

What drives local lending by global banks?*

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Abstract

We find that the lending behavior of large global banks' subsidiaries throughout the world is more closely related to local macroeconomic conditions and their financial structure than to their owner-specific counterparts. This inference is drawn from a panel dataset populated with bank-level observations from the Bankscope database. Using this database, we identify ownership structures and incorporate them into a unique methodology that identifies and compares the owner and subsidiary-specific determinants of lending. A distinctive feature of our analysis is that we use multi-dimensional country-level data from the BIS international banking statistics to account for exchange rate fluctuations and cross-border lending.

Keyword(s): Bankscope; G-SIB; bank-level data; global banks; BIS international banking statistics.

JEL Classification: E44; F32; G15; G21

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1 Introduction

Most of the discussion on the main determinants of global banking activity during the post-crisis period has focused on global drivers (also known as push factors) of cross-border bank lending flows. Those factors undoubtedly played a major role in the cross-country transmission of the financial crisis and the ensuing permissive credit facilities. Nevertheless, the existing evidence does not make it clear whether these factors are more important than local drivers (i.e., “pull” factors), which are also a common determinant of global bank flows according to empirical findings (Koepke, 2015). Furthermore, in studies that examine the lending behavior of global banks, hereafter internationally-active banks (IABs), much of the focus has been on cross-border lending as opposed to local lending of IABs through their foreign subsidiaries (Bruno and Shin, 2015a,b; Cerutti et al., 2016). The distinction between the two types of lending is important since the latter tends to be much more stable, growing less rapidly during expansions and contracting less sharply during retrenchments (Allen et al., 2011; Cecchetti et al., 2010; Cerutti and Claessens, 2016) and it has become a more important form of lending in the past two decades as we illustrate in Figure 1.¹

In this paper we compare the relative importance of push and pull factors for IABs’ local (as opposed to cross-border) lending. Doing so allows us to gain insights into why IABs increase/decrease their presence across countries through their subsidiaries. This is a pressing issue at the moment as IABs have extensive global networks and account for a high share of total domestic credit in a very large number of countries. Drawing accurate inferences for financial stability without considering the decision making processes of these institutions is, thus, no longer feasible.

In our analysis, we focus on owner-specific (IAB-specific) and host-specific (local subsidiary and host nation-specific) factors as the source of push and pull effects, respectively. This particular definition of push and pull effects allows us to compare the independent

¹The 2008 Global Financial Crisis provided another vivid example of this disparity (see, Avdjiev et al., 2012; Fender and McGuire, 2010; Ongena et al., 2013).

effects of the two factors as we describe below. We should note that the term “push effects” is also used to describe the effects of systematic shocks such as global risk aversion and U.S. monetary policy shocks on IAB lending. In addition to capturing the idiosyncratic effects of these shocks on IAB lending, our definition of push factors further allows us to account for any relative deterioration/improvement in the financial condition of banks. Despite potential differences in interpretation, we often refer to our host and owner-specific determinants of IAB lending as pull and push factors, respectively, to simplify terminology.

Our main conclusion is that pull factors are more important for IABs’ local lending than push factors. The biggest hurdle on the path to making this comparison is the independent identification of the two factors. Put simply, are IABs lending more in a given country because their own financial conditions are better or is the higher level of lending explained by local factors? While both mechanisms are potentially at play, what are their independent effects? To answer these questions, we use a unique methodology that is centered on the relative local lending behavior of IAB subsidiaries.

To identify pull effects, we compare the lending behavior of subsidiaries affiliated with the same parent IAB. By so doing, we are able to suppress any IAB-specific factor (or any other push shock transmitted through IABs) that may symmetrically affect their subsidiaries’ lending decisions. Throughout the paper, we use two sets of pull factors associated with local lending: (i) macroeconomic variables that gauge the local cost of funding and the strength of borrowers’ balance sheets and (ii) indicators of local subsidiaries’ financial health. To visualize how we execute this identification strategy, assume that a German IAB g has a subsidiary g^b in Brazil and that the balance sheets of Brazilian borrowers are getting stronger due to an economic expansion, which is not observed in the other countries where g has subsidiaries. A comparison of the lending behavior of g^b with its sister subsidiaries in other countries then allows us to determine the effects of the expansion on local lending that are independent of IAB related (push) factors. A similar illustration can be made by replacing

the economic expansion with changes in the relative financial condition of subsidiary g^b .²

To identify the independent effects of push factors, we reverse our methodology and compare the lending behavior of subsidiaries that are located in the same country, but have different parent IABs. Push factors here similarly fall under the two main (bank-specific and macroeconomic) categories mentioned above. This time, however, these factors describe the financial conditions of the IABs and the macroeconomic conditions in the country in which they are headquartered. Continuing with our hypothetical illustration, now assume that a US IAB, u , also lends in Brazil through its subsidiary u^b . Suppose that IAB u is experiencing a drop in the quality of its assets while IAB g is not. By comparing the lending behavior of u^b and g^b , our methodology neutralizes any symmetric effects that local conditions may have on the subsidiaries' lending when measuring the impact of the decline in the asset quality of IAB u . As a part of this methodology, we also control for various subsidiary-specific variables to hone in on the IAB related push factors.

The two distinct contributions of this paper are the investigation of the local lending behavior of global banks and the utilization of bank-level data in doing so. The existing literature primarily uses aggregate (country-level) data to distinguish just among borrowing (but not lending) countries and focuses on cross-country capital flows. The few papers that also distinguish among lenders (Avdjiev and Takáts, 2016; Aysun and Hepp, 2016; Cerutti and Claessens, 2016) have done so at the lending country (i.e. national banking system) level and have used cross-country data to do so (e.g. Fratzscher, 2012 and Houston et al., 2012).³ By contrast, we use bank-level data which allows us to control for heterogeneity

²We should also mention that by measuring and comparing the growth rate of macroeconomic variables and financial ratios over time we are also suppressing any relatively time-invariant institutional factor that may affect the level of lending (but not the growth rate of lending). The regulatory asymmetries that explain the relative level of international bank flows in Houston et al. (2012), for example, are very stable over time compared to the financial and macroeconomic variables that we use in our analysis.

³Fratzscher (2012) performs a formal comparison of the relative importance of push versus pull factors in driving net capital flows. While his empirical exercise is similar in spirit to ours, it differs along a couple of important dimensions. First, he studies aggregate capital flows in general, whereas we focus on bank lending in particular. Second, he examines cross-border flows, while we study local lending by foreign banks. Houston et al. (2012) also account for both pull and push factors of international banking flows. Their focus and approach is distinctly different from ours. First, like Fratzscher (2012), they use country-level (and not bank-level) data. Second, they exclusively focus on the effects of the level of regulations on the level

among lending banks, even if they have the same nationality. The bank-level financial data are obtained from the Bureau van Dijk Bankscope database. We use this database also to infer the ultimate owners of global bank subsidiaries and focus on the local lending behavior of these institutions. The financial variables for both subsidiaries and owners are from the consolidated statements compiled by Bankscope. In our dataset, these variables are at the annual frequency (1995 to 2014) and they allow us to directly account for owner and subsidiary-specific factors that may be affecting lending. Our dataset consists of 275 owner/subsidiary country pairs that include both advanced and developing economies.

There are two missing components of the lending data in Bankscope that complicate our analysis: the currency composition of loans and the share of cross border lending are not reported. The first deficiency makes it hard to determine whether changes in lending are due to pull factors or simply due to currency fluctuations. For example, if a subsidiary lends only in euros while all of its sisters lend in US dollars, a euro appreciation would result in a mechanical increase in the former subsidiary's lending reported in the data, which is expressed in US dollars for every bank in our dataset, even if its actual lending expressed in euros remains the same. A similar mismeasurement of pull effects could occur if a subsidiary's loans are mostly cross-border rather than local. To deal with these issues, we incorporate the BIS locational banking statistics (LBS) and the BIS consolidated banking statistics (CBS) into our analysis. Using the LBS and CBS, we extract the currency composition of local lending and the share of cross-border lending, respectively, for each (subsidiary/owner) country pair. We then apply these breakdowns to our bank-level panel to obtain exchange rate adjusted loan growth rates and to account for cross-border lending. This aspect of our analysis is necessary for an accurate comparison of push and pull factors across countries, and, to the best of our knowledge, it has not been implemented at the bank-level before. We should point out here that while restricting our dataset with country-level data would

of banking flows (while we focus on relative growth rates of our regression variables). Third, they use BIS data on banks foreign (cross-border plus local) lending. By contrast, we focus exclusively on local lending by foreign banks.

be problematic if the number of banks were large, the country pairs in our sample typically have a small number of banks (with a sample average of 3.89 and a sample median of 2). Furthermore, restricting our sample to country pairs with a different number of banks does not change our conclusions.

Using a difference general method of moments (GMM) dynamic panel estimator, we find that the variables capturing macroeconomic conditions and borrowing costs in the countries where the subsidiaries of IABs are located (pull factors) are more important determinants of local lending than the corresponding variables for the countries in which their parent IABs are headquartered (push factors). Our results also suggest that the sensitivity of lending to pull factors is economically meaningful.

Turning to financial variables, we do not observe a clear disparity between the statistical significance of pull and push factors. The financial variables in this part of our analysis constitute the entire population of the financial ratios in the Bankscope database. They are classified under four groups of ratios which measure (i) capital adequacy, (ii) asset quality, (iii) performance and (iv) liquidity. Our results show that subsidiary lending is significantly related to the liquidity of the subsidiaries (the pull factor). For the remaining three categories, there is no clear difference between the statistical significance of owner and subsidiary ratios (the push and pull factors, respectively) for subsidiary lending. Our descriptive statistics suggest that it may be misleading to use statistical significance to draw conclusions about (relative) economic significance as the host nation-specific macroeconomic variables and subsidiary-specific ratios in our dataset tend to have considerably larger standard deviations than lending nation and owner specific variables. To account for this disparity we standardize our main independent variables so that their coefficients represent the lending responses to a one-standard-deviation change in the independent variable. We find that the subsidiaries' financial ratios, measured in this way, are more important determinants of their lending than their owners' ratios.

In addition to being based on a large set of macroeconomic and financial variables, our

results are also robust to a variety of additional tests. Specifically, our key conclusion that pull factors are more important for global bank lending remains unchanged after all of the following robustness checks: using two alternative ways of controlling for cross-border lending, accounting for the number of banks, restricting our sample to countries with a higher degree of foreign currency lending, using alternative methodologies to account for mergers and acquisitions (M&A), using a specification for the main independent variables that is different from the deviational form described above, and reconstructing our dataset with country-level data.

As indicated in Obstfeld (2012), it has become very difficult to associate cross-country capital flows with trade imbalances and to ignore the role that global banks play in driving these flows. This view has materialized in a majority of research in the field of international macroeconomics ensuing the 2008-09 financial crisis. For example, Alpanda and Aysun (2014), Davis (2010), Gertler and Karadi (2011), Kollmann (2013), Kollmann et al. (2011) and Meh and Moran (2010) have incorporated global banks in open economy models to investigate how global shocks are transmitted to local economies through global banks.⁴ We approach the subject from a different angle. Instead of assessing the effects of global banking on local business cycles, we try to understand the ebbs and flows of global bank lending in host nations. This agenda is closer to research in the field of international finance, such as Cetorelli and Goldberg (2012a, 2012b), Bruno and Shin (2015a), Buch et al. (2016), Rey (2015), Schnabl (2012) and Shin (2012), which reveals a strong cross-country transmission of global financial push shocks.⁵ In our paper we put an equal degree of emphasis on pull

⁴Earlier work identifies two effects of global banks: support and substitution effect. The evidence on the relative strength of these effects is mixed. While studies such as Buch (2000), Dahl et al. (2002), De Haas and Van Lelyveld (2006), Goldberg (2002), Hernandez and Rudolph (1995), Jeanneau and Micu (2002), Martinez Peria et al. (2002) and Morgan and Strahan (2004) find that the cross-country movement of global banks' loanable funds that depends on borrowers' balance sheet strength (the substitution effect) destabilizes economies, studies such as De Haas and Van Lelyveld (2010), Cetorelli and Goldberg (2012b), Crystal et al. (2002), Dages et al. (2000), and Peek and Rosengren (2000) find that global banks shift funds across subsidiaries, irrespective of local conditions, to support lending.

