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The Role of Foreign Banks in Monetary Policy Transmission: Evidence from Asia during the Crisis of 2008-9*

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Abstract

Since the 1997-8 Asian financial crisis, the level of foreign bank penetration has increased steadily in Asian banking markets. This paper examines the impact of foreign banks on the monetary policy transmission mechanism in emerging Asian economies during the period from 2000 to 2009, with a specific focus on the global financial crisis of 2008-9. We present consistent evidence that, on the whole, an increase in foreign bank penetration weakened the effectiveness of the monetary policy transmission mechanism in the host emerging Asian countries during crisis periods. We also investigate various conditions and environments, including the type of monetary policy shocks, the severity of shocks upon parent banks in global crisis, the dependence of parent banks on the wholesale funding market, the country of origin of foreign banks, and entry modes, under which the effectiveness of monetary policy transmission is reduced more severely due to the increasing presence of foreign banks in the emerging Asian banking markets.

Keywords: Foreign Bank Penetration, Monetary Policy Transmission, Asian Banking

JEL Classification: E44, F43, G21

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1. Introduction

Since the 1997-8 Asian financial crisis, the banking system and domestic financial sectors in Asia have experienced significant structural changes and global integration. Domestic banks in Asia have become more consolidated, while they have faced more intensive competitive pressure from domestic and abroad. Through the efforts of opening up and international financial integration, with the policy recommendation from the International Monetary Fund, the presence of foreign banks has steadily increased. Between 1994 and 2009, emerging Asian banking markets have seen an increase in the level of foreign bank penetration from 17 percent to 25 percent when measured by the share of bank assets held by foreign banks, and from 26 percent to 43 percent when measured by the ratio of the number of foreign banks to the total number of banks in the host country.[1]

The recent global financial crisis of 2008-9 provides the first significant test for evaluating the stabilizing/destabilizing role of foreign banks in emerging Asia after experiencing a steady and substantial increase in foreign ownership in their banking sectors (Vogel and Winkler, 2011). Foreign banks are expected to enhance the financial stability of the host banking sector by providing an additional source of financing for lending. However, during the recent global financial crisis, it has been observed that many local subsidiaries of foreign banks in Asia reduced their credit by a larger extent than their domestic counterparts. The average growth rate of loans from foreign bank subsidiaries fell from 18.6% in 2007 to -4.0% in 2009, while domestic banks only from 15.4% to 5.1% (see Figure 1).[2] Meanwhile, foreign banks' cross-border lending to Asian economies also decreased substantially during the 2008-9 crisis period (Figure 2). Since the collapse of Lehman Brothers in September 2008, foreign banks' cross-border claims to Asian economies were reduced by 127 billion dollars in six months, among which the shrinkage of the funds to Asian banks amounted to 69 billion.[3]

This paper examines the impact of increased foreign bank penetration on the monetary policy transmission mechanism in emerging Asian economies during the period from 2000 to 2009, with a specific focus on the recent global financial crisis. We specifically focus on the bank lending channel as the monetary policy transmission mechanism in seven Asian economies, namely, Hong Kong SAR, Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand.[4] Estimating the loan growth equation and loan interest rate equation using the bank-level panel data, both of which control for bank-specific characteristics and demand factors, allows us to identify the different effects of changes

[1] These ratios of foreign bank penetration are obtained from *BankScope* for selected emerging Asian economies, which include Hong Kong SAR, Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand. See Appendix 1.

[2] The deeper reduction of foreign banks credit seems to be decoupled from the change in their deposits. In 2009, thanks to the expansionary monetary policy across Asian economies, foreign banks' deposits actually increased by 4.28% on average, although it is lower than domestic banks' average growth rate of 6.35%.

[3] For a description on how Asian banking markets were affected by the financial turmoil in 2007, see McCauley and Zukunft (2008).

