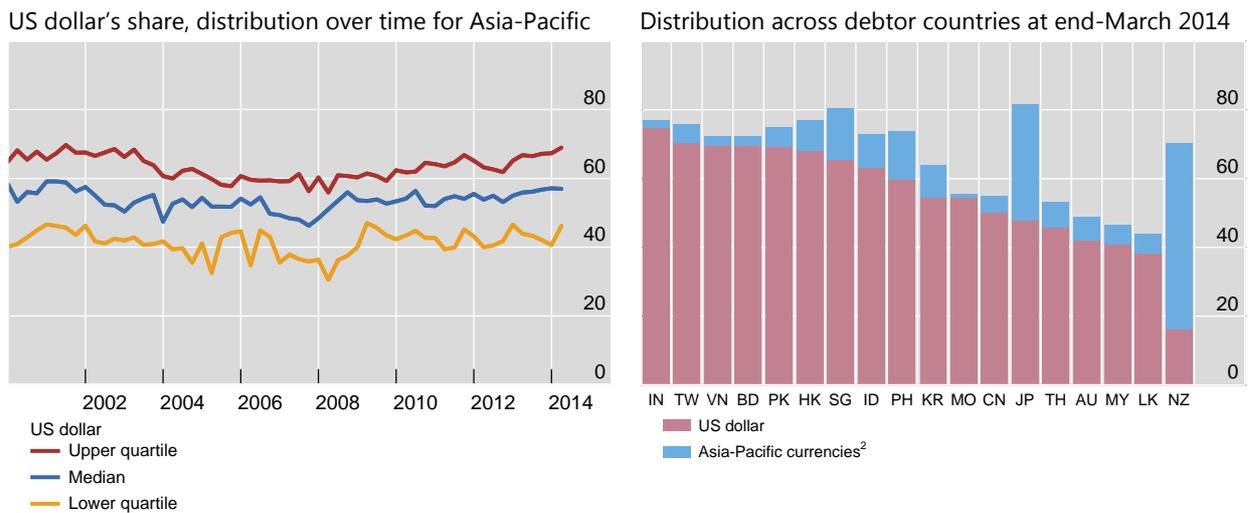
interbank markets that followed the collapse of Lehman Brothers (left-hand panel). While the ratio has inched up since then, recent trends appear unremarkable.

Even where local banks are not unduly reliant on cross-border interbank funding, such funding might still heighten their vulnerability to shocks if foreign currency borrowing is left unhedged. Historically, foreign bank lending to countries in Asia-Pacific was denominated mainly in US dollars. To the extent that borrowers do not hedge their dollar liabilities – either directly using derivatives or indirectly through dollar earnings – cross-border borrowing can give rise to currency mismatches.⁵ In Asia-Pacific, various initiatives aim to promote greater use of a regional currency in intra-regional transactions (BIS (2012), Rhee and Sumulong (2014)). Nevertheless, the US dollar’s share of cross-border lending shows no signs of declining. The median value for the dollar’s share has fluctuated around 55% since 2009, which is similar to its long-term average (Figure 8, left-hand panel). The dollar’s share is lowest for borrowing by New Zealand residents, where a significant proportion of external liabilities to banks are denominated in Australian and New Zealand dollars (right-hand panel). The US dollar’s share is highest in India, Chinese Taipei and Vietnam.

Currency composition of cross-border borrowing from banks

As a percentage of BIS reporting banks’ claims allocated by currency

Figure 8



See Figure 5 for definitions of country codes.

¹ Excludes claims of banks in countries that do not report a detailed currency breakdown to the BIS, notably Hong Kong SAR, Macao SAR, Curaçao and Singapore. ² Mainly JPY, plus small amounts of AUD and 16 other Asia-Pacific currencies. Coverage of currencies other than JPY is incomplete.

Sources: BIS locational banking statistics by residence; authors’ calculations.

In Asia-Pacific, vulnerabilities arising from foreign currency borrowing are less of a concern today than they were in the run-up to the Asian financial crisis of 1997–98. Avdjiev et al (2012) estimate that US dollar credit now accounts for a small share of total credit (local plus cross-border credit) to non-financial private sector

⁵ Even when the borrowing bank hedges its exposure, it may remain exposed to currency risk if the final borrower is unhedged.

borrowers. Nevertheless, its future evolution merits attention because the growth of dollar credit has in recent years outpaced that of total credit, and aggregate data may mask currency mismatches in particular sectors.

2.2.3 Local lending channel

The final transmission channel that we consider is local lending by international banks' affiliates abroad. Locally funded lending is considerably less volatile than cross-border lending (García-Herrero and Pería (2007), Hills and Hoggarth (2013), McCauley et al (2012)). And recent crises revealed that local lending via subsidiaries is less volatile than that via branches (Hoggarth et al (2013)). Thus, subsidiarisation is one potential way to reduce the risk of adverse shocks spilling across national borders, albeit at the potential cost of hindering the efficient flow of funds across borders (Fiechter et al (2011)).

Subsidiaries of international banks typically fund and manage their activities in the same location as where they are supervised. They are separate legal entities and often entail substantial investment of capital. Subsidiaries usually hold a banking license in the host country and as such can perform the same banking services as a domestic bank. In contrast, branches of international banks are usually restricted in the activities they are allowed to engage in – in particular in their ability to collect deposits or raise short-term funding in the host country. As a consequence, they rely more heavily on direct funding from their parent. Branches can be less costly to set up and operate because, in many jurisdictions, they are not subject to the same capital and liquidity rules of authorities in the host country as domestic banks. Instead, they are often supervised primarily by authorities in the home country.

The BIS international banking statistics do not reveal a noticeable shift in Asia-Pacific policymakers' preference for subsidiarisation in recent years. While data for subsidiaries are not separately reported, claims booked via local affiliates – subsidiaries and branches combined – and denominated in the local currency of the country where the affiliate is located are a reasonable proxy because they are closely correlated with local funding and subsidiaries account for the bulk of local funding.⁶ Figure 9 shows international banks' claims booked via local affiliates as a percentage of these banks' total (cross-border plus local) claims on residents of the borrower country. The median value fell from 52% before the crisis to 43% in 2011, as the growth of cross-border claims outpaced that of local claims (left-hand panel). The ratio of international banks' local to total claims on Asia-Pacific borrowers is broadly similar to that in other regions. However, international banks' share of aggregate bank credit is low in all but a few Asia-Pacific economies, notably New Zealand, Hong Kong SAR and Singapore (right-hand panel).

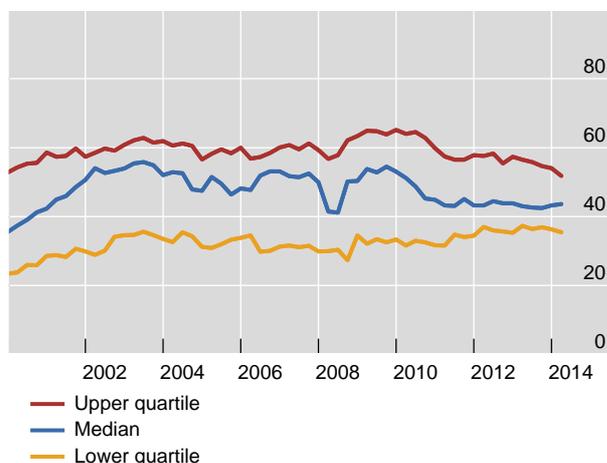
⁶ In 2014 data for subsidiaries and branches started to be reported in the BIS international banking statistics, as part of a major set of enhancements (Committee on the Global Financial System (2012)).

Claims of international banks' local affiliates¹

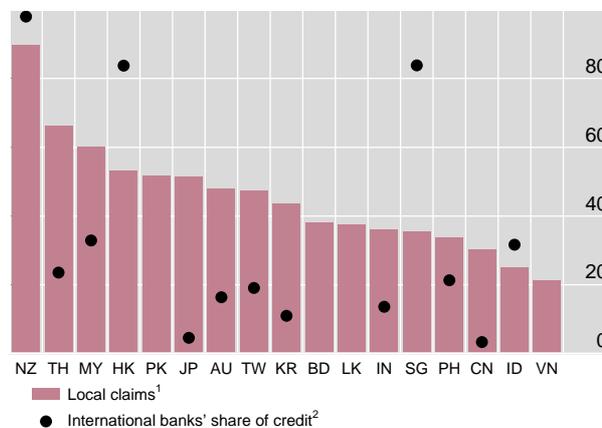
As a percentage of international banks' total claims on the borrower country

Figure 9

Distribution over time for Asia-Pacific



Distribution across debtor countries at end-March 2014



See Figure 5 for definitions of country codes.

¹ Claims of local affiliates on residents of the borrower country, denominated in the currency of the borrower country. Excludes claims of international banks headquartered outside the BIS reporting area. ² Total consolidated claims of international banks (cross-border plus local claims) on non-bank borrowers, as a percentage of aggregate bank credit to non-bank residents (credit from international and local banks). Local claims include claims on banks and thus international banks' share of aggregate bank credit to non-bank borrowers is overestimated.

Sources: BIS consolidated banking statistics on an immediate borrower basis (Table 9A); authors' calculations.

2.3 Summary

In summary, since 2007 international banking in Asia-Pacific has seen changes in the composition of creditors, yet these do not appear to have had a distinct impact on the channels through which international banks might transmit shocks across borders. Some international banks have retrenched, which has contributed to increased concentration. Yet others have expanded, which has resulted in greater diversity in creditors across countries. In particular, Chinese and other regional banks increased their activity in the region. Cross-border interbank funding remains a reasonably important source of funding for local banks. And there has not been a noticeable shift away from cross-border lending towards local subsidiaries.