⁵Within this literature studies such as Forbes and Warnock (2012), Rey (2015), Miranda-Agrippino and Rey (2015), Cerutti et al. (2015) examine the determinants of cross-border bank lending as one of several main components of international capital flows.

factors and find that while some push factors are significant determinants of global bank lending, pull factors such as the financial condition of subsidiaries and local macroeconomic conditions are more important.

As mentioned earlier, the most challenging part of our analysis is identifying the independent effects of the two sets of factors. This difficulty also explains the relatively small number of studies that investigate pull effects. The challenge here is to link borrower balance sheets with the amount of lending while at the same time controlling for any lender-specific (push) factors. A solution to the problem comes from a different line of work. Specifically, few studies in the credit channel of monetary transmission literature either use loan level data to link terms of lending, borrower and lender balance sheets directly (e.g. Aysun and Hepp, 2013; Jimenez et al., 2009) or compare the state-level lending of subsidiaries with the same parent bank holding companies (e.g. Ashcraft and Campello, 2007; Aysun and Hepp, 2011) to identify state-specific pull factors in the US. Both sets of papers then investigate the impact of monetary policy through the balance sheet channel.⁶ While our approach is closer in spirit to the second identification strategy, we compare balance sheets across countries and we use financial ratios of subsidiaries to identify pull factors. The second part of our analysis, comparing the lending of subsidiaries that lend in the same country, but are owned by different IABs, has not been used in the credit channel literature to the best of our knowledge. It is also different from the prevalent methodology in the literature on push factors that we mentioned above. Specifically, while this methodology captures the direct impact of global financial shocks on IABs' lending, we focus on the relative lending behavior of banks and thus any relative impact that global shocks may have on IAB affiliates. Doing so, allows us to weed out any pull effects that may be impacting local lending coincidentally with push effects.

There are two opposing mechanisms in global banking that are related to the pull and

⁶While the most direct way to identify pull factors is to use a loan-level analysis, data are often limited and complex. In Aysun and Hepp (2013), for example, some loan deals are syndicated making it hard to link borrowers with lenders.

push factors that we analyze in our paper. According to the first mechanism, centralized decision-making (decisions made by IABs) and its execution through internal capital markets are commonly observed. Studies such as Buch et al. (2016), Campello (2002), Cetorelli and Goldberg (2012a), De Haas and Lelyveldb (2010), and Houston et al. (1997) provide evidence for this. However, there is also evidence (see for example, Avdjiev and Takáts, 2014, and Fiechter et al., 2011), for decentralized banking activity (such as local funding and decision making) in global banking. Our results suggest that while both mechanisms are operational, the latter may be more important.

2 Identifying pull and push effects

The first step in our methodology is to identify the ownership structures for the banks in our sample. In the next section, we discuss in detail how we proceed along this direction by using the Bankscope database. It is, however, convenient at this point to mention that the owners in our sample are the 53 largest commercial bank holding companies that own subsidiaries throughout the world. Our goal in this paper is to determine why and how the loans of these subsidiaries change over time. In pursuing this goal, we face a major obstacle: while the banks lend in different currencies, their total loans are reported only in the local currency at the end of the period. Comparing the growth rate of these loans, after converting them to a common currency (say the US dollar), does not give an accurate picture of whether banks are more active or passive in the lending market, as these loans are not adjusted for currency fluctuations. Take, for example, a subsidiary lending a fixed amount of local currency in every period in a given country. If this country experiences an x percent currency appreciation, then looking at the unadjusted figures one could inaccurately conclude that the subsidiary is x percent more active in the lending market. While the currency appreciation may be linked indirectly to the loan demand that the bank faces, the unadjusted change in its loan growth rate is directly linked to the currency appreciation. Adjusting for exchange rates is therefore a critical part of our analysis, especially given that

we are comparing the lending behavior of banks across a large number of countries.

To adjust for exchange rate fluctuations, we use BIS locational banking statistics (LBS), which contain information on the currency composition of loans available for each (lending nationality/borrowing country) pair in our sample (see the next section for a detailed description). Let $l_{ij,t}$ denote the total end of period stock of loans, in US dollars, of subsidiary i that is owned by parent IAB j (not necessarily located in the same country as bank i) at time t and let $l_{ij,t}^n$ denote the amount of bank i loans, also in US dollars, that are extended in currency n so that

$$l_{ij,t} = \sum_{n=1}^Z l_{ij,t}^n \quad (1)$$

Here Z denotes the number of currencies in which subsidiary i lends.⁷ After decomposing total lending by currency, we convert the US dollar loans to the currency in which they were extended as

$$l_{ij,t}^{n,c} = l_{ij,t}^n / e_{n,t}^{op} \quad (2)$$

where $e_{n,t}^{op}$ represents the end of period exchange rate (expressed as US dollars per currency n) and $l_{ij,t}^{n,c}$ is the amount of loans extended and denominated in currency n . After applying this calculation to each time period, we measure the change in bank i 's loans in currency n , $dl_{ij,t}^{n,c}$, as

$$dl_{ij,t}^{n,c} = l_{ij,t}^{n,c} - l_{ij,t-1}^{n,c} \quad (3)$$

Next we convert $dl_{ij,t}^{n,c}$ back to US dollars by multiplying it with the average exchange rate during time period t , denoted by $e_{n,t}^a$. The exchange rate adjusted change in lending, $dl_{ij,t}$, and the adjusted lending growth rate, $lg_{ij,t}$, are then computed as follows:

⁷The BIS LBS data contains breakdowns for claims denominated in US dollars, euros, and yen. We assume that, for each (host country/lending bank nationality) pair and at each point in time, the remaining claims are distributed proportionately among the above three major currencies.

$$dl_{ij,t} = \sum_{n=1}^Z e_{n,t}^a dl_{ij,t}^{n,c} \quad (4)$$

$$lg_{ij,t} = \log(l_{ij,t-1} + dl_{ij,t}) - \log(l_{ij,t-1}) \quad (5)$$

This variable is then used to compute the dependent variable in our estimations.

The second step in our analysis is the identification of the factors that determine banks' lending behavior. In our paper, we categorize these factors under two groups: pull and push factors. When analyzing pull factors, our focus is on the relative financial condition of the subsidiaries and the macroeconomic conditions of the country in which these subsidiaries operate. In identifying the effects of these factors, we control for owner-specific conditions by comparing the loan growth rate of a subsidiary to the average loan growth of all the subsidiaries that its parent IAB owns such that,

$$ld_{ij,t}^h = lg_{ij,t} - \bar{lg}_{j,t} \quad (6)$$

where $ld_{ij,t}^h$ represents the exchange rate adjusted loan growth rate of bank i that is owned by IAB j relative to the average loan growth rate across all subsidiaries owned by IAB j . This important feature of our analysis signals to us how closely attached the lending decisions of banks are to their parent IABs. If, for example, IABs' financial conditions are the overriding determinant of their subsidiaries' lending behavior then we would not expect to find any relationship between subsidiaries' lending and host specific factors. We test this hypothesis by estimating the following dynamic panel model:

$$ld_{ij,t}^h = \sum_{k=1}^2 \lambda_k^h ld_{ij,t-k}^h + \gamma_1^h hfd_{ij,t-1} + \sum_{m=1}^M \alpha_m^h of_{j,t-1}^m + \varepsilon_{ij,t}^h \quad (7)$$

where $hfd_{ij,t}$ is the host-specific factor that reflects either the financial conditions of the subsidiary or the local macroeconomic conditions. In our estimations we use various macroe-

conomic and subsidiary-specific variables for $hfd_{ij,t}$ and we similarly measure it relative to its average computed across all of bank i 's sister subsidiaries. In equation (7) we also include owner specific factors, $of_{j,t-1}^m$, to control for any residual effects of the owners' condition on their subsidiaries' lending that our methodology may not be picking up.

Estimating equation (7) allows us to determine whether subsidiaries' lending activities are detached from the overall financial conditions of their owners or not. This does not, however, give us a way to measure the strength of the influence that owners have on their subsidiaries as equation (7), by design, measures the importance of local and subsidiary-specific factors only. To capture this influence, we invert our methodology so that our perspective is now from the vantage point of host nations. Specifically, by focusing on a given country, we compare the lending behavior of all global bank subsidiaries in this country that are owned by different parent IABs. The relative lending growth rate, denoted by $ld_{ij,t}^l$, under this scenario is given by

$$ld_{ij,t}^l = lg_{ij,t} - \bar{lg}_{i,t} \quad (8)$$

where the average loan growth rate, $\bar{lg}_{i,t}$, is measured across all the banks that lend in the same country as bank i . The corresponding independent variable that is the main focus here is $ofd_{ij,t}$ and it measures the conditions of the owner of bank i relative to all the other owners that have subsidiaries in the same country as bank i . We then incorporate these two variables in the following model,

$$ld_{ij,t}^l = \sum_{k=1}^2 \lambda_k^l ld_{ij,t-k}^l + \gamma_1^l ofd_{ij,t-1} + \sum_{m=1}^M \alpha_m^l hf_{i,t-1}^m + \varepsilon_{ij,t}^l \quad (9)$$

where $hf_{i,t-1}^m$ are subsidiary and host-specific factors that are included to control for local conditions. Under this formulation, we are effectively controlling for any local factors that affect subsidiaries' lending symmetrically and focus on the effects of parent IABs on local lending. To help visualize this channel of transmission, say a given country experiences

an expansion that prompts a higher demand for bank loans. Now assume that out of all the foreign owned banks, bank i 's parent is the only one experiencing a deterioration in its financial conditions (or a macroeconomic deterioration in the parent IAB's country). In this case, the coefficient of $ofd_{ij,t-1}$ captures to what extent this deterioration is transmitted to bank i 's lending.

3 Data and estimation methodology

We draw our data from three sources: Bureau van Dijk Bankscope, BIS locational and consolidated banking statistics, and International Financial Statistics (IFS) databases. The definitions of the variables that we obtain from these databases are provided in Appendix A.

Our bank-level observations are available at the annual frequency. The ownership structures of the banks are from the Bankscope database and they cover the period 1995 to 2014. To construct our dataset by using this database we follow several steps and restrictions. First, we exclude all banks that are not classified as commercial banks and bank holding companies. This eliminates Specialized Governmental Credit Institutions, Multi-lateral Governmental Banks and Central Banks whose behavior may be driven by factors outside of the identification framework discussed in the previous section. While a majority of the financial statements in the Bankscope database are reported at the end of the year, there are some banks with quarterly observations. To harmonize the dataset we only include end of year statements. Second, we identify banks that are, on average, in the top 5 percent. We do so by ranking the banks in each year based on their total assets (in US dollars). We then take the average of these rankings over the sample period and keep banks that have an average ranking in the top 5 percent. These banks are the owners that we refer to as IABs in our paper. After obtaining a list of these large commercial banks, we identify the banks that they own by using the ownership structure module of Bankscope. While it is possible to determine the different layers of ownership (immediate, domestic and global ultimate)

within this module, we focus on global ultimate ownership since it is more consistent with our methodology that focuses on the global functioning of internal capital markets. While the ultimate owners in Bankscope are banks that own more than 50 percent of a subsidiary, we should mention that a majority of the ownership shares are 100 percent in the database. Furthermore, in order to rule out the confounding effects of potential mergers and acquisitions activity, we exclude observations with loan growth rates above 200 percent and below -200 percent.⁸ As a third step, we combine the financial and structural (such as location and bank history) data of the owners and subsidiaries to form our baseline dataset. To make the cross-country comparison in equation (7) feasible, we identify and keep owners that have subsidiaries in at least two countries.