[4] The bank lending channel was pioneered by Bernanke and Blinder (1988, 1992) and further explored by Kashyap and Stein (1995, 2000), Kieshan and Opiela (2000), Gambacorta (2005), Cetorelli and Goldberg (2008), and many others.

in host country monetary policy on lending by domestic banks and foreign banks operating in host countries through the supply-side bank lending channel. In our study, we adopt different types of bank ownership—domestically owned vs. foreign owned—as an important factor of bank-specific characteristics affecting the capacity of financing for loans, along with other bank-specific characteristics, including liquidity, capitalization, bank size, profitability, and levels of riskiness.

Using the Asian data in the banking sector provides unique opportunities for us to investigate the role of foreign banks in monetary policy transmission in an environment where, first, the presence of foreign banks has increased steadily since the 1997 Asian financial crisis; second, global foreign banks and regional foreign banks coexist in the region; and third, banks play an important role in transmitting monetary policy to the host economies and facilitating project financing and economic growth. In contrast to emerging Asia, the banking sector in Eastern Europe is too dominated by foreign banks over the weak presence of domestic banks, and in Latin America foreign banks have not been affected significantly, compared to other regions, by the recent global financial crisis.[5]

The main contributions of this paper are, first, to present consistent evidence on the buffering impact of foreign banks on the effectiveness of the monetary policy transmission mechanism from the bank-lending channel perspective in emerging Asian economies during the period of global financial crisis, and second, to identify specific conditions and environments under which that impact works more fully in the host banking markets. The specific conditions and environments include the type of monetary policy shocks, the severity of shocks upon parent banks during global financial crisis, the dependence of parent banks on wholesale funding markets, the country of origin of foreign banks, and their entry modes to host banking markets. The main findings are robust to various alternative samples, measurements, and conditions. We also expect that the main findings of this paper will have useful policy implications for monetary authorities and bank regulators to minimize the adverse effects of the increasing presence of foreign banks on the stability and effectiveness of monetary policy in the Asian region.

The remainder of this paper is organized as follows. Section 2 reviews the related literature on the role of foreign banks in emerging economies. Section 3 describes the model, data and methodology used in the study. Section 4 reports and discusses the empirical results, followed by robustness checks in section 5. Section 6 concludes.

2. The Related Literature on the Role of Foreign Banks

The accurate assessment of the impact of the increased foreign bank penetration into host emerging economies has been an important issue and has been called for by academicians as well as policymakers. In particular, the volatility in the access to foreign credit at the time of credit contraction

[5] For the differences in the bank ownership structure between banks in the Asia-Pacific region and those in other regions including North America, Europe, Latin America and Africa, see Hossain et al. (2013).

in host countries brings up legitimate concerns about the advantages and disadvantages of foreign bank presence in host economies. The host economies in crisis would need credit expansion in a swift and efficient manner to bail them out from the adverse international contagion effect of credit crunch spilled over from the origin country of financial turmoil. Under these circumstances, the host monetary authorities are expected to conduct expansionary monetary policy. They should be well aware of the impact of foreign banks on the efficiency of the monetary policy transmission mechanism, in particular, during crisis periods to achieve specific objectives of monetary policy in the host economies.

The proponents of foreign bank entry argue that foreign banks enhance competition in domestic banking markets, improve the efficiency of domestic bank operations, provide financial services with lower costs, and play a positive role in economic growth by boosting the efficiency of resource allocation (e.g., Clasessens et al. (2001), Crystal et al. (2002), Clasessens and Laven (2005), Claessens and van Horen (2009), Wu et al. (2010), and Jeon et al. (2011)). They also argue that foreign banks do not destabilize domestic banking markets nor distract the monetary policy transmission mechanism to a significant degree. They extend their argument further that foreign banks play a positive role to mitigate the credit crunch and banking crisis in host countries by bringing in additional liquidity from their headquarters in the home country (see, for example, De Haas and Lelyveld (2010)).