3. The determinants of cross-border versus local intermediation

The previous section explained the channels through which different types of foreign lending – cross-border or local – might transmit shocks across borders. We now turn to an analysis of banks' decision whether to lend locally or cross-border. Specifically, we analyse what factors determine the relative importance of different types of foreign lending, and how well these factors explain observed dynamics. By analysing how borrower-specific versus creditor-specific factors influence the type

of foreign bank intermediation, we seek to better understand the potential transmission channels of financial shocks and the potential risks they pose to financial stability.

3.1 International lending decision

The international lending decision of a given bank at a given point in time generally involves two, not necessarily independent, dimensions: (1) whether to increase or decrease their foreign claims on a given country; and (2) to which extent the increase or decrease should be intermediated cross-border or locally. Our focus is on the effects of cross-border versus local intermediation. These effects can vary over time and this time variation is crucial for any potential effect on financial stability risks. If, for instance, a compositional change towards less cross-border lending happens when overall foreign lending growth is declining, then this would mean an amplification of the foreign lending cycle. Depending on how severe this amplification is, this could indicate increased financial stability risks. Without looking at the dynamic dimension and the quantitative impact on foreign lending, the relevant policy implications would be unclear.

3.2 Econometric model

In order to study the dynamic effects on international lending growth, we estimate a model in growth rates. To concentrate on the effects of a change in the composition of foreign lending, the model takes the growth rates as given and focuses on explaining the variation in the shares of cross-border and local claims:

$$\frac{\Delta forClaims_t^{c,i}}{forClaims_{t-1}^{c,i}} = \Gamma_1 X_{1,t-1}^{c,i} \frac{\Delta xborderClaims_t^{c,i}}{xborderClaims_{t-1}^{c,i}} + \Gamma_2 X_{2,t-1}^{c,i} \frac{\Delta locClaims_t^{c,i}}{locClaims_{t-1}^{c,i}} + \varepsilon_t^{c,i}$$

with superscript c denoting the credit country and i denoting the debtor country. All explanatory factors X are interacted with either the growth in cross-border and foreign currency claims ($xborderClaims$) or with the growth in locally intermediated claims in local currency ($locClaims$). Γ_1 and Γ_2 are the vectors of coefficients to be estimated.

The terms $\Gamma_1 X_{1,t-1}^{c,i}$ and $\Gamma_2 X_{2,t-1}^{c,i}$ have a direct economic interpretation as the shares of cross-border and local claims in total foreign claims. Starting from the definition of total foreign claims ($forClaims$),

$$forClaims_t^{c,i} \stackrel{\text{def}}{=} xborderClaims_t^{c,i} + locClaims_t^{c,i}$$

the growth rate of total foreign claims is a weighted average of the growth rates in cross-border claims and local claims:

$$\frac{\Delta forClaims_t^{c,i}}{forClaims_{t-1}^{c,i}} = \underbrace{\frac{xborderClaims_t^{c,i}}{forClaims_{t-1}^{c,i}}}_{\beta_{1,t-1}^{c,i}} \times \frac{\Delta xborderClaims_t^{c,i}}{xborderClaims_{t-1}^{c,i}} + \underbrace{\frac{locClaims_t^{c,i}}{forClaims_{t-1}^{c,i}}}_{\beta_{2,t-1}^{c,i}} \times \frac{\Delta locClaims_t^{c,i}}{locClaims_{t-1}^{c,i}}$$

Hence, the term $\Gamma_1 X_{1,t-1}^{c,i}$ can be interpreted as an estimate for share of cross-border claims in total foreign claims ($\beta_{1,t-1}^{c,i}$) and $\Gamma_2 X_{2,t-1}^{c,i}$ as an estimate for the share of local claims ($\beta_{2,t-1}^{c,i}$). As the shares are both varying across country pairs c,i as well as over time t , admissible explanatory factors can be time-varying, varying across countries/country pairs, or both.

While the growth rates of the different types of claims can be volatile, the shares for cross-border and local claims are more stable. Therefore, our model can be seen as explaining the relatively slow-moving intermediation trends in the data. *Ceteris paribus*, this should facilitate finding robust statistical relationships with macroeconomic variables and gravity factors, which are typically also less volatile. At the same time, the model still allows us to make predictions of the impact of the changes in the intermediation shares on the dynamics of foreign claims.

We consider a wide range of explanatory factors:

$$X_{f,t}^{c,i} = \left[1, T_t^{c,i}, G^{c,i}, M_t^c, M_t^i, B_t^c, B_t^i, d(\cdot)_t^{c,i} \right]$$

where T refers to bilateral trade shares, G to gravity factors (which are typically time invariant), M to macroeconomic conditions in creditor c as well as borrower i countries, and various dummies d . Our main variables of interest are the banking sector characteristics B . Details are provided in Table 2.

We do not impose the restriction $\Gamma_1 X_{1,t-1}^{c,i} + \Gamma_2 X_{2,t-1}^{c,i} = 1$.⁷ Therefore we are estimating an over-identified model. As explained in the following section, many of our explanatory factors X do not vary across country pairs or over time. Hence, requiring $\Gamma_1 X_{1,t-1}^{c,i}$ and $\Gamma_2 X_{2,t-1}^{c,i}$ to add up to one would be unnecessarily restrictive. Note that the explanatory factors are lagged by one period in our econometric model, which should mitigate potential endogeneity issues stemming from feedback effects of, for instance, cross-border lending on net interest margins or trade.

⁷ In our estimations, $\Gamma_1 X_{1,t-1}^{c,i} + \Gamma_2 X_{2,t-1}^{c,i} = 1$ generally does not hold and the error term will pick up the unexplained fraction in growth of total international claims. Also note that, even though $intClaims_t^{c,i} = xborderClaims_t^{c,i} + locClaims_t^{c,i}$, the growth rates $\frac{\Delta xborderClaims_t^{c,i}}{xborderClaims_{t-1}^{c,i}}$ and $\frac{\Delta locClaims_t^{c,i}}{locClaims_{t-1}^{c,i}}$ are not necessarily perfectly negatively correlated. In fact, in our sample the correlation between the two is low and positive (0.15). Hence, using an identical set of explanatory factors for both interactions does not pre-impose our results. Many of the result tables show the same signs for coefficients $\gamma_{1,j}$ and $\gamma_{2,j}$ for various explanatory factors j . In this respect, our model is more flexible than a setup where the share of local claims itself is regressed on a set of explanatory factors (as in García-Herrero and Pería (2007)). As per definition $\frac{locClaims_{t-1}^{c,i}}{intClaims_{t-1}^{c,i}} = 1 - \frac{xborderClaims_{t-1}^{c,i}}{intClaims_{t-1}^{c,i}}$, the estimated effect on one share is exactly equal to the negative effect on the other share. Hence, the absolute magnitude (and statistical significance) of the marginal effects would be the same across shares in this kind of setup. In our setup, the marginal effects and significance of explanatory factors can, and do, vary for $xborderClaims$ and $locClaims$.

Summary of variables¹

Table 2

Category	Name	Definition
Foreign lending	xborderClaims	Cross-border and foreign currency claims of banks headquartered in creditor country <i>c</i> against residents in borrower country
	locClaims	Local claims in local currency: claims extended through local operations in the borrower country which are owned by a bank headquartered in the creditor country against residents in borrower country
	forClaims	Total foreign bank claims = sum of xborderClaims and locClaims. All claims are valued in USD.
Trade factors	exportShare	Share of exports from creditor country to borrower country
	importShare	Share of imports to borrower country from creditor country
Gravity factors	dist	Distance between capitals of creditor and borrower country (logarithm of distance in km)
	comborder	Dummy(=1) if creditor and borrower country have a common border
	comlang	Dummy for common language
	comcol	Dummy for common colonial history
	comlegal	Dummy for common legal system
	finCentre	Dummy for borrower country being a financial centre
	financial-Freedom	Annual index for financial freedom in the borrower country
	chinnIto	Chinn-Ito index for current account openness
Macro factors	logGDP	Log of nominal GDP in the borrower country in billions of USD
	GDPGrowth	Annual GDP growth rate in the borrower country in percent
	banking-Crisis	Dummy for banking crisis, based on Laeven and Valencia (2013)
	Creditor-BkCrisis	Same as above, but for creditor country
Banking system factors:	impairedLoanRatio	Face value of impaired loans divided by total loans, aggregate for all banks in borrower country
Stability of borrower country	loanDepositRatio	Net loans divided by total customer deposits, aggregate for all banks in borrower country
	equityRatio	Book equity (capital + capital reserves) divided by total assets, aggregate for all banks in borrower country
Banking system factors:	netInterestMargin	Net interest revenue divided by earning assets, aggregate for all banks in borrower country
Profitability of borrower country	returnOnAssets	Net income divided by total assets, aggregate for all banks in borrower country
	bankingSector-Concentration	Aggregate total assets of the 3 largest banks divided by aggregate total assets of all banks in borrower country
Banking system factors:	ratioNonInterestInc-TotInc	Non-interest income divided by total income, aggregate for all banks in creditor country
Efficiency of creditor country	costToIncomeRatio	Operating expenses divided by total income, aggregate for all banks in creditor country
	ratioOverhead-TotAssets	Operating expenses divided by total assets, aggregate for all banks in creditor country

¹ For a more detailed variable description and data sources, see Table A3 in the appendix.

3.3 Sample selection

A key conceptual issue that arises in many international banking studies is the treatment of banks that do not lend abroad, or lend only cross-border. While the former is not of significance in our study on foreign lending between countries, there are many country pairs for which foreign lending takes solely the form of cross-border lending.⁸

We choose to restrict the sample to country pairs where the creditor country exhibits both types of foreign lending. The reasons for doing so are both conceptual and technical. Conceptually, we are mostly interested in the question of how banks decide on how much foreign lending to extend through a given channel. This presumes that there is a choice between different types of foreign intermediation, ie that foreign affiliates already exist. The question of whether or not banks decide to establish local affiliates is different in nature and also would most likely depend on different kinds of explanatory factors. Technically, taking account of potential threshold effects would require a structural model and potentially restrictive assumptions.⁹ We prefer to retain a high degree of flexibility when analysing the data.