The main dependent variables in our estimations are constructed by using the total loans of subsidiaries. We convert these loans to US dollars and measure their growth rate over the previous year. At this stage, we incorporate BIS data on the currency composition of bank claims to adjust our lending growth rates for exchange rate fluctuations as described above. The BIS data that we use are at the country level, available for country pairs, and they come from two sources. We obtain the currency composition of local claims in foreign currency from the locational banking statistics by nationality (LBSN) for the set of 44 countries which report data to the BIS LBS. These data are reported for locally-booked claims denominated in foreign currencies and contain individual currency breakdowns for loans denominated in US dollar, euro, and yen. From these, we infer lending in foreign currency that cannot be allocated to any currency (other foreign currency claims) as the difference between total foreign currency claims and the sum of claims denominated in the three currencies. The share of loans in currencies other than US dollar, euro, and yen for the 44 countries is 16.8 percent on average (both across time and country pairs) in our sample. Using outstanding loan volumes, we compute the share of foreign currency lending for each currency. In so doing, we allocate the share of other foreign currency loans to the US dollar, euro and yen

⁸200 percent corresponds roughly to a 4 standard deviation band around the mean loan growth rate in our sample. We follow an alternative strategy to account for M&A activity in Section 4.3.2.

lending categories to a country pair at a given time by using the currency distribution of the loans for the same country pair and time. The remaining group of host countries (i.e. those that do not report data to the BIS LBS) tend to be mostly smaller economies. For them, we can observe total local claims in local currency and total local claims in all currencies from the BIS consolidated banking statistics. While the existing data do not contain the currency decomposition of local claims in foreign currency for this group, we observe that the share of local currency lending tends to be quite high (above 90 percent for an overwhelming majority of these countries). That is why we do not apply the exchange rate adjustment for the foreign currency lending component of total local lending for this group of countries in our baseline estimations.

There are two sets of independent variables that are the focal point of our baseline analysis. The first set consists of country-specific observations for GDP, unemployment and deposit rates that in turn help us approximate the local macroeconomic conditions and the local cost of funding in the countries. We refer to these as macroeconomic variables. Besides GDP and unemployment, there are, of course, various other macroeconomic variables that are related to borrower balance sheets and their probability of default. These two variables, however, constitute the broadest and the most harmonized measures of economic activity in the IFS database for the group of countries in our sample. As mentioned above, while global banks use their internal capital markets effectively to provide funding to their subsidiaries (Cetorelli and Goldberg, 2012a), it is also true that these subsidiaries use local funding. This is the reason why we include deposit rates as a macroeconomic indicator of local conditions in our baseline estimations. We broaden the definition of local funding by considering various other local interest rates in our sensitivity analyses. In the second set, we have owner-specific and subsidiary-specific financial ratios that measure capital adequacy, asset quality, performance, and liquidity. In our baseline analysis these features are captured by the total capital (TC), loan-loss-reserves-to-gross-loans (LLR/TL), return on average equity (ROAE) and liquid-assets-to-total-short-term-funding-and-deposits (LA/STFD) ratios, respectively.

We choose these ratios since they are commonly used indicators of the four financial aspects of banks. We do, however, extend this baseline set of variables later in our paper to cover the entire population of the ratios (measuring the four features mentioned above) in the Bankscope database in our sensitivity analyses.

All macroeconomic variables described above, as well as the dependent variables, are transformed so that they represent percentage changes over the previous year in our model. The ratios, by contrast, are measured as the difference between their levels at time t and $t-1$ since they can be close to zero or negative at times. The second layer of differencing is applied to our main dependent and independent variables by following the procedure discussed in the previous section. Specifically, following equation (6) we measure the difference between the exchange rate adjusted loan growth rate of a subsidiary and the mean loan growth computed across all of its sister subsidiaries that belong to the same parent. In equation (7), the corresponding independent variable is measured similarly as the difference between the growth rate of the subsidiary or host-specific variable (either the subsidiary's ratios or the host nation's macroeconomic variables) and the corresponding mean value computed across sister subsidiaries or the host nations in which these subsidiaries reside. The control variables in equation (7) are the owners' ratios - TC, LLR/TL, ROAE, and LA/STFD - differenced across time. Conversely, the main dependent and independent variables in equation (9) represent deviations across owners that have subsidiaries in the same country and the control variables are the baseline ratios for the subsidiary.

Restricting the sample as described above leaves us with 53 large banks and 602 of their subsidiaries. While we do not list the names of these banks, we should note that all private commercial banks designated as a Global, Systemically Important Bank (G-SIB) by the Financial Stability Board are in our list of owners.⁹ As displayed in Table 1, the total assets of these owners are considerably larger (approximately 16 times) than their subsidiaries' assets. The owners are located in 18 countries and there are 95 countries where subsidiaries

⁹For the list of these banks see, <http://www.fsb.org/2016/11/fsb-publishes-2016-g-sib-list/>.

reside in our baseline sample. We have observations for 275 pairs of these countries (the list of host and lending nations are listed at the bottom of Table 1). When we incorporate the data on the currency composition of local lending in foreign currency, the number of lenders stays the same but the number of borrowers and the number of country pairs decrease. The table also shows that the number of subsidiaries per owner (an average of 19.9) and the number of subsidiaries owned by global banks per country pair are large enough for us to exploit the cross-subsidiary variation in our analysis.

In the next section, we measure the statistical significance of owner- and subsidiary-specific financial ratios and macroeconomic variables. It is important to note at this point that these variables have different means and standard deviations (both across factors and types of banks) as reported in Table 1 (for example, host-specific variables usually have larger standard deviations). It is, therefore, important to take account of these differences when comparing the magnitudes of the coefficients and drawing inferences for economic significance.

In the BIS IBS database, there are, naturally, more reporting lending countries than in our sample since we restrict our sample to countries that have at least one IAB. The number of countries that are hosts to the subsidiaries and the number of banks per country pair are slightly lower in our sample as well. The latter disparity is due to the standalone non-IAB banks and banks that are owned by non-IABs in the BIS statistics. This is also the main reason why the total number of banks in our sample is smaller. In the BIS LBS data, there are 44 countries that report local claims in foreign currency by currency type. Over 90 percent of foreign currency-denominated local claims in these countries are either in US dollars, euros, or yens. Foreign currency claims, in turn, are roughly 25 percent of the local claims in all currencies (local claims in local currency plus local claims in foreign currency). As explained above, we use these statistics, at the country pair level, when adjusting for currency fluctuations. We find that this adjustment is large and makes a noticeable difference in our estimations as we explain in the next section. Comparing the

loan growth rates with and without the exchange rate adjustment (computing the absolute value of the difference between the two measures), for example, we find an average difference of 6.6 percent in our sample period. While it is possible to use the BIS CBS to estimate the share of local claims denominated in foreign currency (in total local claims) for the remaining countries, the currency decomposition of these loans is not reported. That said, this share is small (less than 10 percent) for the majority of these countries. That is why we assume that all loans are denominated in local currency when computing the exchange rate adjusted loan growth rates in these countries in our baseline estimations. Furthermore, we also investigate whether our main inferences remain the same when we use data for only the 44 currency composition reporting countries later in the paper.

Another feature of Bankscope that can potentially complicate our analysis is that the loan amounts reported in this database include cross-border loans. If these shares are large then the link between the local macroeconomic variables and loan growth modeled in equation (7) would be inconsistent with data and it could potentially produce a weak link between the two variables. While local lending represents the majority (approximately three-quarters) of lending in our sample of subsidiary/host country pairs, we modify our analysis in several different ways to account for cross-border lending and check the robustness of our main results in Section 4.

To estimate equations (7) and (9) we use the difference GMM dynamic panel estimator of Arellano and Bover (1995).¹⁰ This methodology is designed for panels that, like ours, have a relatively smaller time dimension. It accounts for panel level fixed/random effects and idiosyncratic errors that are heteroskedastic and correlated across time. The methodology is also advantageous since it does not require all independent variables to be strictly exogenous and the endogenous variables in levels are instrumented with the lags of their first differences. In our estimations, we use the first lags of all the baseline variables as instruments. For all the different model specifications that we use in this paper, the tests of over-identifying

¹⁰We use the code developed by Roodman (2009) to apply this methodology in STATA.

restrictions indicate that instruments as a group are valid and exogenous.¹¹ In all of these estimations, we apply the Windmeijer’s finite-sample correction as it is well-known that the standard two-step estimation, though robust, yields downward biased standard errors.

4 Results

In this section we report and discuss our baseline results that are obtained from the estimation of equations (7) and (9), we incorporate a broader set of macroeconomic variables and financial ratios into our analysis, we conduct sensitivity analyses that correspond to various sample restrictions and we measure and compare the economic significance of the determinants of subsidiary lending.

4.1 Baseline results

Our baseline results obtained from the estimation of equation (7) are reported in Table 2. The spotlight here is on the coefficients appearing in the first row. The first set of these indicates that the subsidiaries lend relatively more when their host country has an economic expansion, lower unemployment and lower deposit rates. To clarify the interpretation of these coefficients, it is useful to think about the following scenario: Assume that bank x operates in Brazil and is owned by a large IAB m that also owns banks in other countries. Now assume that the Brazilian economy is experiencing a 1 percent increase in its real GDP and the rest of the economies in the world are not growing. The number 0.7437 reported under the GDP column then implies that bank x increases its loans by 0.7437 percent more than the mean loan growth rate across all of its sister subsidiaries that belong to IAB m . The coefficients of the unemployment ratio and deposit rates have a similar interpretation (the deposit rate coefficient represents the percent response of lending growth rate to a one basis point change in the rate).

In a second set of estimations, we replace the host-specific macroeconomic variables with

¹¹For these tests we report the Hansen J statistic since its alternative, the Sargan statistic, is not robust to heteroskedasticity or autocorrelation.

subsidiary-specific financial ratios in equation (7). The results indicate that better capitalized, more liquid and profitable banks with higher asset quality expand their lending by more compared to their sister subsidiaries. For most of the asset quality ratios in Bankscope, as well as our baseline measure, an increase in the ratio implies a decline in quality. In reporting our baseline results in Table 2 and 3, we reverse the sign of the coefficient so that an increase in the ratio indicates an increase in quality. We do, however, report the actual coefficient values in our sensitivity analyses below.

By design, the coefficient values of bank ratios, similar to deposit rate coefficients, show the percent change in lending growth corresponding to a one basis point increase in the ratio relative to the IAB-specific mean. The estimated value of the capital adequacy coefficient, for example, implies that if a bank's total capital ratio is one percent higher than that of its sister subsidiaries, its lending growth is 0.58 percentage points higher than that of its sisters. We should reiterate at this point that we cannot compare these coefficients to draw conclusions regarding economic impact since the ratios and the macroeconomic variables have very different standard deviations. The same can be said for the comparison between equations (7) and (9) since there is a similar disparity between the standard deviations of bank/host nation and owner-specific variables. We will scrutinize the economic significance of these coefficients later in the paper.

Table 2 also shows that the owner-specific coefficients are mostly insignificant. This result suggests either that our methodology of measuring deviations across sister subsidiaries is effective in controlling for owner-specific determinants of subsidiary lending or that the internal capital markets are not as important and the lending decisions of subsidiaries are formulated independently. Based on the inferences that we draw by using a broad set of owner-specific factors (these are reported below), we reject the latter hypothesis. In our estimations, we find no evidence for second-order serial correlation in the error term or any evidence for the invalidity of the instruments. This is also true for all the remaining estimations in our paper.

Next, we invert our methodology to study the owner-specific determinants of subsidiary lending as we describe in our discussion of equation (9). The results that demonstrate the strength of this channel are reported in Table 3. The main conclusion here is that owner-specific determinants (our baseline measures of macroeconomic and financial conditions) are not as significant; only the coefficients of GDP growth in the owner’s country and the owner’s return on average equity are significant. These two coefficients have the expected signs: subsidiaries with owners that reside in expanding economies and that are more profitable expand their lending by more. The remaining owner-specific coefficients are insignificant. To interpret the estimated value for the GDP coefficient we can expand the above thought experiment as follows: assume that in addition to bank x there is a bank y in Brazil that is owned by a different IAB, say IAB n , that is located in a different country from the owner of bank x (IAB m). Now assume that IAB m ’s economy experiences a 1 percent increase in its GDP growth rate while IAB n ’s does not, then the coefficient value of 1.323 implies that bank x expands its lending by 1.323 percent more than bank y . A similar interpretation applies to the coefficient of ROAE. If IAB m ’s ROAE is 1 percent higher than IAB n ’s then bank x increases its loan by 3.97 percent more than bank y .