The opponents of the growing role of foreign banks are concerned that foreign banks lack hard information on the credit worthiness of smaller-size borrowers in local markets, tend to have higher interest margins and profitability than domestic banks in developing countries, and lead domestic banking markets to lower competition. They are also concerned about a sudden stop or reversal of capital and credits during difficult times, especially when the parent banks in home countries suffer from the credit crunch or capital loss. They present evidence that foreign banks are a major channel of the financial shock transmission or contagion, and pose a significant challenge to the effectiveness of monetary policy in host economies (see, for example, Cetorelli and Goldberg (2012a, 2012b) and Jeon et al. (2013)).

However, extant literature reports only scarce (and even mixed) empirical evidence on the impact of foreign banks on the effectiveness of the monetary policy transmission in host economies. Wu et al. (2011) find evidence that foreign banks, compared to domestic counterparts, are less sensitive to changes in the host monetary policy in adjusting their loans and interest rate, even after controlling for the heterogeneity in liquidity, capitalization, size and cost efficiency at the individual bank level. Arena et al. (2007) also find difference between domestic and foreign banks in the loan growth rate and the lending interest rate in response to changes in monetary policy, but only as significant among lower liquid and capitalized banks. In addition, the research on the impact of foreign bank presence on the monetary policy transmission concentrates on Central and Eastern Europe and Latin America, but is still scanty for emerging Asian economies.

A few recent papers have ascribed the insensitivity of foreign bank subsidiaries to host monetary policies, relative to domestic banks, to their parent banks' global-wide liquidity and assets management, especially when the global banks are hit by various forms of financial stress. For example, the intra-group capital flows from U.S. banks' affiliates abroad to their head offices increased (or flows from head offices to their foreign affiliates decreased) when the liquidity condition is tightened in the U.S., as shown by Cetorelli and Goldberg (2010, 2011, 2012b). It was also reported that in 2008 and 2009, the U.S. branches of foreign banks used the Fed discount window actively to raise funds and channeled them back to their parent banks, thus alleviating the degree to which parent banks had to be engaged in "fire-sale" of assets to meet their liquidity demand. As a matter of fact, these reversed capital flows (from subsidiaries to parents) were not rare at the time of home crisis when head offices' uncertainty regarding their ability to meet capital requirement and maintain liquidity increased substantially.[6]

Cross-border bank capital flows to emerging market economies were reversed considerably during the periods starting from the fall of Lehman Brothers to the second quarter of 2009. Foreign bank subsidiaries conduct assets transfer back to their parent banks through intra-group deposits and loans, off-balance sheet transactions, income flow (such as dividend), and internal transactions of other financial instruments, as reported by Vogel and Winkler (2011), Allen et al. (2011), and Giannetti and Laeven (2012).[7]

This upstreaming capital flow raises a question regarding the potency of host monetary policy, particularly the generally adopted expansionary policy in the context of the 2008-09 financial turbulence. Furthermore, if multinational banks had reallocated, on a global basis, their liquidity and assets more concentratively toward their headquarters and reduced credit in host markets, the expansion in host money supply would have generated only less pronounced outcomes, particularly in the economies with higher foreign bank presence. Using aggregated data, Milesi-Ferretti and Tille (2011) observe that banks in advanced economies pull back their foreign investment remarkably during the global crisis period. This is done through both retrenching cross-border lending and oversea affiliates' activities in host countries, although the withdrawal via the latter displays a lower extent than the former. In emerging Asian markets, Mihaljek (2010) documents that using aggregated national-level data, banks reduced the growth of new loans and increased the holding of foreign bonds in 2009.

[6] Alternative reasons why multinational banks withdraw capital from oversea subsidiaries during crisis periods include that financial stress may cause banks less able to evaluate the creditworthiness of foreign borrowers, and as a result, engenders less foreign loans or a reversion of loans to domestic markets. Banks may also increase the share of domestic assets, by transferring resources from abroad, in order to increase the likelihood of being benefited from government bailout (Giannetti and Laeven (2011)).