3.4 Banking system characteristics as determinants for intermediation channels

Banking sector characteristics are potentially important determinants for a bank's decision of whether to lend cross-border or locally.¹⁰ Banking system characteristics contain information about the state of a banking sector. In this light, they are potentially informative for policymakers. While the set of factors we analyse cannot give a full picture of the advantages or disadvantages of decentralised intermediation, we concentrate on one particular hypothesis: are there signs that local claims are *relatively* more supportive towards more fragile or less developed banking systems?

We are particularly interested in the stability and profitability of the banking sector in a given borrower country, and the efficiency of the banking sector in a

⁸ There are also country pairs for which international lending is intermediated solely through local affiliates, but their number is far smaller.

⁹ As setting up foreign operations presents substantial fixed costs for banks, there is a certain threshold which banks have to overcome before they invest abroad and therefore have the option to intermediate foreign bank claims locally. Buch et al (2009) argue that banks with a certain size and productivity are more likely to overcome this threshold and develop an ordered Probit model to take this unobserved threshold into account.

¹⁰ See De Haas and van Lelyveld (2006) for evidence in Central and Eastern European recipient countries during the crisis and García-Herrero and Pería (2007) for Italian, Spanish and US creditor banks. Claessens and van Horen (2014), using a large database on foreign banks, argue that the effect of private credit and foreign bank presence importantly depends on host country and banks' characteristics. However, as argued above, shocks in the home country of the creditor may transmit to their foreign branches and subsidiaries (Cetorelli and Goldberg (2011, 2012))

creditor country. Each of these categories is captured with three different factors, for a total of nine potential banking system factors.¹¹

The stability of the banking sector in borrower countries is represented by the impaired loan ratio, loan-to-deposit ratio, and equity ratio. A high impaired loan ratio is a sign of potential weaknesses in the banking sector, which may cause banks to reduce risks and cut down on lending going forward. If local intermediation strengthens credit supply in weaker banking systems, then we should see a higher share of *locClaims* for banking systems with higher impaired loan ratios.¹² A similar line of argumentation applies to the loan-to-deposit ratio. Loan/deposit ratios are a key indicator for liquidity mismatch risk (Kashyap et al (2002)). Deposits are viewed as a more stable source of funding (Ivashina and Scharfstein (2010), Cornett et al (2011)). Loan-to-deposit ratios tend to be positively correlated with, the supply of credit and willingness of banks to take on risks – in addition to a generally greater liquidity mismatch (van den End (2013)). Thus, if our hypothesis holds true, high loan-to-deposit ratios should be correlated with a lower share of local intermediation. Banking systems with higher equity ratios tend to be more stable (BCBS (2011)), and perhaps face more stringent regulatory requirements. Thus we postulate higher equity ratios to be associated with a relatively higher share of *locClaims*, if *locClaims* are associated with relatively lower financial stability risks.

To measure the profitability of the banking sector in borrower countries, we look at net interest margins, banking sector concentration and return on assets. High net interest margins are generally a sign of limited competition, restricted access to credit or high economic uncertainty (Ho and Saunders (1981), Claessens et al (2001)). Thus the interaction term of net interest margins with *locClaims* should be positive, if they are relatively more important in less developed or more fragile banking systems. The same applies to banking sector concentration. The influence of higher return on assets on the form of intermediation is a priori not clear. It could reflect the same drivers as for net interest margins, and thus expected to be positively correlated with *locClaims*. Alternatively, it could reflect higher risk taking, which we would expect to be positively correlated with *xborderClaims*.

The final category of banking system factors we consider is the efficiency of the banking system in the creditor country. Our proxies are the ratio of non-interest income to total income, the ratio of costs to total income, and the ratio of overheads to total assets. Ideally, more efficient banking sectors should support less efficient ones. If local claims fulfil this function, then this would imply that the interaction terms of *locClaims* growth with the ratios of cost to income as well as overhead to total asset would have a negative sign. Niepman (2013), for instance, develops a model where more efficient banking sectors export capital and set up foreign operations. We do not have a clear hypothesis with respect to the ratio of non-interest to total income, which is a measure for banks' activities outside traditional bank lending and deposit taking.

¹¹ We have also checked financial stability and profitability factors for the creditor country and banking sector efficiency characteristics for debtor countries. However, these factors are generally not significant in our model.

¹² Local affiliates of foreign banks could also have an informational advantage. This could tilt foreign bank intermediation towards local claims. In the face of informational asymmetries, local claims would most likely be preferable from a financial stability point of view.

3.5 Data

For our estimations, we exploit the richness of the BIS consolidated banking statistics. These statistics capture the outstanding claims of 31 national banking systems on counterparties in over 200 countries going back to 1999.¹³ This results in a large cross-section of country pairs as well as a long time series for many pairs. Furthermore, the consolidated statistics distinguish between cross-border and local claims – subject to the caveat discussed in section 2 that local claims in non-local currencies are included with cross-border claims. Their compilation by nationality of the reporting bank is especially important for our purposes because, in a world where international banks operate through affiliates in many countries, nationality is a more meaningful indicator than residence of where the underlying economic decisions are taken.

Our sample is based on year-end data and covers the period 2000–13. To limit potential biases from outliers, we exclude observations where annual growth in *xborderClaims* or *locClaims* is greater than 500%. Moreover, as argued above, the dataset is restricted to observations where *locClaims*>0. This latter restriction causes roughly half the number of potentially available observations to drop out.¹⁴ As shown in Table A1 in the appendix, the relative impact on the number of available observations is similar for both borrower regions and creditor regions, with a relatively smaller impact on the number of observations that involve countries from Asia-Pacific. The final sample comprises 813 country pairs and is geographically balanced across advanced economies and emerging markets. Table A2 in the appendix provides a list of all creditor and borrower countries in our sample and the number of observations associated with them. We have on average 9 annual observations for country pair, which yields a total of 7290 observations.

Table 3 provides the summary statistics and regional distribution of observations for the different types of foreign lending. Cross-border claims account for the largest share of foreign lending across countries in our sample; the median share of *locClaims* is only 25.2%. However, the growth rates for *locClaims* are generally higher. Also, country pairs that exhibit large values of foreign bank claims tend to intermediate large sums locally as well, driving up the sum of outstanding *locClaims*. As a result, at the end of 2013 the aggregate sum of outstanding *locClaims* was almost as large as that of *xborderClaims* (conditional on *locClaims*>0): USD 10.9 trillion versus USD 11.7 trillion.

¹³ The data start in 1983 for a subset of mainly developed countries.

¹⁴ While focusing on the restricted sample allows a more straightforward identification of the determining factors, it naturally renders our sample less representative for global foreign lending dynamics. While our model fits the sample very well, our results are not applicable to the unrestricted sample, as the scope of our research question is different. We are interested in the expected effect of various determinants, given that a banking sector exhibits both types of flows (ie given that there is an explicit choice through which channel to intermediate flows).

Summary table for data sample on foreign bank claims¹

Table 3

In percent, unless stated otherwise

	Country pairs: Creditor countries → borrower countries			
	All-→All	All → Asia Pacific	Asia-Pacific → Asia-Pacific	Asia-Pacific → All
Number of observations	7290	2086	585	1123
Number of country pairs	813	217	68	134
Mean <i>forClaims</i> growth	13.6	16.3	17.4	15.9
Standard deviation (Std) of <i>forClaims</i> growth	45.8	45.8	32.3	33.7
Mean <i>xborderClaims</i> growth	16.2	20.3	19.7	17.9
Std <i>xborderClaims</i> growth	57.2	58.9	43.5	43.5
Mean <i>locClaims</i> growth	21.2	22.5	26.1	23.6
Std <i>locClaims</i> growth	88.8	78.7	64.9	74.3
5% percentile of <i>locClaims</i> share	0.17	0.9	3.3	0.8
Median <i>locClaims</i> share	25.2	31.1	25.6	17.6
95% percentile of <i>locClaims</i> share	80.7	78.8	75.1	68.9
Sum of <i>forClaims</i> at end of 2013, in billions of USD	22609.4	4416.2	1503.8	3998.0
Sum of <i>xborderClaims</i> at end of 2013, in billions of USD	11684.3	2275.5	808.5	2567.7
Sum of <i>locClaims</i> at end of 2013, in billions of USD	10925.1	2140.7	695.3	1430.2

¹ Data sample is based on observations for which *locClaims*>0, as described in section 3. The data are annual (outstanding claims at the end of year) for 2000–13.

Sources: BIS consolidated banking statistics; authors' calculations.

In US dollar terms, the volatility of growth rates of *locClaims* is considerably higher than that of *xborderClaims*. The standard deviation of the former is 89%, compared to 57% for the latter. This in part reflects the impact of exchange rate movements. As discussed in section 2, in many borrower countries cross-border claims are denominated principally in US dollars. By contrast, local claims are by definition in the consolidated banking statistics denominated in the currency of the borrower country. Considering that we take growth rates as given in our empirical model, and that the exchange rate effect is the same on both sides of the equation, we do not expect exchange rate movements to bias our results. Methodological changes between periods, such as changes in the reporting population, would bias the results. But we are able to control for these and adjust the growth rates for so-called breaks in series between periods.¹⁵

For the banking system factors, we calculate country aggregates using individual bank data from BankScope.¹⁶ While the data from BankScope may not

¹⁵ The BIS publishes a list of breaks on its website (www.bis.org/statistics/breakstablescons.pdf).