4.2 Broader set of macroeconomic and bank-level indicators

Our baseline macroeconomic and financial indicators give us a good way of identifying owner (IAB) and subsidiary-specific determinants of lending. As a robustness check, we use alternative country and bank level indicators to expand our set of macroeconomic variables and financial ratios and reinvestigate the relationships above. In expanding the set of macroeconomic variables, we mostly incorporate different interest rates to approximate the costs of funding and returns to lending. We choose not to expand the list of macroeconomic indicators related to borrowers’ conditions since GDP and unemployment are the most comprehensive measures of economic activity that are directly related to borrower balance sheets and that are at the same time the most harmonized measures across the countries in our

sample.

In Table 4, we report the coefficients of the macroeconomic variables in equation (7) and (9). These coefficient estimates have similar interpretations and, more generally, reveal that host-specific macroeconomic factors are more significant determinants of subsidiary lending than owner-specific macroeconomic factors. We do not report the control variable coefficients and the diagnostic test statistics in the table as they are qualitatively similar. The owner's GDP is the only owner-specific macroeconomic variable that has a significant effect on subsidiary lending. Turning to host-specific factors, we find that subsidiaries in countries with rising interest rates contract their lending more than their sister subsidiaries located in countries with relatively stable interest rates. This negative relationship can be due to both supply and demand factors. On the supply side, a rise in deposit rates can increase local funding costs, while an increase in T-Bill rates can negatively impact lending if banks are holding government securities. On the demand side, an increase in lending and money market rates can coincide with a drop in loan demand. The more central finding here, though, is that an increase in interest rates restricts lending only if this takes place in the host nation. In addition, we find that subsidiaries in countries with an appreciating currency and higher equity growth expand their lending by more. The former result is consistent with the findings of Bruno and Shin (2015b), who show that appreciating local currencies increase the perceived creditworthiness of local borrowers with currency mismatches on their balance sheets and, ultimately, lead to more lending to such borrowers.

Next, we broaden the set of financial ratios by including all ratios provided in the Bankscope database. These ratios are similarly categorized under the four groups (capital adequacy, asset quality, performance, liquidity) that we defined above and their definitions are provided in Appendix A. The results obtained by using these ratios in both equations (7) and (9) are displayed in Table 5. We report these results in four blocks corresponding to the four groups.

A majority of the owner and subsidiary-specific capital adequacy ratio coefficients are

significant. All of the significant coefficients for both owners and subsidiaries have a positive sign suggesting that higher capitalization levels of owners or subsidiaries are associated with higher levels of lending by subsidiaries. While two of the standard regulatory measures of capital adequacy, i.e., the total (tier 1 + tier 2) capital ratio and the tier 1 ratio, are insignificant in equation (9), the other measures are mostly significant. One difference between these two ratios and the remaining measures of capital adequacy is that the former are based on risk-weighted assets and they could be more binding than the latter.¹² The insignificant coefficients for owners could then be a product of owners carrying excess capital and thus non-binding capital restrictions.¹³ This is a unique result as it offers a different perspective on the relationship between capital adequacy and lending behavior. The literature is divided on this subject, with studies such as Berrospide and Edge (2010), Hancock and Wilcox (1993) and Bernanke and Lown (1990), Francis and Osborne (2009) finding modest effects of capital on lending (especially for larger banks), and the findings in studies such as Adrian and Shin (2007), Hatzius (2007), Ciccarelli et al. (2010) and Gambacorta and Shin (2016) implying otherwise. Our results suggest that the significance of large bank capital adequacy for lending behavior may vary by the type of ratio; while risk-weighted asset based ratios do not affect this behavior, those based on total assets do.

In contrast to the results for capital adequacy, we do not find that the liquidity ratios of owners and subsidiaries are equally significant determinants of lending and that subsidiaries' liquidity is more closely related to their lending than their owners' liquidity. In fact, we do not find a significant relationship for any of the owners' liquidity measures. The signs of the significant coefficients for the subsidiaries indicate that subsidiaries with more liquid assets expand their lending by more.¹⁴ Turning to the different performance and asset quality ratios,

¹²There is evidence that ratios based on risk-weighted assets tend to be more binding for some banks, while ratios based on total assets tend to be more binding for others (Brei and Gambacorta, 2016; Fender and Lewrick, 2015).

¹³There is also evidence indicating that the actual implementation of Basel rules is highly different across countries, making the stringency of capital restrictions non-uniform (e.g. Kara, 2016).

¹⁴Notice here that an increase in the ratios with loans (the illiquid asset) in the numerator implies a decrease in liquidity.

we again do not observe a clear difference in the significance of the owners' and subsidiaries' coefficients. These coefficients in general imply that higher asset quality and performance are associated with higher levels of lending. The coefficients of the performance ratios of both owners and subsidiaries, though, are not as significant as the coefficients of the ratios in the other three categories. There is a similar disparity between the standard deviations of these different ratios across owners and subsidiaries making it difficult to compare the magnitude of the coefficients to draw conclusions for economic significance.

4.3 Sample restrictions

Our sample includes countries for which we do not observe the currency composition of local claims in foreign currency, banks that do cross-border lending yet only report their total loans, country pairs with a large number of IAB subsidiaries, and banks with M&A activity. In this section, we restrict our sample in various ways to account for some of these characteristics and check for robustness. In addition, we skip the exchange rate adjustment in our methodology to determine whether the inferences are different with unadjusted loan growth rates.

4.3.1 Excluding countries without currency decomposition of lending

As mentioned above, there are 44 countries that report local claims in foreign currency (broken down by currency) to the BIS LBS. For the remaining countries in our sample, which tend to be countries with smaller economies and small shares of foreign currency lending, we assumed that all local lending is in local currencies. To test whether our results are sensitive to this assumption, we restrict our sample to the 44 countries that report to the BIS LBS (i.e. the countries for which the currency composition of claims is available). This allows us to match more closely our methodology with the data. The downside, of course, is that by doing so we are losing observations from the remaining 51 countries and we are, in effect, shifting our focus to the larger economies in the world.

The results that we obtain after applying this restriction are reported in the second

column of Table 6. Compared to our baseline results, reproduced in the first column of the table for convenience, the magnitude of the GDP coefficient is larger for both owners and subsidiaries. Furthermore, the host nations' deposit rates are not significant determinants of lending in this restricted sample. The results for the financial ratios are more alike and similarly suggest a closer relationship between the subsidiaries' ratios and their lending. The insignificance of deposit rates signals that subsidiaries in larger economies may have a larger set of funding alternatives to local deposits compared to subsidiaries operating in smaller economies.

4.3.2 Accounting for mergers and acquisitions

So far, we have excluded loan growth rates that are above 200 percent and below -200 percent that can also reflect M&A activity. In this section, we follow an alternative, and more rigorous way of identifying and excluding observations corresponding to M&A activity. We do so by using the bank history information provided in the Bankscope database. Investigating this information, we manually identify 439 M&A episodes.¹⁵ Following an M&A, if a bank is absorbed by another bank it retains its identification number so that our time series observations of this bank are not disrupted. The assets and loans of this bank, however, typically change drastically (sometimes above and sometimes below the 200-percent threshold) confounding our analysis. We, therefore, exclude these periods from our estimations. The results reported in the third column of Table 6 are mostly similar to the baseline results in terms of signs and significance of the coefficients. With this restriction, however, the coefficients of macroeconomic indicators are larger and unemployment becomes significant in equation (9). The coefficients of the baseline financial ratios are again more significant for subsidiaries.

¹⁵In our list of M&A's there are banks with multiple (up to 4 times) observations during the sample period.

4.3.3 Accounting for cross-border lending

The lending data reported in Bankscope cover total loans, which tend to consist primarily of loans to local residents, but may also include cross-border lending. Unfortunately, there is no way of determining the fraction of cross-border lending at the bank level since the Bankscope database does not contain such breakdowns. Nevertheless, the BIS IBS offer a way to account for these loans at the country level. Specifically, BIS LBS and the BIS CBS, which are available on a bilateral basis, can be combined to produce estimates of the fraction of claims extended by banks of a given nationality located in a given host country (e.g. French banks in Turkey) that are booked locally.

We use the above statistics to construct a time series of local lending shares for each pair of countries in our full sample. After doing so, we restrict/adjust our dataset in two ways. First, we re-estimate our models after excluding (nationality/location) country pairs for which the share of cross-border lending by local banks exceeds 25 percent.¹⁶ The results corresponding to this restriction are reported in the second set of columns in Table 7. The magnitudes and the significance of the coefficients are similar to the baseline results reported in the first set of columns. The only exceptions are the deposit rate coefficients in equations (7) and (9), which are more significant and larger and the owner performance coefficient, which is no longer significant.

Second, we account for the share of cross-border lending more rigorously by applying these shares to the bank-level data. More concretely, we assume that, at each point in time, the share of locally-extended loans in total loans for a bank of nationality a located in host country b is equal to the estimate for the respective share for the (nationality/location) country pair $a - b$, obtained from the BIS LBS and the BIS CBS, using the methodology described above. To approximate the volume of loans that are extended locally by each bank of nationality a located in host country b , we multiply total loans of that bank (obtained

¹⁶We obtain qualitatively similar results when we use lower (i.e., more conservative shares). Nevertheless, using lower shares, (for example 10 percent) reduces the number of observations drastically.

from Bankscope) by the local-loans share for the (nationality/location) country pair $a - b$ (obtained using the BIS IBS estimate). We then compute growth rates of local lending, adjusted for exchange rates, by using the share of total loans.

Due to the fact that some of the 44 countries which submit data to the BIS LBS join the reporting population after the start of our sample, the BIS panel with shares of cross-border lending is unbalanced, with missing observations for some country pairs and time periods. That is why, before applying the methodology described above, we only focus on periods with two consecutive positive observations of cross-border shares. This ensures that our computation does not produce artificially low values.

The results obtained for this specification of the dependent variable are reported in the third set of columns of Table 7. These are mostly similar to our baseline results. Nevertheless, there are some exceptions. First, subsidiaries' lending is more sensitive to GDP (especially to the GDP of their parents). Second, unemployment in the host nation and the performance of the parent IAB are no longer significant determinants of lending. Finally, the magnitudes of the subsidiary financial ratio coefficients are also larger compared to our baseline results.

To summarize, the overall evidence from the set of robustness checks is consistent with our main conclusions. Furthermore, it is also revealed that, when the data are purged of cross-border lending, the link between lending behavior and the independent variables strengthens, as demonstrated by the larger and more statistically significant coefficient estimates.

4.3.4 Accounting for the number of banks

A distinct feature of our analysis is that we are controlling for currency fluctuations by using currency decomposition of lending. Currency decompositions, however, are only available (bilaterally) at the country level. Therefore, our implicit assumption is that the country-level decompositions also represent bank-level decompositions of loans by currency. While a majority of the country pairs in our sample have either a single or a small number of IAB subsidiaries, there are pairs (especially where both countries are large advanced economies) for which the number of subsidiaries is in the double-digits. For these countries then our

assumption becomes less realistic, as different banks may have different currency baskets. To determine whether this feature of the data changes our results, we only include country pairs with less than five banks.¹⁷

The results from this alternative estimation are reported in the last set of columns in Table 7. Similar to our results obtained by controlling for cross-border lending, we find a stronger link between BHC and subsidiary-specific factors (especially for deposit rates) and lending in these estimations. Specifically, the coefficients have similar signs and are generally larger in magnitude.

We should note that the closer link that we find when we control for the number of banks may be a product of the set of countries that remain in our sample. This is also true for our first methodology that controls for cross-border lending. Specifically, the country pairs with a smaller number of banks typically consist of one large (host) economy and one small (home) economy. It is, therefore, possible that there may be more than one factor causing this closer link such as the degree of competition, the shares of foreign currency and cross-border lending.

4.3.5 Unadjusted loan growth rates

As mentioned above, if the impact of currency fluctuations is not accounted for, the analysis of the relationship between loan growth rates and macroeconomic/financial conditions can potentially yield inaccurate results. To check whether controlling for exchange fluctuations has a significant impact on our results, we use unadjusted loan growth rates (implied by the raw Bankscope series on total loans) in our estimations. The results reported in the last set of columns in Table 6 indicate that while the significance and the signs of the coefficients are mostly the same, their sizes are considerably different. The magnitudes of the host-specific macroeconomic variables, for example, are considerably larger while the GDP coefficient for the lending nation is much smaller. By contrast, we observe that the subsidiary financial

¹⁷We choose 5 as our cutoff point since in our bilateral panel, if we exclude the observations on the diagonal, the average number of banks was 5.24. We did, however, experiment with different cutoff values and obtained similar results.

ratio coefficients are not as large.