[7] Vogel and Winkler (2011), and some others, also find that the reverse of cross-border bank capital flows is not homogeneous across regions. Foreign banks in Eastern and Central Europe is found to be less affected by the shock on their parent banks' balance sheet, in contrast to foreign banks in other emerging market economies.

Our paper aims to fill the gap in the literature by using bank-level panel data and investigating the impact of increased foreign bank penetration on the monetary policy transmission mechanism in emerging Asian economies during the period from 2000 to 2009. We put a specific focus on loan growth and the adjustments of loan interest rates by foreign banks, compared to domestic banks, during the recent global financial crisis.

3. The Model, Data and Econometric Methodology

3.1 The Model

We adopt the bank lending channel model for the estimation as follows:

$$
\begin{aligned}
Y_{i,j,t} = {} & c + \alpha \cdot Y_{i,j,t-1} + \beta \cdot mp_{j,t} + \chi \cdot crisis + \delta \cdot foreign_{i,j,t} + \phi \cdot mp_{j,t} \times crisis \\
& + \varphi \cdot foreign_{i,j,t} \times crisis + \gamma \cdot foreign_{i,j,t} \times mp_{j,t} + \eta \cdot foreign_{i,j,t} \times mp_{j,t} \times crisis \\
& + \lambda \cdot characteristics_{i,j,t} + \mu \cdot characteristics_{i,j,t} \times mp_{j,t} + \theta \cdot characteristics_{i,j,t} \times mp_{j,t} \times crisis \\
& + \rho \cdot hostmacro_{j,t} + f_{i,j} + \varepsilon_{i,j,t}
\end{aligned}
$$

where $Y_{i,j,t}$ represents the growth rate of loans (in real terms, loan growth equation) or the change in loan interest rates (loan rate equation) of bank *i* in country *j* in year *t*, and $Y_{i,j,t-1}$ is its one-year lag. $mp_{j,t}$ is the monetary policy shock of country *j* in year *t*, measured by the first-order difference of money market rates in year *t* relative to the previous year. A positive figure in $mp_{j,t}$ indicates a tightened monetary policy, while a negative value suggests that the central bank eases money supply. *crisis* is the dummy of global financial crisis in the year 2008-09, taking the fall of Lehman Brothers in September 2008 as the milestone of crisis. $foreign_{i,j,t}$ represents an ownership dummy, which is equal to 1 if bank *i* in country *j* is foreign owned in year *t*, and 0 otherwise. $characteristics_{i,j,t}$ is a vector of individual bank characteristics, including *liquidity*, *capitalization*, *size*, *riskiness* and *profitability*. To mitigate concern on the potential endogeneity between the dependent variable and bank characteristics, we use one-year lag values of the bank characteristics variables. $hostmacro_{j,t}$ includes a set of variables measuring the macroeconomic condition and the banking sector structure in the host Asian countries in our sample. $f_{i,j}$ is the time-invariant bank-specific effect, and $\varepsilon_{i,j,t}$ is the idiosyncratic error.

Following the literature of the bank lending channel, which suggests that banks play a non-neutral role in transmitting monetary policy, we expect the sign of the coefficient on $mp_{j,t}$ to be negative in the loan growth equation, implying that banks would reduce (increase) their lending in response to a tightened (relaxed) monetary policy due to their limited capacity to compensate for the reduced resources for lending after a contractionary monetary policy. We also expect that the coefficient on $mp_{j,t}$ in the loan rate equation has a positive sign, which implies that changes in interest rates by monetary authority are transmitted to changes in loan rates offered by individual commercial banks under its purview.