¹⁶ Our approach is conceptually identical to the one taken in Beck et al (2000) for the World Bank's Financial Development and Structure Dataset. However, the method of calculating country

cover all banks, they cover almost the entirety of the larger banks that reside in a given country. For calculating banking system ratios, BankScope should therefore be an adequate source for borrower countries. Considering that the international bank lending data are consolidated based on the nationality and not the residence of the bank, our banking sector characteristics for the creditor country are an imperfect proxy. But in many creditor countries, the largest banks are local ones, not foreign owned. Based on the full set of annual unconsolidated balance sheet data,¹⁷ we calculate ratios for each individual bank for which data are available, and then calculate a weighted average (weighted by the denominator) for all banks incorporated in a given country.¹⁸ For countries where data for less than three banks are available, the observation is assumed to be missing.

4. Empirical results

In tackling our main empirical question regarding the determinants of the relative importance of different types of foreign lending, it is useful to start with a thought experiment: if the share of foreign intermediation through the different channels is constant across country pairs and constant over time, how much of foreign lending dynamics can be explained?¹⁹ The answer to this question provides a relevant benchmark for our research questions. Only the fraction of variation in foreign lending that remains unexplained can possibly be determined by factors which capture country-specific and time-varying differences in the shares of *xborderClaims* and *locClaims*.

If both shares are constant across countries and over time, then both channels exhibit the same properties regardless of the state of banking sectors or the state of the credit cycle. In this case, both channels would have similar characteristics and would not be of great relevance to policymakers. The cross-country and time variation in the shares we measure allows making a statement about the *relative* features of intermediation channels.²⁰ Further, the share of the unexplained variance

aggregates is different as are the type of income statement and balance sheet characteristics that we cover.

¹⁷ We take all banks with consolidation levels U1 and U2. Banks are institutions with any of the following BankScope "specialisations": "Commercial Banks", "Bank Holding & Holding Companies", "Investment Banks", "Cooperative Bank", "Savings Bank", "Real Estate & Mortgage Bank", "Specialized Governmental Credit Institution", "Islamic Banks", "Group Finance Companies", "Micro-Financing Institutions".

¹⁸ In this way, we avoid biases due to missing data for either the denominator or nominator, which would occur if the ratio was calculated as the ratio of country aggregates.

¹⁹ Alternatively, one can think of this thought experiments as conditioning on banks' decision in a given creditor country by how much to increase total foreign lending, keeping the relative importance of the channels of intermediation unchanged.

²⁰ Taking growth rates of *xborder* and *locClaims* as given, we investigate whether the change in the relative importance between the two is of any relevance for policymakers. As most of the variation in the data is driven by the growth rates themselves, the absolute impact in credit in a given debtor country is probably driven by the growth rates themselves, rather than the changes in the relative importance of intermediation channels.

Regressions with trade, gravity factors and financial development factors

Generalised least squares allowing for heteroscedasticity across country pairs

Table 4

Explanatory variable	Category	(1)	(2)	(3)	(4)
<i>xborderClaims</i> growth		0.700***	0.327***	0.350***	0.219***
<i>locClaims</i> growth		0.154***	0.327***	0.321***	0.344***
Interaction terms with <i>xborderClaims</i> growth:					
exportShare	Trade		-0.215	-0.269	-0.252
importShare	Trade		-0.851***	-0.773***	-0.953***
dist	Gravity		-3.244***	-3.325***	-3.896***
comborder	Gravity		5.229***	5.055***	5.927***
comlang	Gravity		-17.936***	-17.526***	-15.908***
comcol	Gravity		-12.123***	-12.125***	-13.281***
comlegal	Gravity		7.607***	8.285***	10.052***
finCentre	Gravity		6.416***	7.165***	8.542***
financialFreedom	Gravity		-0.086***	-0.099***	-0.098***
chinnIto	Gravity		2.773***	2.532***	3.331***
logGDP	Gravity		5.001***	4.823***	5.657***
GDPGrowth	Macro				0.924***
bankingCrisis	Macro				6.507***
Creditor_BkCrisis	Macro				0.912
Interaction terms with <i>locClaims</i> growth:					
exportShare	Trade		1.039***	0.966***	1.011***
importShare	Trade		-0.711***	-0.609***	-0.639***
dist	Gravity		0.053	0.444*	0.215
comborder	Gravity		3.369***	2.768**	2.958***
comlang	Gravity		8.353***	8.464***	8.020***
comcol	Gravity		3.513**	2.469	3.969**
comlegal	Gravity		-4.404***	-4.310***	-4.837***
finCentre	Gravity		-1.488***	-2.153***	-1.429**
financialFreedom	Gravity		0.105***	0.115***	0.100***
chinnIto	Gravity		-3.512***	-3.500***	-3.483***
logGDP	Gravity		-1.595***	-1.821***	-1.749***
GDPGrowth	Macro				-0.099
bankingCrisis	Macro				-2.831***
Creditor_BkCrisis	Macro				1.718***
Constant		0.135	0.245**	-0.402	0.266***
Time dummies		No	No	Yes	No
Unadjusted R²		0.7428	0.7890	0.7909	0.7899
Number of obs		7290	6949	6949	6949

Source: Authors' estimation.

sets a benchmark for how much variation in foreign lending growth is left to be explained by variation in the type of intermediation across country pairs and over time.

Model (1) in Table 4 presents the results of this thought experiment.²¹ In our sample, the explained share of variation of growth in *forClaims* for this simple model is around 74% (unadjusted R²=0.743). In other words, around one quarter (26%) of the variation in foreign lending growth is due to the variation in patterns of foreign intermediation across country pairs and time. The additional explanatory power of our determinants is to be judged against this remaining quarter of unexplained variation.

4.1 Trade, gravity and macro factors

As the dataset covers a relatively large number of country pairs, the results for the trade, gravity and macro factors provide a benchmark on how relevant they are for the type of foreign bank intermediation. Importantly, they also provide a reference point for the explanatory power of the banking system characteristics.

Introducing trade and gravity factors in model (2) explains an additional 4.2% of the total variation – or roughly 16% of the variation unexplained by model (1). Consistent with many other studies on foreign bank lending or trade, both trade factors and gravity factors have statistically significant explanatory power for observed lending patterns. But in which way do they influence the *type* of foreign bank intermediation?

As far as trade is concerned, two main results emerge – which are consistent across all our model specifications. The first observation is that, overall, trade factors are more relevant for explaining the share of locally intermediated claims than they are for explaining the share of cross-border claims. In particular, when banking system-specific factors are introduced, trade factors are generally insignificant in explaining cross-border claims.²² Models (2)–(7) suggest that if the borrower country is a financial centre, the share of *xborderClaims* is 6%–9% higher, everything else being equal. The size factor (logGDP) is strongly positive for *xborderClaims* and strongly negative for *locClaims*. The same applies to current account openness, as measured by the Chinn-Ito index. Financial flows, ie flows which are unrelated to trade activity, tend to be more prevalent among large countries, and cross-border bank claims may be an important means to facilitate these flows.

A second observation is that if a trading relationship is important for a creditor country, the creditor country is more likely to intermediate bank claims locally. Hence, our results suggest that banks are more likely to engage in local operations in important export markets. The coefficient for the interaction term of *locClaims* growth and *exportShares* is around one for models (2)–(4), which would imply an additional one percentage point in the share of locally intermediated claims for every one percentage point increase in export shares. However, if the importance of a trade relationship is greater for a borrower country (higher import share), the

²¹ Model (1) in Table 4 amounts to $\frac{\Delta forClaims_t^{c,i}}{forClaims_{t-1}^{c,i}} = const + \gamma_1 \frac{\Delta xborderClaims_t^{c,i}}{xborderClaims_{t-1}^{c,i}} + \gamma_2 \frac{\Delta locClaims_t^{c,i}}{locClaims_{t-1}^{c,i}} + \epsilon_t^{c,i}$. In this case the terms interacted with growth in *xborderClaims* and *locClaims* are simply the coefficients γ_1 and γ_2 , which are constant across country pairs and time.

²² We do not report the results for estimations with trade and banking system characteristics, as the signs and magnitudes of both the coefficients on trade factors and banking system characteristics do not change noticeably. The only exceptions are coefficients for the interaction terms of trade factors and *xborderClaim* growth, which become insignificant.

share of *locClaims* is lower on average. An exporter would have no reason to engage in relatively more costly local intermediation if the importance of the trade relationship lies with the importing/borrower country.

The various gravity factors in models (2)–(4) exhibit similarly consistent patterns and results are in line with our expectations. A common border, proximity, a common legal system, and current account openness, as well as a larger and financial centre borrower country, favour cross-border lending. A common language and common colonial history tend to be associated with higher shares of locally intermediated bank claims. Model (4) introduces the macro-factors. They broadly have the expected effects, but do not noticeably increase the share of explained variance.

4.2 Banking system characteristics

Three main results emerge for the three sets of banking system factors.²³ First, banking system stability factors in the borrower country have the most overall explanatory power among the banking system characteristics we study. Second, differences in banking system characteristics explain approximately the same share of the variation in observed growth of foreign bank claims as do trade, gravity and macro factors together. Third, taking into account differences in banking system characteristic across countries and time, there are various indications that locally intermediated lending by international banks is supportive of relatively weaker and less developed banking systems.²⁴

A model with banking stability and gravity factors captures 80% of the observed variation in foreign lending growth (Table 5, model (5)) – the highest goodness of fit among all our specifications. Banking stability and gravity factors hence explain 22.6% of the variation that cannot be explained by the benchmark model (1) with constant shares of claims across countries and over time.

But the other banking system characteristics also have significant additional explanatory power (models (6) and (7)). With all three sets of banking system factors together in model (8), but without gravity factors, the resulting unadjusted R^2 is 0.781. This implies an additional explanatory power which is similar to the trade and gravity variables in model (2), where the share of explained variance is around 0.789. In this respect we can support the general thrust in the international bank lending literature, that heterogeneity among international lenders and borrowers – in our case creditor and borrower countries – is a relevant determining factor.