The above results can be interpreted as evidence for the importance of adjusting loan growth rates for exchange rate fluctuations. While the qualitative inferences are the same, one can draw starkly different quantitative conclusions from estimations in which the growth rates of loans are not adjusted for exchange rate fluctuations.

4.4 Economic significance

So far, our results indicate that subsidiary lending is more closely related to local macroeconomic variables. For some of the financial ratios in our analysis we do not observe a similar disparity between the statistical significance of subsidiary and owner-specific coefficients. In this section, we compare the relative importance of subsidiary and owner-specific financial ratios for local bank lending. As mentioned above, comparing the magnitudes of the coefficient estimates in our baseline regressions does not allow us to make this assessment accurately as the two types of variables have different degrees of variation. In particular, we observe that the standard deviation of host nation and subsidiary-specific variables is higher. To adjust for this difference in variations, we rescale our main independent variables in equations (7) and (9) and divide them by their sample standard deviations. We then compare the economic significance of these two sets of variables.

Table 8 makes this comparison only for the ratios that had significant coefficients in both equation (7) and (9). For all the coefficient pairs that we report in this table, equation (7) coefficients are larger in magnitude suggesting that a subsidiary's financial condition/structure is a more important determinant of its lending behavior than its parent's financial condition/structure. While the fact that the differences in some of the ratio coefficients are not large qualifies this conclusion, we should note that for a majority of the ratios (especially for the liquidity ratios) that we did not compare in this sub-section, subsidiary ratios had significant coefficients and owner ratios did not.¹⁸

¹⁸We also replicated this methodology for all the sensitivity analyses we performed in Section 4.3. While the results were similar qualitatively, we found a larger disparity (larger coefficients of the subsidiary-specific variables) when we used our alternative way of accounting for M&A activity.

4.5 Country-level data and an alternative specification

In this section we conduct two more tests to determine whether the disparity in the economic significance of the two sets of coefficients is robust.

The main advantages we gain by using bank-level data are that we can directly utilize the bank level ownership structure in our analysis of internal capital markets, we can associate subsidiary-specific financial variables with their lending behavior and we can use a large number of observations to test our hypotheses. The disadvantage, as we mentioned above, is that the country-level BIS IBS data that we use in our analysis may not always provide an accurate description of bank-level behavior, especially if the number of banks for a given country pair is large. To form a closer link between the BIS IBS and the Bankscope data, we replicate our analysis by using a country-level panel dataset (where the cross-sectional dimension is formed by the country pairs) as our first robustness test. To aggregate the financial variables to the country pair level, we compute weighted averages of these variables for each country pair, while using individual banks' total assets as weights.

As a second test, we use our baseline bank-level dataset again but this time we include the main independent variables without converting them to the deviational form described in Section 2. We do this for both the financial and the macroeconomic variables. The reason we use this alternative specification is that while our baseline approach allows us to capture the sensitivity to the variations across subsidiaries and IABs, it does not allow us to compare the systematic effects of push and pull factors. If, for example, there is global push shock that affects the IABs symmetrically (similar to the shocks investigated by the post-2008 studies discussed in the introduction to our paper) then our approach would not capture the total impact of this shock. Similarly, if there is a global recession that affects countries symmetrically, we cannot detect the pull effects that this may cause. In this section, we compare the effects of push and pull factors by including the main independent variables without converting them to their deviational form and report their economic significance. The dependent variables in these estimations, however, have the same deviational form.

The results of our two tests are reported in Tables 9 and 10, respectively. The tables report only the significant coefficients that represent the percentage point response of lending to a one standard deviation change in the main independent variable, as in Table 8. In these tables, we also include our baseline results for a comparison. Overall, these alternative tests confirm the conclusions drawn in the previous section.

More concretely, the results in Table 9 indicate that, in our country-level analysis, the number of significant coefficients is smaller. This is especially true for the push factors (reported under the equation (9) column) as none of the profitability and liquidity ratios are significant with this alternative dataset and only one asset quality and one macroeconomic variable are significant. Turning to equation (7) results, while the significance of macroeconomic and capital adequacy variables is lower, this is not the case for the remaining three categories. In rare instances, when both coefficients corresponding to the country-level analysis are significant, the pull factor coefficients are similarly larger in magnitude. Compared to the baseline results, our alternative estimations tend to produce smaller coefficients.

The results in Table 10 suggest that considering the systematic effects of push and pull factors reinforces our main conclusion that pull factors are more important than push factors. Specifically, while we observe a similar drop in the number of significant coefficients for equation (9) variables, we cannot make the same observation for the variables included in equation (7). Compared to our baseline results, however, the magnitudes of the coefficients are smaller (though their signs are mostly similar). This implies that the relative lending growth rates of subsidiaries are more strongly related to the deviations of the pull and push variables from cross-country and IAB-specific averages than the unadjusted growth rates.

4.6 Further analyses

We have performed several other tests that also produced results that were consistent with our main inferences. The results from two of these tests are reported in Appendix B. In the first test, we use asset weighted averages to measure our main variables as deviations

from lender-specific (in equation 7) and borrower-specific averages (equation 9). Doing so allows us to investigate how a subsidiary's lending deviates from the overall foreign lending behavior of its parent IAB (in equation 7) and how a subsidiary's lending behavior deviates from the overall foreign bank lending in a given country (in equation 9). We do this exercise for only the financial ratios since it is not meaningful to weigh macroeconomic variables with the asset size of banks. The results, displayed in Table B.1 in Appendix B, similarly show that pull effects are more significant and in rare cases when both pull and push effects are significant, pull factors are more economically important.

Our baseline sample includes all overseas subsidiaries of an IAB, even those that account for a very low share of the total overseas (local) lending by its parent IAB. In our second exercise we test whether the strength of pull and push effects are different for banks that account for a high/low share of total IAB lending. We do this by separating the subsidiaries into two groups based on their lending shares. If a subsidiary's lending share (compared to its sister subsidiaries in equation 7 and compared to all the other foreign subsidiaries in the same country in equation 9) is above the mean value, it is classified as a high lending share bank and a low lending share bank otherwise. We then replicate estimations separately for these two groups. The results, displayed in Table B.2, show that pull effects are more significant and economically important in general compared to push effects for each group. The additional inference here is that both pull and push effects are larger in strength (for most of the variables in the table) when a subsidiary has a lower share suggesting that subsidiaries with a larger share may be providing more robust lending.

5 Conclusion

Our analysis in this paper sheds new light on the role of global banks in the international transmission of macroeconomic and financial shocks. A common agreement in the existing literature on the subject is that global banks play a major role in determining capital flows by transmitting the shocks they face to the countries that they lend in. These so-called push

factors do a good job of explaining the spillover effects of the 2008 crisis and the subsequent recovery in open economy models. Empirical evidence is generally consistent with theoretical predictions.

In our paper, we investigate the pull as well as the push determinants of global bank lending and allow for a horse-race between the two. Our results demonstrate that pull (host nation and subsidiary-specific) factors are more important determinants of global bank lending than push (lending nation and owner bank holding company specific) factors. Specifically, the results show that the macroeconomic conditions in the country in which the subsidiaries of global banks reside and the financial condition of these subsidiaries are both statistically and economically more important for their lending behavior compared to the macroeconomic conditions in their owners' countries and their owners' financial condition. We obtain these results by using bank-level data, BIS locational and consolidated banking statistics to account for the currency decomposition of global banks' loans and their cross-border lending, and a unique methodology to identify the independent effects of push and pull factors. The strength of our conclusions comes from a large set of tests that demonstrates the robustness of our results.

This paper makes predictions for the determinants, but not the macroeconomic effects of global bank lending. The predictions we make here though should inform the literature on the effects of global bank lending and they can help formulate future research questions. There are two well-known mechanisms in the global banking literature that can potentially (de)stabilize economies: the support mechanism (parent banks' provision of loanable funds through internal capital markets) and the substitution mechanism (reallocation of loans across countries to equate risk-adjusted returns). Our findings suggest that the substitution mechanism of global banking is more important than the support mechanism and that it should receive greater attention when assessing the overall impact of global bank lending on economic stability.

Our paper also provides insights for the relative importance of centralized versus decen-

tralized decision making in global banking. Specifically, we show that the lending behavior of subsidiaries of global banks is more strongly linked to their own financial condition compared to their owners' financial condition and that local funding costs have a significant impact on their lending. These results suggest that decentralized decision-making may be more prevalent in global banking. It would be interesting to directly test this hypothesis by using bank-level data on banking flows through internal capital markets. One could determine how these flows are related to actual lending behavior of subsidiaries and draw direct inferences for the relative strength of centralized versus decentralized decision making (as well as pull versus push factors) in global banking.¹⁹

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¹⁹Buch et al. (2016) provides a good example for the type of data that could be useful for this type of analyses.

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Appendix A. Data

Table A.1. Data definitions

Variables	Description
Loans	Total loans
<u>Capital adequacy ratios</u>	
Total Capital Ratio	Tier 1 + Tier 2 capital (including subordinated debt, hybrid capital, loan loss reserves and valuation reserves) as a share of risk weighted assets and off balance sheet risks.
Tier 1 Ratio	Tier 1 capital (shareholder funds plus perpetual non cumulative preference shares) / risk weighted assets & off balance sheet risks.
Equity / Tot Assets	This ratio measures the amount of protection afforded to the bank by the equity they invested in it. The higher values indicate
Equity / Net Loans	This ratio measures the equity cushion available to absorb losses on the loan book.
Equity / Cust & ST Funding	The amount of permanent funding relative to short term potentially volatile funding.
Equity / Liabilities	This leverage ratio is simply another way of looking at the equity funding of the balance sheet and capital adequacy.
Cap Funds / Tot Assets	(Equity + hybrid capital + subordinated debts) / total assets
Cap Funds / Net Loans	(Equity + hybrid capital + subordinated debts) / net loans
Cap Funds / Dep & ST	(Equity + hybrid capital + subordinated debts) / Deposits & Short term funding
Cap Funds / Liabilities	(Equity + hybrid capital + subordinated debts) / total liabilities
Subord Debt / Cap Funds	The percentage of total capital funds provided in the form of subordinated debt.
<u>Performance ratios</u>	
Net Interest Margin	Net interest income to earning assets. The higher this figure the cheaper the funding or the higher the margin.
Net Int Rev / Avg Assets	This ratio is similar to the net interest margin but it is expressed as a percentage of the total balance sheet.
Oth Op Inc / Avg Assets	This ratio indicates to what extent fees and other income represent a greater percentage of earnings of the bank.
Non Int Exp / Avg Assets	Non interest expenses or overheads plus provisions. It measures the costs relative to the assets invested.
Pre-Tax Op Inc / Avg Assets	This is a measure of the operating performance of the bank before tax and unusual items.
Non Op Items & Taxes / Avg	This ratio measures costs and tax as a percentage of assets.
Return On Avg Assets	The returns generated from the assets financed by the bank.
Return On Avg Equity	Measures the return on shareholder funds.
Dividend Pay-Out	Measures the share of post tax profits paid out to shareholders.
Inc Net Of Dist / Avg Equity	The return on equity after deducting the dividends from returns. The increase in equity due to internally generated funds.
Non Op Items / Net Income	The percentage of total net income consisting of unusual items.
Cost To Income Ratio	The overhead costs of running the bank as percentage of income generated before provisions.
<u>Asset quality ratios</u>	
Loan Loss Res / Gross Loans	Indicates how much of the total portfolio has been provided for but not charged off. It is a reserve for losses (% of total loans).
Loan Loss Prov / Net Int Rev	Provisions in the profit and loss account to interest income.
Loan Loss Res / Impair.	Loan loss reserves to nonperforming or impaired loans.
Impaired Loans / Gross Loans	This is a measure of the amount of total loans which are doubtful.
NCO / Average Gross Loans	Net charge offs or the amount written-off from loan loss reserves less recoveries as a percentage of the gross loans.
NCO / Net Inc Bef Ln Lss	Net charge offs to income net of loan loss provisions
Impaired Loans / Equity	Impaired or problem loans as a percentage of the bank's equity.
Unres. Impair. Loans / Equity	Impaired or problem loans not covered by reserves, as a percentage of capital.
<u>Liquidity ratios</u>	
Interbank Ratio	Loans to other banks divided by funds borrowed from other banks.
Net Loans / Tot Assets	The percentage of assets constituting loans.
Net Loans / Dep & ST	Loans to deposits and short term funding.
Net Loans / Tot Dep & Bor	Similar to the ratio above except the denominator includes deposits and total borrowing
Liquid Assets / Dep & ST	The percentage of customer and short term funds that could be serviced if they are withdrawn immediately.
Funding Liquid Assets / Total Debt and Borr	This ratios is similar to the one above but the denominator includes total borrowing.
<u>Macroeconomic variables</u>	
GDP	Gross Domestic Product by Expenditure in Constant Prices. Seasonally adjusted index, 2010=1.
Unemployment	Harmonized unemployment rate. All Persons, seasonally adjusted.
Exchange rate	Annual average and end of period nominal exchange rates expressed as US Dollars per currency.
Deposit rate	Rates offered to resident customers for demand, time, or savings deposits. The rates for time and savings deposits are classified according to maturity and amounts deposited. Deposit money banks and similar deposit-taking institutions may offer short and medium-term instruments at specified rates for specific amounts and maturities; i.e. "certificates of deposit."
Lending rate	The bank rate that usually meets the short- and medium-term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing.
Money market rate	The rate on short-term lending between financial institutions.
T-Bill rate	The rate at which short-term securities are issued or traded in the market.
Central bank policy rate	The rate at which the central banks lend or discount eligible paper for deposit money banks
Equity	Annual index of share prices
<u>Bilateral data</u>	
Currency decomposition	BIS locational banking statistics, currency decomposition of local claims in foreign currency
Share of cross-border lending	BIS locational banking statistics, share of local claims in total claims
Number of reporting banks	BIS locational statistics, number of reporting banks for each country pair

Appendix B. Alternative Specifications (For online publication)

Table B.1. Deviations from asset weighted averages

	eq (7), baseline	eq (9), baseline	eq (7), deviations from asset weighted averages	eq (9), deviations from asset weighted averages		eq (7), baseline	eq (9), baseline	eq (7), deviations from asset weighted averages	eq (9), deviations from asset weighted averages
<u>Capital Adequacy</u>					<u>Performance</u>				
Total Capital Ratio	0.0886		0.0860		Net Interest Margin				0.0296
Tier 1 Ratio	0.1090		0.1062		Net Int Rev / Avg Assets	-0.0357			0.0275
Equity / Tot Assets	0.0502	0.0309	0.0632	0.0284	Oth Op Inc / Avg Assets	0.0311		0.0260	
Equity / Net Loans	0.1153	0.0893	0.1180		Non Int Exp / Avg Assets				0.0304
Equity / Cust & ST Funding	0.0566	0.0331	0.0684		Pre-Tax Op Inc / Avg Assets				
Equity / Liabilities	0.0408	0.0327	0.0514	0.0303	Non Op Items & Taxes / Avg Ast				
Cap Funds / Tot Assets	0.0645	0.0333	0.0658	0.0326	Return On Avg Assets (ROAA)		0.0162		
Cap Funds / Net Loans	0.0895	0.0877	0.0876		Return On Avg Equity (ROAE)	0.0210	0.0142	0.0192	
Cap Funds / Dep & ST Fund.		0.0309		0.0237	Dividend Pay-Out		-0.0156		-0.0164
Cap Funds / Liabilities		0.0351		0.0351	Inc Net Of Dist / Avg Equity	0.0283	0.0140	0.0281	
Subord Debt / Cap Funds					Non Op Items / Net Income				
					Cost To Income Ratio				
<u>Asset Quality</u>					<u>Liquidity</u>				
Loan Loss Res / Gross Loans	-0.0296				Interbank Ratio			0.0199	
Loan Loss Prov / Net Int Rev	-0.0223	-0.0144	-0.0226		Net Loans / Tot Assets	-0.1148		-0.1214	
Loan Loss Res / Impair. Loan	0.0458	-0.0114	0.0419		Net Loans / Dep & ST Fund.	-0.0565		-0.0467	
Impaired Loans/Gross Loans	-0.0615		-0.0536		Net Loans / Tot Dep & Bor	-0.0800		-0.0786	0.0208
NCO / Average Gross Loans					Liquid Assets/Dep & ST Fund.		0.0648	0.0632	-0.0299
NCO / Net Inc Bef Ln Lss P.		-0.0139			Liquid Assets/Tot. Debt & Bor.	0.0971		0.0942	
Impaired Loans / Equity	-0.0429		-0.0370						
Unres. Impair. Loans/Equity	-0.0339	-0.0304	-0.0294						

Notes: This table reports the estimated coefficients of the ratios that are the main independent variables in equations (7) and (9). In the table we only report coefficients that were significant at 10% or less. The coefficients represent the percentage point response of lending to a one standard deviation change in the ratio. The results are shown for both the baseline estimations and those obtained devotional form is computed by using asset weighted averages.

Table B.2. The effects of lending shares

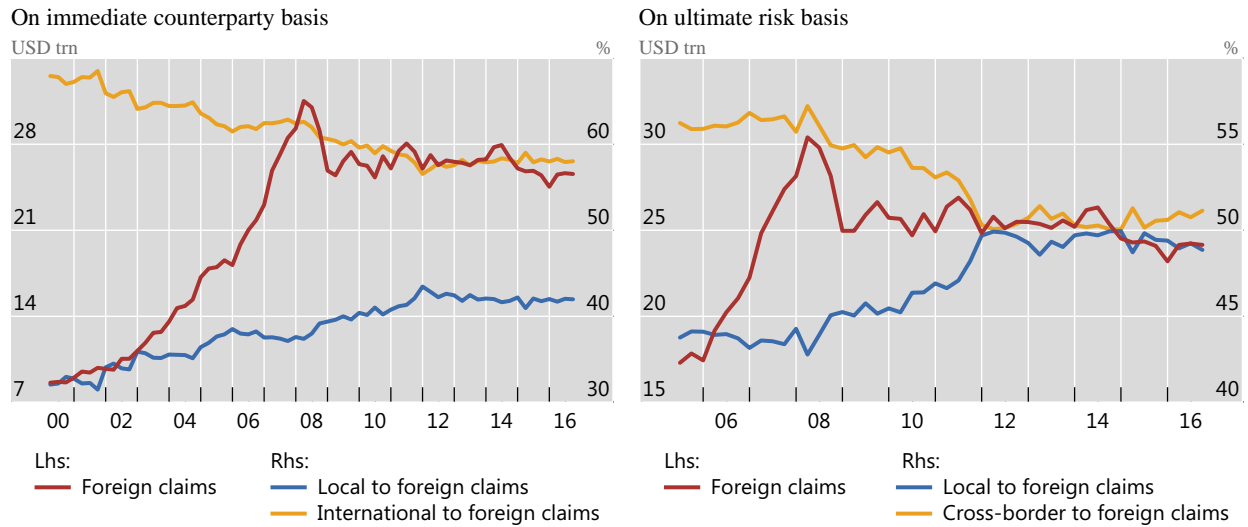
	eq (7), baseline	eq (9), baseline	eq (7), high share	eq (9), high share	eq (7), low share	eq (9), low share		eq (7), baseline	eq (9), baseline	eq (7), high share	eq (9), high share	eq (7), low share	eq (9), low share
GDP	0.0186	0.0159	0.0204		0.0278	0.0263							
Unemployment	-0.0128				-0.0147								
Exchange rate	0.0179		0.0162		0.0225								
Deposit rate	-0.0052		-0.0041		-0.0084								
Lending rate	-0.0223		-0.0176		-0.0310								
Money market rate	-0.0136		-0.0156										
T-Bill rate	-0.0030		-0.0020										
Central bank policy rate													
Equity	0.0226		0.0392		0.0333								
Capital Adequacy													
Total Capital Ratio	0.0886		0.1125		0.0969	0.0048	Performance						0.0362
Tier 1 Ratio	0.1090		0.1276		0.1127		Net Interest Margin						
Equity / Tot Assets	0.0502	0.0309	0.0470		0.0563	0.0616	Net Int Rev / Avg Assets	-0.0357					-0.0344
Equity / Net Loans	0.1153	0.0893	0.0468	0.0649	0.1165	0.1283	Oth Op Inc / Avg Assets	0.0311					0.0293
Equity / Cust & ST Funding	0.0566	0.0331			0.0591	0.0533	Non Int Exp / Avg Assets				-0.0288		
Equity / Liabilities	0.0408	0.0327			0.0720	0.0644	Pre-Tax Op Inc / Avg Assets				0.0445		
Cap Funds / Tot Assets	0.0645	0.0333			0.0913	0.0658	Non Op Items & Taxes / Avg Ast						
Cap Funds / Net Loans	0.0895	0.0877		0.0654		0.1287	Return On Avg Assets (ROAA)	0.0210	0.0162	0.0832			
Cap Funds / Dep & ST Fund.		0.0309				0.0513	Return On Avg Equity (ROAE)		0.0142	0.0405			0.0138
Cap Funds / Liabilities		0.0351				0.0673	Dividend Pay-Out		-0.0156				
Subord Debt / Cap Funds			-0.0346				Inc Net Of Dist / Avg Equity	0.0283	0.0140	0.0320			0.0297
							Non Op Items / Net Income			0.0106			-0.0157
							Cost To Income Ratio						
Asset Quality							Liquidity						
Loan Loss Res / Gross Loans	-0.0296				-0.0443		Interbank Ratio						
Loan Loss Prov / Net Int Rev	-0.0223	-0.0144			-0.0291		Net Loans / Tot Assets	-0.1148		-0.1002			-0.1228
Loan Loss Res / Impair. Loan	0.0458	-0.0114	0.0443		0.0523	-0.0148	Net Loans / Dep & ST Fund.	-0.0565		-0.0824			-0.0366
Impaired Loans/Gross Loans	-0.0615		-0.0475		-0.0746		Net Loans / Tot Dep & Bor	-0.0800		-0.0719			-0.0725
NCO / Average Gross Loans					-0.0222		Liquid Assets/Dep & ST Fund.	0.0648		0.0539			0.0634
NCO / Net Inc Bef Ln Lss P.		-0.0139			-0.0195		Liquid Assets/Tot. Debt & Bor.	0.0971		0.0823			0.0914
Impaired Loans / Equity	-0.0429		-0.0522		-0.0364								
Unres. Impair. Loans/Equity	-0.0339	-0.0304	-0.0451										

Notes: This table reports the estimated coefficients of the ratios that are the main independent variables in equations (7) and (9). In the table we only report coefficients that were significant at 10% or less. The coefficients represent the percentage point response of lending to a one standard deviation change in the ratio. To obtain the results reported under the high (low) share columns, we include the observations for banks that have a lending share above (below) the average lending share of the banks in a given host country.

Figure 1. Growing share of local claims

Local claims as a share of foreign claims

By lending banking system, all reporting countries



Notes: The graph illustrates the share of local and international/cross-border claims in the total foreign claims of internationally active banks headquartered in BIS reporting countries. More detailed information about the data source is available at http://www.bis.org/statistics/about_banking_stats.htm.