Among the three sets of factors, most results are robust across specifications and reveal a general pattern that locally intermediated claims are relatively more

²³ We tested all three sets of factors for both creditor and recipient country. Banking sector stability and profitability factors for the creditor country yield no significant results; neither do banking sector efficiency proxies for the recipient country.

²⁴ Results are robust against exchange rate changes. As discussed in section 3.3, growth in local claims in USD terms is subject to exchange rate changes, as local claims are denominated in the local currency of the borrower country. Including percentage changes in exchange rates for major currencies as an interaction terms with cross-border claims and percentage changes in exchange rates of the borrower's currency with local claims does not change the statistical significance in a measurable way and has only a very marginal impact on the coefficients and the explanatory power in our models.

supportive of weaker and less developed banking systems. The signs of the coefficients for the banking stability factors point towards the direction discussed in section 3.2, whereas the same coefficients on *xborderClaims* generally point in the opposite direction. For instance, when impaired loan ratios are higher in a borrower country, then on average a higher share of claims is intermediated locally – and a lower share through cross-border claims.

A similar picture emerges when looking at the banking profitability proxies. Local intermediation tends to be significantly higher if net interest margins in the borrower country are high and return on assets is low. This is typically the case when banking sectors do not face a lot of competition and are inefficient – or unprofitable because of underlying economic problems.

Regressions with banking system factors

Generalised least squares allowing for heteroscedasticity across country pairs

Table 5

Explanatory variable	Category	(5)	(6)	(7)	(8)
<i>xborderClaims</i> growth		0.377***	0.484***	0.276***	0.690***
<i>locClaims</i> growth		0.365***	0.258***	0.363***	0.155***
Interaction terms with <i>xborderClaims</i> growth:					
impairedLoanRatio	BKStab	-0.465***			-0.389***
loanDepositRatio	BKStab	0.058***			0.094***
equityRatio	BKStab	0.527***			0.256***
netInterestMargin	BkProf		-2.398***		-3.856***
returnOnAssets	BkProf		0.639*		-0.966***
bankingSectorConcentration	BkProf		0.046**		-0.108***
Creditor_ratioNonInterestIncTotInc	BkEff			0.121***	-0.02
Creditor_costToIncomeRatio	BkEff			0.207***	0.214***
Creditor_ratioOverheadTotAssets	BkEff			-0.983***	-2.929***
Interaction terms with <i>locClaims</i> growth:					
impairedLoanRatio	BKStab	0.315***			0.250***
loanDepositRatio	BKStab	-0.030***			-0.041***
equityRatio	BKStab	-0.067			-0.029
netInterestMargin	BkProf		2.696***		2.455***
returnOnAssets	BkProf		-1.626***		-0.714***
bankingSectorConcentration	BkProf		0.068***		0.104***
Creditor_ratioNonInterestIncTotInc	BkEff			-0.053***	0.030**
Creditor_costToIncomeRatio	BkEff			-0.114***	-0.152***
Creditor_ratioOverheadTotAssets	BkEff			-0.271*	-0.196
Constant		-0.004	0.041	0.103	0.131
Gravity factors		Yes	Yes	Yes	No
Unadjusted R²		0.8010	0.7943	0.7908	0.7813
Number of observations		6650	6993	7113	6772
Avg number of obs per country-pair		8.5	8.9	9	8.5

Source: Authors' estimation.

In addition, less efficient creditor banks seem to intermediate proportionately more through cross-border claims. Higher cost-to-income ratios signal higher share of cross-border and lower shares of locally intermediated claims. However, less efficient banks, as measured by the ratio of overhead to total assets, tend to intermediate less internationally in general. Our results for the share of non-interest income to total income are not consistent across specifications.

4.2.1 Economic significance

For policy analysis it is important to establish which factors are of highest economic significance and therefore the most relevant to be monitored by policymakers. Model (8) (last column of Table 5) uses all banking system characteristics simultaneously in our econometric model. With the general pattern of results unchanged, we can study the relative importance of each individual factor.

How important the individual banking system characteristics are in explaining foreign lending growth dynamics can be illustrated by a simple variance decomposition exercise. Using the fact that $cov(x + y) = cov(x) + cov(y)$ for any random variables x and y , the variance contribution of each individual factor f in our model can be decomposed as follows:

$$\frac{cov(g_{forClaims_t^{c,i}}, g_{forClaims_t^{c,i}})}{var(g_{forClaims_t^{c,i}})} = 1 = \sum_f \frac{cov(\gamma_{1,f} X_{f,1,t-1}^{c,i} g_{xborderClaims_t^{c,i}}, g_{forClaims_t^{c,i}})}{var(g_{forClaims_t^{c,i}})} + \sum_f \frac{cov(\gamma_{2,f} X_{f,1,t-1}^{c,i} g_{locClaims_t^{c,i}}, g_{forClaims_t^{c,i}})}{var(g_{forClaims_t^{c,i}})} + \frac{cov(\varepsilon_t^{c,i}, g_{forClaims_t^{c,i}})}{var(g_{forClaims_t^{c,i}})}$$

With the total adding up to one, the summation terms can be interpreted as a share of explained variance. The shares can be negative, if the interaction term associated with factor f is negatively correlated with $g_{forClaims_t^{c,i}}$. The sign of the correlation is therefore important for financial stability considerations, as it indicates whether certain factors are pro-cyclical or support international lending growth in downturns. The absolute contribution is a relevant indicator of the importance of an individual factor for explaining the variation in the growth of foreign claims across countries and over time.²⁵ As the share of local intermediation is generally smaller, so is its overall economic significance for foreign lending growth (Table 6).

Overall, we can identify one factor within each of our three categories that explains a considerable share in the variation of observed growth of foreign claims: the loan-to-deposit ratio (9.2% through *xborderClaims* and -3% through *locClaims*) for banking stability; the net interest margin (-8.1% and 4.8%) for banking system profitability; and the cost-to-income ratio for the creditor banking system efficiency (12.1% and -7%).

²⁵ Naturally, the shares represent the explained co-variance within our sample. As our sample is restricted to observations with *locClaims*>0, the measured variance contributions are not representative for the observed variation in an unrestricted sample.

Co-variance contributions by individual factors for model (8)¹

Table 6

Term	Contribution share ²	Term	Contribution share ²
<i>xborderClaims</i> growth	69.3	<i>locClaims</i> growth	12.1
Interaction terms with <i>xborderClaims</i> growth		Interaction terms with <i>locClaims</i> growth	
impairedLoanRatio	-2.51	impairedLoanRatio	2.07
loanDepositRatio	9.19	loanDepositRatio	-2.98
equityRatio	2.30	equityRatio	-0.22
netInterestMargin	-8.08	netInterestMargin	4.78
returnOnAssets	-0.66	returnOnAssets	-0.35
bankingSectorConcentration	-6.50	bankingSectorConcentration	5.02
Creditor_ratioNonInterestIncTotInc	-0.83	Creditor_ratioNonInterestIncTotInc	1.00
Creditor_costToIncomeRatio	12.01	Creditor_costToIncomeRatio	-6.96
Creditor_ratioOverheadTotAssets	-4.25	Creditor_ratioOverheadTotAssets	-0.21

¹ For estimation result of model (8), see last column in Table 5. The co-variance contribution share of the error term is 15.76.

² Contribution shares are multiplied by 100.

Source: Authors' calculations.

Our results imply that in borrower/creditor countries where these characteristics change, the implied change in foreign lending growth can be noticeable. Borrower banking sectors where loan/deposit ratios are relatively high on average exhibit higher growth in foreign lending through cross-border claims. Similarly, borrower countries with high net interest margins may choose to monitor growth in cross-border claims closely. Creditor countries where cost-to-income ratios are rising may want to scrutinise outflows of cross-border credit.

Apart from the factors which also have a relatively strong impact through the cross-border claims channel (but in the opposite direction²⁶), two additional factors for local claims can be highlighted: banking sector concentration (5%) and the impaired loan ratio (2.1%). Our results suggest that for borrower banking sectors in which banking sector concentration and impaired loan ratios are high, a higher local presence of foreign banks will on average have a positive impact on bank lending growth.

4.3 Model implications for Asia-Pacific

How well does our model fit the data for borrower countries in Asia-Pacific? This is an important question, as Asia-Pacific as a region exhibits patterns of international lending which are, on average, different from the other country pairs in our sample.²⁷

²⁶ As pointed out above, the correlation between *xborderClaims* growth and *locClaims* growth is low (0.15) and non-negative. The fact that factors have co-variance contribution with a similar magnitude and opposite signs is therefore to not at all superimposed by our model.

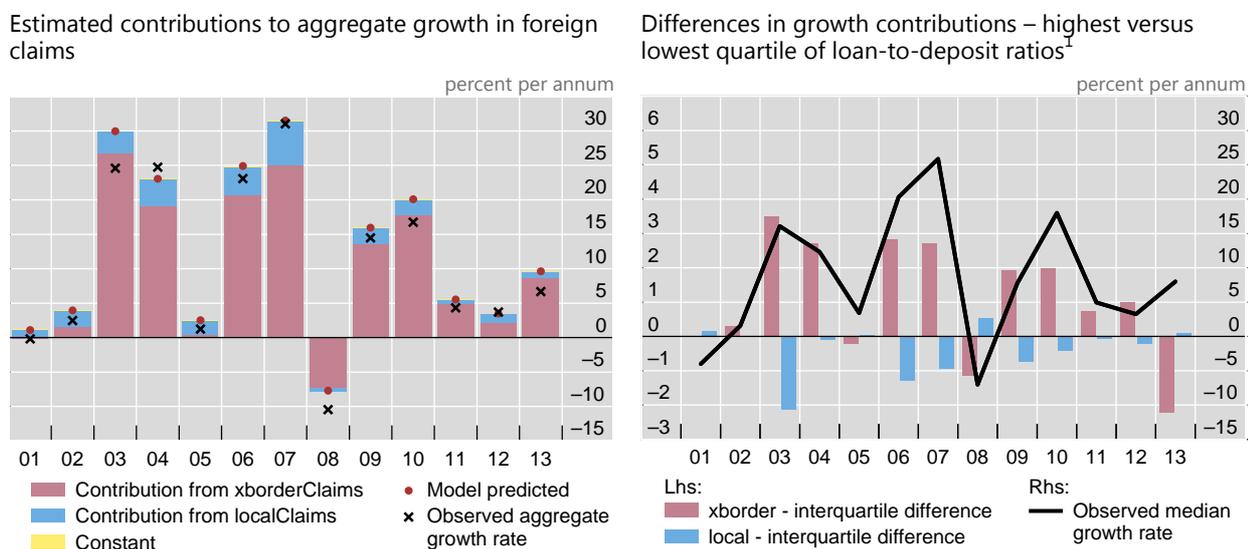
²⁷ See sections 1 and 2.