Table 1. Descriptive statistics

<u>Bankscope, restricted by BIS banking statistics availability</u>				<u>BIS banking statistics</u>			
Number of owners		53		% of loans loans	USD		0.6518
Number of banks		602			Euro		0.1789
Average # of subsidiaries		19.9			Yen		0.0692
Number of lending countries		18			Other currency		0.3075
Number of borrowing countries	with CBS	95					
	without CBS	35		Local versus foreign currency	local		0.742
Number of country pairs	with CBS	275		loans	foreign currency		0.257
	without CBS	151					
Average # of banks per country pair	whole sample	61.85		Number of lending countries			32
	by year	3.89		Number of borrowing countries	CBS		108
Average ratio of assets (banks/owners)		0.057			LBS		44
				Average # of banks per country pair			5.2380
<u>Main variables in deviational form</u>		<u>Mean</u>	<u>Std. Dev.</u>	Total number of banks			6382
GDP growth	lenders	0.015	0.022	Share of local loans: local/(local+crossborder)	BIS-32 lenders		0.5938
	borrowers	0.029	0.033		Our sample - 18 lenders		
Unemployment	lenders	7.891	3.806	Average exchange rate adjustment (%)			6.6333
	borrowers	7.594	4.135				
Deposit rates	lenders	1.944	1.216				
	borrowers	5.810	5.817				
Total Capital Ratio	lenders	13.190	4.651				
	borrowers	19.747	18.377				
Loan loss reserves / Gross Loans	lenders	3.048	1.971				
	borrowers	3.692	5.109				
ROAE	lenders	10.259	8.938				
	borrowers	10.740	23.283				
Liquid Assets/Deposits & ST	lenders	48.907	30.631				
Funding	borrowers	40.764	47.332				
<u>Borrowing Countries</u>							
Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Bahamas, Bangladesh, Barbados, Belgium, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chad, Chile, China, P.R.: Macao, China, P.R.: Mainland, Colombia, Costa Rica, Cote d Ivoire, Croatia, Czech Republic, Denmark, Egypt, El Salvador, Estonia, Finland, France, Gambia, The, Georgia, Germany, Ghana, Grenada, Guatemala, Guinea, Honduras, Hong Kong, Hungary, Indonesia, Ireland, Italy, Kazakhstan, Kenya, Korea, Republic of, Latvia, Lebanon, Lithuania, Luxembourg, Macedonia, FYR, Madagascar, Malaysia, Malta, Mauritius, Mexico, Moldova, Montenegro, Morocco, Mozambique, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe							
<u>Lending Countries</u>							
Austria, Australia, Brazil, Canada, Switzerland, Germany, Denmark, Spain, France, United Kingdom, Italy, Japan, Korea, Republic of, Netherlands, Portugal, Sweden, Singapore, Turkey, United States							

Notes: This table reports descriptive statistics from our dataset and the BIS banking database, and provides a list of the countries that we include. The definitions of the reported statistics are provided in Appendix A.

Table 2. Subsidiary and host-nation-specific factors

	Macroeconomic variables			Banks' ratios			
	GDP	Unemployment	Deposit rate	Capital Adequacy	Asset Quality	Performance	Liquidity
γ_1^h	0.7437 (0.016)**	-0.1088 (0.0047)***	-0.0031 (0.0071)***	0.0058 (0.000)***	0.0063 (0.0963)*	0.0010 (0.0001)***	0.0016 (0.000)***
$\sum_{k=1}^2 \lambda_k$	-0.0196 (0.3474)	-0.0428 (0.1561)	-0.0151 (0.048)**	0.0417 (0.0017)***	0.0560 (0.0001)***	0.0040 (0.3508)	0.0452 (0.1575)
Owner's capital adequacy	-0.0006 (0.5942)	-0.0008 (0.5969)	-0.0020 (0.3028)	-0.0005 (0.874)	-0.0017 (0.248)	-0.0010 (0.3938)	-0.0019 (0.2374)
Owner's asset quality	0.0026 (0.5999)	0.0021 (0.7015)	0.0008 (0.8672)	-0.0020 (0.584)	0.0017 (0.5826)	0.0019 (0.7482)	0.0030 (0.590)
Owner's performance	-0.0004 (0.4923)	-0.0003 (0.6432)	0.0005 (0.5599)	0.0002 (0.7277)	-0.0003 (0.7185)	-0.0004 (0.4448)	0.0000 (0.941)
Owner's liquidity	0.0005 (0.1108)	0.0007 (0.0557)*	0.0005 (0.2866)	0.0006 (0.2441)	0.0006 (0.1485)	0.0005 (0.1288)	0.0006 (0.094)*
Number of observations	2,881	2,588	1,886	1,668	2,375	3,016	2,993
Hansen test	0.7853	0.7769	0.8908	0.9137	0.9912	0.8717	0.7887
AR2 test	0.5621	0.6295	0.8370	0.7655	0.8960	0.4981	0.4246

Notes: This table reports the results obtained from the estimation of equation (7). Capital adequacy, asset quality, performance and liquidity of both owners and banks are captured by the total capital ratio, loan loss reserves to gross loans ratio, return on average equity and the liquid assets to total deposits and short term funding ratio, respectively. The number is parentheses, and the statistic reported for the Hansen test are the p-values. AR2 test row reports z-values. *, **, *** significant at 10%, 5%, 1%, respectively.

Table 3. Owner IAB and lender-nation-specific factors

	Macroeconomic variables			Owner's ratios			
	GDP	Unemployment	Deposit rate	Capital Adequacy	Asset Quality	Performance	Liquidity
γ_1^l	1.3230 (0.0244)**	-0.0378 (0.6408)	-0.0386 (0.2521)	0.0005 (0.1636)	0.0010 (0.5866)	0.0022 (0.0889)*	-0.0002 (0.613)
$\sum_{k=1}^2 \lambda_k$	0.0347 (0.3983)	0.0369 (0.3732)	-0.0850 (0.6144)	0.0517 (0.1884)	0.0482 (0.187)	0.0429 (0.1814)	0.0531 (0.1625)
Bank's capital adequacy	0.0005 (0.7561)	0.0005 (0.7566)	-0.0009 (0.6404)	0.0022 (0.3039)	0.0021 (0.3202)	0.0021 (0.3145)	0.0022 (0.2983)
Bank's asset quality	0.0063 (0.1619)	0.0062 (0.172)	-0.0060 (0.3702)	0.0051 (0.3877)	0.0054 (0.3534)	0.0050 (0.3701)	0.0050 (0.3849)
Bank's performance	0.0009 (0.000)***	0.0009 (0.000)***	0.0013 (0.1382)	0.0102 (0.2752)	0.0103 (0.2664)	0.0097 (0.2955)	0.0099 (0.2862)
Bank's liquidity	0.0001 (0.773)	0.0001 (0.8133)	-0.0001 (0.792)	-0.0001 (0.8047)	-0.0001 (0.8274)	0.0000 (0.8573)	0.0000 (0.8568)
Number of observations	1535	1535	458	1291	1304	1319	1328
Hansen test	0.9867	0.9738	1.0000	0.9557	0.9534	0.9310	0.9545
AR2 test	0.3569	0.4078	0.5836	0.3765	0.3562	0.3969	0.3737

Notes: This table reports the results obtained from the estimation of equation (9). Capital adequacy, asset quality, performance and liquidity of both owners and banks are captured by the total capital ratio, loan loss reserves to gross loans ratio, return on average equity and the liquid assets to total deposits and short term funding ratio, respectively. The number is parentheses, and the statistic reported for the Hansen test are the p-values. AR2 test row reports z-values. *, **, *** significant at 10%, 5%, 1%, respectively.

Table 4. Other macroeconomic factors

	Deviations across host nations	Deviations across lending nations
GDP	0.7437 (0.016)**	1.3230 (0.0244)**
Unemployment	-0.1088 (0.0047)***	-0.0378 (0.6408)
Exchange rate	0.2413 (0.0042)***	-0.2022 (0.3148)
Deposit rate	-0.0031 (0.0071)***	-0.0386 (0.2521)
Lending rate	-0.1377 (0.0004)***	-0.1025 (0.1302)
Money market rate	-0.0050 (0.0612)*	0.0005 (0.5769)
T-Bill rate	-0.0018 (0.0144)**	0.0003 (0.644)
Central bank policy rate	-0.0152 (0.5053)	0.0121 (0.6044)
Equity	0.1391 (0.079)*	0.0308 (0.7583)

Notes: This table reports the coefficients of the macroeconomic variables in equations (7) and (9) in column 1 and 2, respectively. The number in parentheses are the p-values. *, **, *** significant at 10%, 5%, 1%, respectively.

Table 5. Other financial ratios

	Capital Adequacy					Performance			
	Deviations across host nations		Deviations across lending nations			Deviations across host nations		Deviations across lending nations	
Total Capital Ratio	0.0058	(0.000)***	0.0005	(0.2507)	Net Interest Margin	-0.0058	(0.1584)	0.0266	(0.1325)
Tier 1 Ratio	0.0076	(0.000)***	0.0032	(0.6237)	Net Int Rev / Avg Assets	-0.0118	(0.0179)**	0.0271	(0.1753)
Equity / Tot Assets	0.0051	(0.0461)**	0.0179	(0.0259)**	Oth Op Inc / Avg Assets	0.0065	(0.0303)**	0.0102	(0.3732)
Equity / Net Loans	0.0015	(0.000)***	0.0034	(0.0015)***	Non Int Exp / Avg Assets	-0.0036	(0.3367)	0.0100	(0.3018)
Equity / Cust & ST Funding	0.0018	(0.0015)***	0.0072	(0.0645)*	Pre-Tax Op Inc / Avg Assets	0.0073	(0.2235)	0.0057	(0.7218)
Equity / Liabilities	0.0011	(0.0855)*	0.0160	(0.0186)**	Non Op Items & Taxes / Avg Ast	-0.0038	(0.5286)	0.0404	(0.2098)
Cap Funds / Tot Assets	0.0067	(0.0024)***	0.0157	(0.032)**	Return On Avg Assets (ROAA)	0.0061	(0.3078)	0.0395	(0.0583)*
Cap Funds / Net Loans	0.0012	(0.0001)***	0.0028	(0.0017)***	Return On Avg Equity (ROAE)	0.0010	(0.0001)***	0.0022	(0.0889)*
Cap Funds / Dep & ST Funding	0.0014	(0.2378)	0.0061	(0.0446)**	Dividend Pay-Out	0.0000	(0.8488)	-0.0003	(0.0281)**
Cap Funds / Liabilities	0.0022	(0.1088)	0.0140	(0.0196)**	Inc Net Of Dist / Avg Equity	0.0012	(0.001)***	0.0026	(0.0847)*
Subord Debt / Cap Funds	-0.0010	(0.4006)	-0.0011	(0.4949)	Non Op Items / Net Income	-0.0001	(0.4953)	0.0001	(0.1618)
					Cost To Income Ratio	0.0003	(0.4456)	0.0005	(0.3623)
	Asset Quality					Liquidity			
	Deviations across host		Deviations across lending			Deviations across host		Deviations across lending	
Loan Loss Res / Gross Loans	-0.0063	(0.0963)*	0.0009	(0.6353)	Interbank Ratio	0.0001	(0.1088)	0.0001	(0.4562)
Loan Loss Prov / Net Int Rev	-0.0006	(0.0299)**	-0.0006	(0.0952)*	Net Loans / Tot Assets	-0.0056	(0.000)***	-0.0005	(0.7101)
Loan Loss Res / Impair. Loans	0.0004	(0.000)***	-0.0002	(0.0702)*	Net Loans / Dep & ST Funding	-0.0014	(0.0008)***	-0.0005	(0.3922)
Impaired Loans / Gross Loans	-0.0099	(0.000)***	-0.0060	(0.2468)	Net Loans / Tot Dep & Bor	-0.0028	(0.000)***	0.0010	(0.3539)
NCO / Average Gross Loans	-0.0044	(0.1035)	-0.0007	(0.9558)	Liquid Assets / Dep & ST Funding	0.0016	(0.000)***	-0.0003	(0.5057)
NCO / Net Inc Bef Ln Lss Prov.	0.0000	(0.7367)	-0.0003	(0.083)*	Liquid Assets / Total Debt and Borr.	0.0030	(0.000)***	-0.0004	(0.7661)
Impaired Loans / Equity	-0.0008	(0.000)***	-0.0007	(0.243)					
Unres. Impair. Loans / Equity	-0.0010	(0.0001)***	-0.0022	(0.0504)*					

Notes: To obtain the estimation results in this table we replace our baseline indicators of bank and owner capital adequacy, performance, asset quality and liquidity in equations (7) and (9) with other measures. For each of the four blocks, the first and last two columns report the main independent variable's coefficient in equation (7) and (9), respectively. The number in parentheses are the p-values. *, **, *** significant at 10%, 5%, 1%, respectively.