One test for a good specification of our model is whether the observed aggregate international lending dynamics for the region can be sufficiently well replicated by the model. As aggregate growth in foreign claims is derived from the whole distribution of growth in claims across all countries in our sample, tracking aggregate growth over time is a steep task.²⁸ If either the coefficient estimates are not representative for Asia-Pacific or the error terms across countries exhibit some non-random pattern, then aggregate deviations can become very large.²⁹ However, the model tracks the time series variation in aggregate growth very closely (Figure 10, left-hand panel). Further, Figure 10 illustrates the thrust of our results for Asia-Pacific. The contribution from cross-border claims has not only been more prevalent during the times when international lending was booming, but it has also been much more volatile (Figure 10, left-hand panel).

In-sample predictions for borrower countries in Asia-Pacific

Contributions to growth in foreign claims from cross-border and local intermediation

Figure 10



¹ Interquartile difference in growth contribution to median growth rate. The differences are calculated as the growth rate for the median borrower country in the highest quartile of loan/deposit ratios minus the growth contribution for the median country in the lowest quartile – everything else being equal. It is equal to the marginal effect of loan-to-deposit ratios multiplied by the inter-quartile difference in median loan-to-deposit ratios in a given year.

Source: Authors' calculations.

One illustration of the generally supportive nature of local claims for weaker and less developed banking systems in Asia-Pacific is given in the right-hand panel of Figure 10. It shows the differences in foreign claims growth between borrower

²⁸ With the share of a country pair's international claims in total international claims of the recipient country i (within a region R) vis-à-vis all creditor countries c equal to $\frac{intClaims_{t-1}^{c,i}}{\sum_{i \in R} \sum_c intClaims_{t-1}^{c,i}}$ we can aggregate across a set of recipient countries i within region R to obtain aggregate growth in international claims of region R as $\sum_{i \in R} \sum_c \frac{\Delta intClaims_{t-1}^{c,i}}{intClaims_{t-1}^{c,i}} \times \frac{intClaims_{t-1}^{c,i}}{\sum_{i \in R} \sum_c intClaims_{t-1}^{c,i}} = \frac{\sum_{i \in R} \sum_c \Delta intClaims_{t-1}^{c,i}}{\sum_{i \in R} \sum_c intClaims_{t-1}^{c,i}}$.

²⁹ In addition, we are effectively looking at just a sub-sample of the data that were used to estimate the parameters by GLS, which gives lower weight to country pairs with more volatile growth rates and hence potentially compounds the error from aggregating over the cross-section.

banking systems with high loan-to-deposit ratios and low loan-to-deposit ratios. The median loan/deposit ratios within a given quartile do not vary much over time.³⁰ However, the growth contributions through the two different channels of foreign lending vary considerably. When overall growth in foreign claims is high, cross-border claims contribute a significant extra amount of lending growth for borrower banking systems with higher loan-to-deposit ratios. The growth contributions from local claims, on the other hand, tend to cushion the cycle.

5. Conclusions

The global financial crisis of 2008–09 and subsequent euro area crisis triggered changes in international banking that are still under way. In the Asia-Pacific region, foreign lending is modest relative to GDP and aggregate bank credit, but financial development and cross-border integration are advancing rapidly. This leaves open many possibilities for the eventual shape of international banking in the region – and provides opportunities for regional banks to increase their international presence.

The global financial crisis turned policymakers' attention to the role of international banks in transmitting shocks across borders. Developments since then give a mixed picture for Asia-Pacific in terms of its vulnerability to such shocks. Generally, Asia-Pacific economies have diversified their creditor base, and therefore the region as a whole should be less vulnerable to adverse developments in individual creditor countries, which were of a particular concern during the intensification of the euro area crisis. While the creditor base for many countries has diversified, the region as a whole is more reliant on funding from regional banks than in the past. And with strong economic and credit growth in the region, cross-border credit has become an important source of funding for banks in some jurisdictions. This cross-border funding is mostly denominated in US dollars and may not be always fully hedged against currency fluctuations.

A key policy question that arose following recent crises is whether a more decentralised model of international banking – in which a greater portion of international banking business is carried out in the country where they operate rather than across borders – is more desirable from a financial stability point of view. While not investigating risks to financial stability per se, this paper attempts to shed light on this question by focusing on one particular aspect: are there signs that locally intermediated claims support relatively more fragile and less developed banking systems? Our analysis of a very large panel of creditor-borrower country pairs seems to suggest so. We find that banking system factors – measures of the stability, profitability and efficiency of banking systems – explain a significant fraction of the variation in growth in foreign lending; on average they explain as much of the variation as trade and gravity factors. Moreover, they are also important determinants of whether to lend cross-border or locally. In borrower countries where banking systems are weak, international banks tend to lend locally. They thus contribute to a strengthening of the banking system. In borrower

³⁰ The cutoff points for the lowest quartile are between 47% in 2002 and 63% in 2012 and the cutoffs for the highest quartile are between 85% in 2009 and 99.2% in 2011.

countries where credit appears to be readily available, cross-border lending is relatively more important than local lending. In other words, cross-border credit tends to move in tandem with the foreign lending cycle, thereby potentially contributing to the credit cycle.

While our analysis helps to shed light on the nexus between types of foreign bank lending and financial stability, it leaves many avenues for extension. First, our approach discards countries for which intermediation through local claims cannot be observed. Future research could explore the differences between countries that do not receive local claims against countries that exhibit a high degree of local claims. Second, whether intermediation takes place cross-border or locally could be related to the nature of claims. For instance, banks which extend long-term loans to large industries abroad may favour local lending to avoid asset-liability mismatches. This may be an important driver of the mode of intermediation, which in itself would have implications for financial stability risks. Third, our analysis concentrates on explaining the cross-sectional differences in the shares of cross-border versus locally intermediated foreign claims. The growth dynamics of international lending itself may be driven by other factors – factors which could potentially be even more informative for financial stability considerations. To the extent that financial cycles have a lower frequency than business cycles (Drehman et al (2012) and Borio (2013)), our analysis on the relatively slow-moving evolution of the channels of intermediation probably captures a part of the international lending dynamics which is relevant for policymakers.

A third aspect of financial stability which is not considered in this paper is the ability to share risks stemming from creditor country or borrower country shocks. The recent literature has paid heightened attention to the severity of the shock transmission from creditor to borrower countries during the recent crisis (Cerutti and Claessens (2014)). However, financial stability also depends on the ability to offset given shocks. An important question for future research is therefore whether shocks from creditor countries or borrower countries can be better shared or insured against, if intermediation through cross-border or local claims is more prevalent.

Appendix A

Differences between unrestricted and restricted (*locClaims*>0) sample

Number of observations

Table A1

	Unrestricted sample		Sample conditional on <i>locClaims</i> >0	
	Number of observations	Average share of <i>locClaims</i> in percent	Number of observations	Average share of <i>locClaims</i> in percent
All	14255	16.5	7289	31.0
<i>Borrower country regions</i>				
Asia-Pacific	3177	23.1	2085	34.6
Central and Eastern Europe	2425	16.4	1017	36.8
Western Europe	3985	12.5	2318	20.2
Latin America	1128	19.8	583	37.1
Middle East and Africa	3012	10.6	866	35.3
North America	528	33.9	420	41.4
<i>Creditor country regions</i>				
Asia-Pacific	2462	11.2	1123	23.4
Central and Eastern Europe	427	2.3	47	18.4
Western Europe	9545	17.0	4955	31.3
Latin America	151	13.7	86	22.1
North America	1670	25.2	1078	38.7

Sources: BIS consolidated data; authors' calculations.

Summary of country pairs in the sample¹

Table A2

	Creditor country (yes=1)	Borrower country (yes=1)	No obs ²	No of country pairs ²		Creditor country (yes=1)	Borrower country (yes=1)	No obs ²	No of country pairs ²
AE	0	1	78	13	KR	1	1	158	31
AR	0	1	120	13	KW	0	1	23	3
AT	1	1	262	39	KZ	0	1	43	6
AU	1	1	266	37	LB	0	1	48	5
BD	0	1	37	6	LK	0	1	55	6
BE	1	1	463	57	LT	0	1	32	5
BG	0	1	90	10	MA	0	1	43	6
BH	0	1	64	7	MU	0	1	30	5
BR	1	1	210	28	MX	0	1	101	10
CA	1	1	428	52	MY	0	1	128	13
CH	1	1	604	68	NG	0	1	30	3
CL	0	1	116	13	NL	1	1	724	69
CN	0	1	167	20	NO	1	1	178	22
CO	0	1	57	9	NZ	0	1	100	9
CZ	0	1	127	11	OM	0	1	32	5
DE	1	1	770	77	PE	0	1	65	8
DK	1	1	162	35	PH	0	1	115	12
EE	0	1	26	6	PK	0	1	77	7
EG	0	1	68	7	PL	0	1	171	17
ES	1	1	479	52	PT	1	1	236	29
FI	1	1	120	20	QA	0	1	32	5
FR	1	1	908	88	RO	0	1	96	13
GB	1	1	996	86	RS	0	1	36	7
GR	1	1	207	34	RU	0	1	131	15
HK	0	1	202	19	SE	1	1	320	55
HR	0	1	38	5	SG	1	1	406	36
HU	0	1	124	12	SI	0	1	41	5
ID	0	1	126	13	TH	0	1	135	14
IE	1	1	236	27	TN	0	1	25	2
IL	0	1	40	6	TR	1	1	144	18
IN	1	1	349	39	TW	1	1	329	32
IT	1	1	519	55	UA	0	1	85	10
JO	0	1	29	3	US	1	1	1070	89
JP	1	1	587	58	VN	0	1	104	10
KE	0	1	50	6	ZA	0	1	112	11

¹ Country names are represented with 2-digit ISO country codes. See en.wikipedia.org/wiki/ISO_3166-1_alpha-2. ² The number of observations indicates whether the country appears as *either* a creditor *or* a borrower. Hence each country is counted twice and the sum of the number of observations (No obs) and country pairs amounts to twice of those in our sample.

Variable description and sources

Table A3

Variable	Description	Source
Cross-border claims	Cross-border and foreign currency claims of banks headquartered in creditor country against residents in borrower country; in USD.	BIS consolidated statistics
Local claims	Local claims in local currency, through local operations in borrower country owned by a bank headquartered in the creditor country against residents in the borrower country; in USD.	BIS consolidated statistics
Foreign claims	Sum of cross-border and local claims	BIS consolidated statistics
Export share	Annual exports in USD from creditor country to borrower country, divided by total annual exports of the creditor country	IMF – Direction of Trade statistics
Import share	Annual imports in USD by borrower country from creditor country, divided by total annual imports of the borrower country	IMF – Direction of Trade statistics
Distance between capital cities	Logarithm of distance between capital cities of the creditor and borrower countries in kilometer. For creditor-borrower country pairs where distances between their capital cities are not available in the above sources, the distances are obtained using an online tool	Primarily based on Kristian Skrede Gleditsch's dataset on distance between capital cities: http://privatewww.essex.ac.uk/~ks/g/data-5.html , supplemented by Feenstra et al. (2001) and Spiegel and Rose (2009).
Common language	Dummy equal 1 if the home and host countries share the same language.	Feenstra et al. (2001) and Spiegel and Rose (2009).
Common border	Dummy equal 1 if the home and host countries share a land border	Feenstra et al. (2001) and Spiegel and Rose (2009).
Common colonial history	Dummy equal 1 if the home and host countries were ever colonies after 1945 with the same colonizer or have colonial relationship	Feenstra et al. (2001) and Spiegel and Rose (2009).
Common legal system	Dummy equal 1 if the home and host countries have the same legal system.	The World Factbook (Central Intelligence Agency)
Free trade agreement	Dummy equal 1 if the home and host countries have the free trade agreement	Feenstra et al. (2001) and Spiegel and Rose (2009); in addition dummy for members of European Union.
Chinn-Ito index	Annual index measuring a country's degree of capital account openness	Chinn and Ito (2008); http://web.pdx.edu/~ito/Chinn-Ito_website.htm .
Log GDP level	Logarithm of annual nominal GDP in billions of US Dollars	World Economic Outlook (IMF)
Financial centre	Dummy=1 for Great Britain, Hong Kong, Ireland, Japan, Mauritius, Singapore, Switzerland, Chinese Taipei, and the United States.	
Financial freedom	Annual index for financial freedom in the borrower country. (Index from 0, for lowest financial freedom, to 100). The index measures the extent of state intervention through direct and indirect ownership, extent of financial and capital market development, government influence on the allocation of credit, and openness to foreign competition.	Heritage foundation www.heritage.org/index .
GDP growth rate	Annual growth rate of real GDP in percentage	World Economic Outlook (IMF)
Inflation	Annual change of consumer prices in percentage	World Economic Outlook (IMF)
Banking-crisis dummy	Dummy equal to 1 if the country was hit by banking crisis in the corresponding year, based on Laeven and Valencia (2013). For crises which are indicated as "ongoing" in Laeven and Valencia (2013), the dummy equals 1 from the start of the crises to 2012.	Laeven and Valencia (2013)

Capital account openness	Measured by the Chinn-Ito index (updated to 2012)	The Chinn-Ito Index website: http://web.pdx.edu/~ito/Chinn-Ito_website.htm
Bank-credit-to-GDP ratio	Ratio of bank credit at year-end to annual nominal GDP	International Financial Statistics (IMF) World Economic Outlook (IMF)
Bank-deposit-to-GDP ratio	Ratio of bank deposit at year-end to annual nominal GDP	International Financial Statistics (IMF) World Economic Outlook (IMF)
Loan-to-deposit ratio	Annual gross loans (series no 2001) divided by total customer deposits (series no 2031), aggregate value for all banks in borrower country	Bankscope, ¹ annual data
Impaired loan ratio	Aggregate face value of impaired loans (series no 2170) divided by gross loans (series no 2001) for all banks in borrower country	Bankscope, ¹ annual data
Equity ratio	Aggregate book equity (series no 2055) divided by total assets (series no 2025) for all banks in borrower country	Bankscope, ¹ annual data
Net interest margin	Aggregate net interest revenue divided (series no 2080) by aggregate earning assets (series no 2010) for all banks in borrower country	Bankscope, ¹ annual data
Return on assets	Aggregate net income (series no 2115) divided by aggregate total assets (series no 2025) for all banks in borrower country	Bankscope, ¹ annual data.
Banking sector concentration	Aggregate total assets (series no 2025) of the 3 largest banks divided by aggregate total assets of all banks in borrower country	Bankscope, ¹ annual data
Ratio of non-interest income to total income	Aggregate ratio of non-interest income (series no 2085) to total income (sum of series no 2085 and series no 2080) for all banks in the creditor country.	Bankscope, ¹ annual data.
Cost-to-income ratio	Aggregate ratio of operating expenses (series no 2090) to total income (sum of series no 2085 and series no 2080) for all banks in the creditor country.	Bankscope, ¹ annual data
Ratio of overhead to total assets	Aggregate ratio of operating expenses (series no 2090) to total assets (series no 2025) for all banks in the creditor country.	Bankscope, ¹ annual data

¹ See section 3.3 for details on how the aggregate ratios are constructed. Some ratios are based on definitions from the World Bank Financial Development database, though they are calculated by a different method.

References

Asian Development Bank (2012): ASEAN+3 Bond Market Guide, Mandaluyong City, Philippines,

asianbondsonline.adb.org/publications/adb/2012/asean+3_bond_market_guide.pdf.

Avdjiev, Stefan, Robert N McCauley and Patrick McGuire (2012): "Rapid credit growth and international credit: Challenges for Asia", BIS Working Papers, no 377, April, www.bis.org/publ/work377.htm.

Bank for International Settlements (2006): "Asian bond markets: issues and prospects", *BIS Papers*, no 30, November, www.bis.org/publ/bppdf/bispap30.htm.

——— (2012): "Currency internationalisation: lessons from the global financial crisis and prospects for the future in Asia and the Pacific", *BIS Papers*, no 61, January, www.bis.org/publ/bppdf/bispap61.htm.

——— (2013): "Guidelines for reporting the BIS international banking statistics", BIS, Basel, March, www.bis.org/statistics/bankstatsguide.pdf.

Basel Committee on Banking Supervision (2010): "Guidance for national authorities operating the countercyclical capital buffer", BIS, Basel, December, www.bis.org/publ/bcbs187.htm.

——— (2011): "Basel III: A global regulatory framework for more resilient banks and banking systems - revised version June 2011", BIS, Basel, June, www.bis.org/publ/bcbs189.htm.

Beck, Torsten, Asli Demirgüç-Kunt and Ross Levine, (2000), "A New Database on Financial Development and Structure," *World Bank Economic Review*, vol 14, 597-605.

Borio, Claudio (2013): "The financial cycle and macroeconomics: What have we learnt?", *Journal of Banking & Finance*, vol 45, pp 182-198.

Borio, Claudio, Craig Furfine and Philip Lowe (2001): "Procyclicality of the financial system and financial stability: issues and policy options", BIS papers No1, pp 1-57.

Bruno, Valentina and Hyun Song Shin (2014): "Cross-border banking and global liquidity", *BIS Working Papers*, no 458, August, www.bis.org/publ/work458.htm.

Buch, Claudia (2003): "Information or regulation: What drives the international activities of commercial banks?", *Journal of Money, Credit, and Banking*, vol 35, pp 851-869.

Buch, C M, C T Koch, M Koetter (2009): "Margins of international banking: Is there a productivity pecking order in banking, too?", CESifo Working Paper Series No. 2891.

——— (2011): "Size, productivity, and international banking", *Journal of International Economics*, vol 85, no 2, pp 329-334.

Buch, Claudia M, Katja Neugebauer and Christoph Schröder (2013): "Changing forces of gravity: how the crisis affected international banking", Deutsche Bundesbank Discussion Paper, no 48/2013.

Available at: [www.bundesbank.de/Redaktion/EN/Downloads/Publications/Discussion Paper 1/2013/2013_11_22_dkp_48.pdf?blob=publicationFile](http://www.bundesbank.de/Redaktion/EN/Downloads/Publications/Discussion_Paper_1/2013/2013_11_22_dkp_48.pdf?blob=publicationFile).

Cerutti, Eugenio and Stijn Claessens (2014): "The great cross-border bank deleveraging: Supply constraints and intra-group frictions", *IMF Working Paper*, no 14/180.

Cetorelli, Nicola and Linda S Goldberg (2011): "Global Banks and International Shock Transmission: Evidence from the Crisis", *IMF Economic Review*, vol 59, pp 41–76, www.palgrave-journals.com/imfer/journal/v59/n1/abs/imfer20109a.html.