Table 6. Sensitivity analysis

	Baseline sample		44 countries		Alternative way of accounting for M&A		Unadjusted loan growth rate	
	eq (7)	eq (9)	eq (7)	eq (9)	eq (7)	eq (9)	eq (7)	eq (9)
<u>Macroeconomic variables</u>								
GDP	0.7437 (0.016)**	1.3230 (0.0244)**	1.0021 (0.0858)*	1.6301 (0.0146)**	0.8998 (0.0841)*	2.1435 (0.0045)**	1.0151 (0.000)***	0.6533 (0.0996)*
Unemployment	-0.1088 (0.0047)***	-0.0378 (0.6408)	-0.0970 (0.051)*	-0.0481 (0.6179)	-0.1928 (0.0002)***	-0.2337 (0.0567)*	-0.1524 (0.000)***	-0.0452 (0.3096)
Deposit rate	-0.0031 (0.0071)***	-0.0386 (0.2521)	-0.0031 (0.1359)	-0.0470 (0.1323)	-0.0042 (0.026)**	-0.0894 (0.1143)	-0.0037 (0.0013)***	-0.0229 (0.4032)
<u>Ratios</u>								
Capital Adequacy	0.0058 (0.000)***	0.0005 (0.1636)	0.0054 (0.0001)***	0.0006 (0.1562)	0.0025 (0.0155)**	0.0007 (0.0727)*	0.0033 (0.0017)***	0.0004 (0.4917)
Asset Quality	0.0063 (0.0963)*	0.0010 (0.5866)	0.0087 (0.0499)**	-0.0005 (0.7766)	0.0102 (0.0093)***	0.0025 (0.3717)	-0.0013 (0.5517)	0.0012 (0.5881)
Performance	0.0010 (0.0001)***	0.0022 (0.0889)*	0.0006 (0.083)*	0.0037 (0.0485)**	0.0010 (0.0045)***	0.0023 (0.1033)	0.0006 (0.0389)**	0.0014 (0.0409)**
Liquidity	0.0016 (0.000)***	-0.0002 (0.613)	0.0015 (0.000)***	-0.0002 (0.735)	0.0014 (0.0001)***	-0.0006 (0.3456)	0.0014 (0.000)***	-0.0001 (0.6973)

Notes: This table reports the coefficients of the main independent variables (and their corresponding p-values) in equations (7) and (9) in column 1 and 2, respectively. The p-values are in parentheses. *, **, *** significant at 10%, 5%, 1%, respectively.

Table 7. Sensitivity analysis, continued

	Baseline sample		Accounting for cross-border lending, sample with relatively more local lenders		Accounting for cross-border lending, adjusted loan growth rates		Accounting for the number of banks	
	eq (7)	eq (9)	eq (7)	eq (9)	eq (7)	eq (9)	eq (7)	eq (9)
Macroeconomic variables								
GDP	0.7437 (0.016)**	1.3230 (0.0244)**	0.6945 (0.0279)**	1.4042 (0.080)*	1.1366 (0.0024)***	3.0593 (0.0011)***	0.8592 (0.0114)**	1.8440 (0.0855)*
Unemployment	-0.1088 (0.0047)***	-0.0378 (0.6408)	-0.1072 (0.035)**	-0.0083 (0.9381)	-0.0748 (0.1704)	-0.1739 (0.1032)	-0.1652 (0.0026)***	-0.1382 (0.3346)
Deposit rate	-0.0031 (0.0071)***	-0.0386 (0.2521)	-0.0794 (0.0001)***	-0.1287 (0.0234)**	-0.0060 (0.000)***	0.0174 (0.8159)	-0.0561 (0.0138)**	-0.1448 (0.0718)*
Ratios								
Capital Adequacy	0.0058 (0.000)***	0.0005 (0.1636)	0.0051 (0.0004)***	0.0000 (0.9892)	0.0079 (0.0001)***	0.0010 (0.5685)	0.0088 (0.0001)***	0.0031 (0.6846)
Asset Quality	0.0063 (0.0963)*	0.0010 (0.5866)	0.0071 (0.0808)*	-0.0029 (0.6218)	0.0071 (0.0325)**	-0.0015 (0.8121)	0.0099 (0.0033)***	0.0057 (0.5076)
Performance	0.0010 (0.0001)***	0.0022 (0.0889)*	0.0018 (0.000)***	0.0007 (0.5911)	0.0011 (0.0002)***	0.0006 (0.595)	0.0013 (0.0095)***	0.0022 (0.1544)
Liquidity	0.0016 (0.000)***	-0.0002 (0.613)	0.0018 (0.0169)**	-0.0002 (0.7739)	0.0018 (0.000)***	-0.0001 (0.9043)	0.0015 (0.000)***	-0.0009 (0.2624)

Notes: This table reports the coefficients of the main independent variables (and their corresponding p-values) in equations (7) and (9) in column 1 and 2, respectively. The p-values are in parentheses. *, **, *** significant at 10%, 5%, 1%, respectively.

Table 8. Comparing the economic significance of ratios, subsidiary versus owner

	<u>eq (7)</u>	<u>eq (9)</u>		<u>eq (7)</u>	<u>eq (9)</u>
<u>Capital Adequacy</u>			<u>Asset Quality</u>		
Equity / Tot Assets	0.0502	0.0309	Loan Loss Prov / Net Int Rev	-0.0223	-0.0144
Equity / Net Loans	0.1153	0.0893	Loan Loss Res / Impair. Loans	0.0458	-0.0114
Equity / Cust & ST Funding	0.0566	0.0331	Unres. Impair. Loans / Equity	-0.0339	-0.0304
Equity / Liabilities	0.0408	0.0327	<u>Performance</u>		
Cap Funds / Tot Assets	0.0645	0.0333	Return On Avg Equity (ROAE)	0.0210	0.0142
Cap Funds / Net Loans	0.0895	0.0877	Inc Net Of Dist / Avg Equity	0.0283	0.0140

Notes: This table reports the estimated coefficients of the ratios that are the main independent variables in equations (7) and (9). The coefficients represent the percentage point response of lending to a one standard deviation change in the ratio. The bold italic values are larger in absolute value than their counterparts in the same column pair.

Table 9. Country-level data

	eq (7), baseline	eq (9), baseline	eq (7), country- level data	eq (9), country- level data		eq (7), baseline	eq (9), baseline	eq (7), country- level data	eq (9), country- level data
GDP	0.0186	0.0159	0.0187						
Unemployment	-0.0128								
Exchange rate	0.0179		0.0181	-0.0158					
Deposit rate	-0.0052								
Lending rate	-0.0223		-0.0272						
Money market rate	-0.0136								
T-Bill rate	-0.0030								
Central bank policy rate									
Equity	0.0226								
<u>Capital Adequacy</u>					<u>Performance</u>				
Total Capital Ratio	0.0886				Net Interest Margin				
Tier 1 Ratio	0.1090				Net Int Rev / Avg Assets	-0.0357		-0.0345	
Equity / Tot Assets	0.0502	0.0309			Oth Op Inc / Avg Assets	0.0311			
Equity / Net Loans	0.1153	0.0893	0.0996	-0.0116	Non Int Exp / Avg Assets			-0.0273	
Equity / Cust & ST Fund.	0.0566	0.0331	0.0255	0.0177	Pre-Tax Op Inc / Avg Assets				
Equity / Liabilities	0.0408	0.0327			Non Op & Taxes/Avg Ast			0.0154	
Cap Funds / Tot Assets	0.0645	0.0333	-0.0151		Return On Avg Assets (ROAA)		0.0162	0.0321	
Cap Funds / Net Loans	0.0895	0.0877		-0.0121	Return On Avg Equity (ROAE)	0.0210	0.0142	0.0329	
Cap Funds/Dep & ST Fund.		0.0309		0.0207	Dividend Pay-Out		-0.0156		
Cap Funds / Liabilities		0.0351			Inc Net Of Dist / Avg Equity	0.0283	0.0140	0.0222	
Subord Debt / Cap Funds					Non Op Items / Net Income			-0.0108	
					Cost To Income Ratio				
<u>Asset Quality</u>					<u>Liquidity</u>				
Loan Loss Res/Gross Loans	-0.0296		-0.0464	0.0090	Interbank Ratio				
Loan Loss Prov/Net Int Rev	-0.0223	-0.0144	-0.0320		Net Loans / Tot Assets	-0.1148		-0.0837	
Loan Loss Res/Impair. Loans	0.0458	-0.0114			Net Loans / Dep & ST Fund.	-0.0565		-0.0649	
Impaired Loans/Gross Loans	-0.0615		-0.0534		Net Loans / Tot Dep & Bor	-0.0800		-0.0346	
NCO / Average Gross Loans					Liquid Assets/Dep & ST Fund.	0.0648		0.0322	
NCO/Net Inc Bef Ln Lss P.		-0.0139			Liquid Assets/Tot. Debt & Bor.	0.0971		0.0345	
Impaired Loans / Equity	-0.0429		-0.0298						
Unres. Impair. Loans/Equity	-0.0339	-0.0304	-0.0207						

Notes: This table reports the estimated coefficients of the ratios that are the main independent variables in equations (7) and (9). In the table we only report coefficients that were significant at 10% or less. The coefficients represent the percentage point response of lending to a one standard deviation change in the ratio. The results are shown for both the baseline estimations and those obtained by using country-level data.

Table 10. An alternative specification of the main independent variables

	eq (7), baseline	eq (9), baseline	eq (7), w/o dev. form	eq (9), w/o dev. form		eq (7), baseline	eq (9), baseline	eq (7), w/o dev. form	eq (9), w/o dev. form
GDP	0.0186	0.0159							
Unemployment	-0.0128		-0.0092						
Exchange rate	0.0179		0.0140	-0.0128					
Deposit rate	-0.0052		-0.0041						
Lending rate	-0.0223		-0.0209						
Money market rate	-0.0136								
T-Bill rate	-0.0030		-0.0028						
Central bank policy rate									
Equity	0.0226			-0.0140					
<u>Capital Adequacy</u>					<u>Performance</u>				
Total Capital Ratio	0.0886		0.0678						0.0350
Tier 1 Ratio	0.1090		0.0581	-0.0117	Net Int Rev / Avg Assets	-0.0357		-0.0325	0.0333
Equity / Tot Assets	0.0502	0.0309	0.0500		Oth Op Inc / Avg Assets	0.0311		0.0344	
Equity / Net Loans	0.1153	0.0893	0.1251		Non Int Exp / Avg Assets				0.0265
Equity / Cust & ST Funding	0.0566	0.0331	0.0765		Pre-Tax Op Inc / Avg Assets				
Equity / Liabilities	0.0408	0.0327			Non Op Items & Taxes / Avg Ast				
Cap Funds / Tot Assets	0.0645	0.0333	0.0657		Return On Avg Assets (ROAA)		0.0162		
Cap Funds / Net Loans	0.0895	0.0877	0.1081		Return On Avg Equity (ROAE)	0.0210	0.0142	0.0229	
Cap Funds / Dep & ST Fund.		0.0309			Dividend Pay-Out		-0.0156		-0.0127
Cap Funds / Liabilities		0.0351			Inc Net Of Dist / Avg Equity	0.0283	0.0140	0.0339	
Subord Debt / Cap Funds					Non Op Items / Net Income				
					Cost To Income Ratio				0.0184
<u>Asset Quality</u>					<u>Liquidity</u>				
Loan Loss Res / Gross Loans	-0.0296		-0.0362		Interbank Ratio				
Loan Loss Prov / Net Int Rev	-0.0223	-0.0144	-0.0233		Net Loans / Tot Assets	-0.1148		-0.1201	
Loan Loss Res / Impair. Loan	0.0458	-0.0114	0.0439		Net Loans / Dep & ST Fund.	-0.0565		-0.0742	
Impaired Loans/Gross Loans	-0.0615		-0.0537		Net Loans / Tot Dep & Bor	-0.0800		-0.0756	
NCO / Average Gross Loans			-0.0467		Liquid Assets/Dep & ST Fund.	0.0648		0.0655	
NCO / Net Inc Bef Ln Lss P.		-0.0139			Liquid Assets/Tot. Debt & Bor.	0.0971		0.1065	
Impaired Loans / Equity	-0.0429		-0.0445						
Unres. Impair. Loans/Equity	-0.0339	-0.0304	-0.0352						

Notes: This table reports the estimated coefficients of the ratios that are the main independent variables in equations (7) and (9). In the table we only report coefficients that were significant at 10% or less. The coefficients represent the percentage point response of lending to a one standard deviation change in the ratio. The results are shown for both the baseline estimations and those obtained by not transforming the main independent variables to their deviational form.