——— (2012): "Liquidity management of US global banks: internal capital markets in the great recession", *Journal of International Economics*, vol 88, pp 299–311.

Chinn, Menzie D and Hiro Ito (2008): "A New Measure of Financial Openness", *Journal of Comparative Policy Analysis*, vol 10, no 3, pp. 309–322.

Claessens, S, A Demirgüç-Kunt, and H Huizinga (2001): "How does foreign entry affect domestic banking markets?.", *Journal of Banking & Finance*, vol 25, no 5, pp 891-911.

Claessens, Stijn and N van Horen (2014): "Foreign banks: Trends and impact," *Journal of Money, Credit and Banking*, vol 46, no s1, pp 295-326.

Committee on the Global Financial System (2004): "Foreign direct investment in the financial sector of emerging market economies", CGFS Publications, no 22, March, www.bis.org/publ/cgfs22.htm.

——— (2010): "Long-term issues in international banking", *CGFS Publications*, no 41, July. Available at: www.bis.org/publ/cgfs41.htm.

——— (2012): "Improving the BIS international banking statistics", *CGFS Publications*, no 47, November, www.bis.org/publ/cgfs47.htm.

——— (2014): "EME banking systems and regional financial integration", *CGFS Publications*, no 51, March, www.bis.org/publ/cgfs51.htm.

Corbett, Jenny, Prasanna Gai and Kazuki Onji (2010): "The banking system in East Asia and the transmission of the global financial crisis", Chapter 7 in Christopher Findlay, Friska Parulian and Jenny Corbett (eds), *Linkages between Real and Financial Aspects of Economic Integration in East Asia*, ERIA Research Project Report, no 1.

Corbett, Jenny and Christopher Findlay (2010): "Linkages between Real and Financial Aspects of Economic Integration in Asia: Overview Report", Chapter 1 in Christopher Findlay, Friska Parulian and Jenny Corbett (eds), *Linkages between Real and Financial Aspects of Economic Integration in East Asia*, ERIA Research Project Report, no 1.

Cornett, M, J McNutt, P Strahan, and H Tehranian (2011): "Liquidity risk management and credit supply in the financial crisis," *Journal of Financial Economics*, vol 101, no 2, pp 297–312.

Dalla, Ismail (2012): "East Asian Bond Markets in 2020: Progress, Prospects and Future Challenges", Fung Global Institute Working Paper, no FGI-2012-3, November, www.funglobalinstitute.org/en/east-asian-bond-markets-2020.

De Haas, R and I Van Lelyveld (2006): "Foreign Banks and Credit Stability in Central and Eastern Europe: Friends or Foes?", *Journal of Banking and Finance*, vol 30, no 7, pp 1927–1952.

——— (2010): "Internal capital markets and lending by multinational bank subsidiaries," *Journal of Financial Intermediation*, vol 19, pp 689-721.

—— (2014): "Multinational banks and the global financial crisis: weathering the perfect storm," *Journal of Money, Credit and Banking*, vol 46, no 1, pp 333-364, <http://onlinelibrary.wiley.com/doi/10.1111/jmcb.12094/full>.

Dell'Ariccia, Giovanni and Robert Marquez (2010): "Risk and the Corporate Structure of Banks", *Journal of Finance*, May, pp 1075-1096, www.afajof.org/details/journalArticle/2884501/Risk-and-the-Corporate-Structure-of-Banks.html.

Drehmann, Mathias, Claudio Borio, Kostas Tsatsaronis (2012): "Characterising the financial cycle: don't lose sight of the medium term!", *BIS Working Paper*, no 230.

European Central Bank (2012): Financial integration in Europe, Frankfurt, April. Available at: www.ecb.europa.eu/pub/pdf/other/financialintegrationineurope201204en.pdf.

Feenstra, R C, J R Markusen, A K Rose (2001): "Using the gravity equation to differentiate among alternative theories of trade", *Canadian Journal of Economics/Revue canadienne d'économique*, vol 34, no 2, pp 430-447.

Fender, Ingo and Patrick McGuire (2010): "Bank structure, funding risk and the transmission of shocks across countries: concepts and measurement", *BIS Quarterly Review*, September, pp 63–79, www.bis.org/publ/qtrpdf/r_qt1009h.htm.

Fiechter, Jonathan, İnci Ötker-Robe, Anna Ilyina, Michael Hsu, André Santos and Jay Surti (2011): "Subsidiaries or Branches: Does One Size Fit All?", IMF Staff Discussion Note, no SDN/11/04, March. Available at: www.imf.org/external/pubs/ft/sdn/2011/sdn1104.pdf.

Focarelli, Dario, and Alberto F Pozzolo (2005): "Where do banks expand abroad? An empirical analysis", *Journal of Business*, vol 79, pp 2435–463.

García-Herrero, Alicia and M.S. Martínez Pería (2007): "The Mix of International Banks' Foreign Claims: Determinants and Implications", *Journal of Banking & Finance*, vol 31, no 6, pp 1613-31.

García-Herrero, Alicia and Philip Wooldridge (2007): "Global and regional financial integration: progress in emerging markets", *BIS Quarterly Review*, September, pp 57–70, www.bis.org/publ/qtrpdf/r_qt0709g.pdf.

Goodhart, Charles A (2006): "A framework for assessing financial stability?", *Journal of Banking & Finance*, vol 30, no 12, pp 3415-3422.

Haldane, A., S. Brennan, and V. Madouros (2010): "What is the contribution of the financial sector: Miracle or mirage?," *The Future of Finance: The LSE Report*, Chapter 2, pp 87–120.

Hahm, Joon-Ho, Hyun Song Shin and Kwanho Shin (2013): "Noncore Bank Liabilities and Financial Vulnerability", *Journal of Money, Credit and Banking*, vol 45 (August), pp 3–36.

Hills, Bob and Glen Hoggarth (2013): "Cross-border bank credit and global financial stability", *Bank of England Quarterly Bulletin*, June, pp 126-136, www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2013/qb130204.pdf.

Ho, T S Y and A Saunders (1981): "The determinants of bank interest margins: theory and empirical evidence.", *Journal of Financial and Quantitative analysis*, vol 16, no 4, pp 581-600.

Hoggarth, Glen, J Hooley and Y Korniyenko (2013): "Which way do foreign branches sway? Evidence from the recent UK domestic credit cycle", Bank of England Financial Stability Paper, no 22,

www.bankofengland.co.uk/research/Pages/fspapers/fs_paper22.aspx.

Houston, Joel F, Chen Lin and Yue Ma (2012): "Regulatory Arbitrage and International Bank Flows", *The Journal of Finance*, vol 67, no 5 (October), pp 1845–1895, onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.2012.01774.x/full.

Ivashina, Victoria and David S Scharfstein (2010): "Bank Lending during the Financial Crisis of 2008", *Journal of Financial Economics*, vol 97, pp 319–38.

Kaminsky, Graciela L and Carmen M Reinhart (1999): "The twin crises: The causes of banking and balance of payments problems", *American Economic Review*, vol 89, no 3 (June), pp 473-500.

Kashyap, A K, R Rajan, and J C Stein (2002): "Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking", *The Journal of Finance*, vol 57, no 1, pp 33-73.

Laeven, L and F Valencia (2013): "Systemic banking crises database", *IMF Economic Review*, no 61, vol 2, pp 225-270.

McCauley, Robert N, Patrick McGuire and Goetz von Peter (2012): "After the global financial crisis: From international to multinational banking?", *Journal of Economics and Business*, vol 64, issue 1, January-February, pp 7-23,

www.sciencedirect.com/science/article/pii/S014861951100052X.

McCauley, Robert N, Judith S Ruud and Philip D Wooldridge (2002): "Globalising international banking", *BIS Quarterly Review*, March, pp 41–51, www.bis.org/publ/qtrpdf/r_qt0203e.htm.

McGuire, Patrick and Adrian Van Rixtel (2012): "Shifting credit patterns in emerging Asia", *BIS Quarterly Review*, December, pp 17-18,

www.bis.org/publ/qtrpdf/r_qt1212u.htm.

McGuire, Patrick and Goetz von Peter (2009): "The US dollar shortage in global banking and the international policy response", *BIS Working Paper*, no 291, October, <http://www.bis.org/publ/work291.htm>.

Niepman, Friederike (2013): "Banking across borders", *Federal Reserve Bank of New York Staff Reports*, No 576.

Prudential Regulation Authority (2014): "Supervising international banks: the Prudential Regulation Authority's approach to branch supervision", *Consultation Paper*, noCP4/14, February,

www.bankofengland.co.uk/pr/Documents/publications/cp/2014/cp414.pdf.

Rhee, Changyong and Lea Sumulong (2014): "Regional Settlement Infrastructure and Currency Internationalization: The Case of Asia and the Renminbi", *Asian Development Bank Institute Working Paper*, no 457, February.

Rose, A K, M M Spiegel (2009): "Noneconomic engagement and international exchange: The case of environmental treaties", *Journal of Money, Credit and Banking*, vol 41, no 2-3, pp 337-363.

Tarullo, Daniel K (2014): "Regulating Large Foreign Banking Organizations", speech at the Harvard Law School Symposium on Building the Financial System of the Twenty-first Century, 27 March, www.federalreserve.gov/newsevents/speech/tarullo20140327a.htm.

Van Rijckeghem, C., Weder, B. (2001): "Sources of Contagion: Is it Finance or Trade?", *Journal of International Economics* 54 (2), pp. 293–308

Van den End, J W (2013): "A macroprudential approach to address liquidity risk with the Loan-to-Deposit ratio.", *Netherlands Central Bank Working Paper*, no 372.

Zicchino, L. (2006): "A model of bank capital, lending and the macroeconomy: Basel I versus Basel II," *Manchester School*, vol 74, pp 50–77.