We introduce the following interaction terms to the estimation equation to detect the marginal effects of monetary policy conditional on the economic stress and bank ownership. We expect that $mp_{j,t}$×*crisis* will reflect the differences in the effectiveness of monetary policy during the 2008-09 crisis period relative to non-crisis, tranquil periods. The coefficient on $foreign_{i,j,t}$×$mp_{j,t}$ will indicate if foreign banks show different responses to changes in monetary policy from domestic banks during non-crisis periods. In order to examine foreign banks' distinctive behavior in adjusting loan granting and loan interest rates during crisis periods from domestic banks, independent of host countries' monetary policy, we add the interaction term, $foreign_{i,j,t}$×*crisis*.

We also include a 3-way interaction term, $foreign_{i,j,t}$×$mp_{j,t}$×*crisis*, to examine if foreign banks respond differently to changes in monetary policy during the 2008-09 crisis period. If global banks use internal capital markets to manage their assets and liquidity on a global scope and reallocate assets toward headquarters during the 2008-09 crisis period, we expect the sign of the coefficient on $foreign_{i,j,t}$×$mp_{j,t}$×*crisis* would be positive in the loan growth equation and negative in the loan rate equation. We interpreted it as the evidence that foreign banks only adjust their lending and price at a lower magnitude than their domestic peers, thus dampening the potency of the host monetary policy.

Since foreign banks may behave differently from domestic banks simply because of their different bank characteristics, say, *liquidity, capitalization,* and *size*, we include in our model the variables of bank-specific characteristics, separately and interactively with monetary policy and the crisis dummy. As the literature of the bank lending channel suggests, banks that are more liquid, more capitalized and larger in size would be less responsive to monetary policy shock due to their capacity of access to alternative options for financing loans.

In addition to the above three most frequently cited bank characteristics, we also add the *riskiness* and *profitability* of individual banks and their interactions with monetary policy and crisis in the model. Banks facing more risky borrowers may be more aggressive to expand their loans (in order to compensate for their potential loss) when central banks increase the interest rate, thus offsetting the effectiveness of monetary policy. Banks with higher profitability, either due to owning more sophisticated management or serving clients with higher creditworthiness, are expected to have more stable financing sources and abilities to buffer the adverse effects of monetary policy shocks. To isolate foreign banks' distinctive responses to changes in monetary policy during the global crisis period, independent of their different bank characteristics, we interact the bank characteristics variables with $mp_{j,t}$ and *crisis*.

In order to control for the demand-side effects on bank credit, we use a vector of host country macroeconomic variables, $hostmacro_{j,t,}$, which includes the real GDP growth rate and unemployment rate. Since banks' lending can also be affected by the banking sector structure, we also include market structure variables, including the financial depth variable, measured by the ratio of bank credit to the private sector to GDP, and the banking market concentration variable, measured by the Herfindal-Hirschman index (HHI) in each of the host Asian banking markets.

3.2 Data

We construct an unbalanced panel dataset using both bank-level data and macroeconomic data. The bank-level data are from Bureau van Dijk's *BankScope* database, which contains financial information (balance sheet data, income and expenses, ratios, and other annual financial data) on over 28,000 banks worldwide and covers on average more than 90 percent of banking sector assets worldwide.[8] We include only commercial banks in Asia in the dataset to reduce the possible bias due to the different nature and business scope among banks that have different objectives and conduct businesses in different specializations. The selected economies from Asia include: Hong Kong SAR, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand, all of which have witnessed a high or an increasingly higher degree of foreign bank penetration among Asian countries. We use annual data for the period 2000 to 2009. The reason for starting at the year 2000 is to minimize the effects caused by the turmoil of the 1997-99 Asian financial crisis. We report the number of domestic and foreign banks in our data set and the level of foreign bank penetration, measured in terms of both assets and number, in Appendix 1.

A bank is defined as "foreign" if more than 50 percent of its capital is owned by foreign banks, firms or individuals.[9] To identify foreign-owned banks, we resort to various sources in addition to *BankScope*, taking the following steps. First, we check the brief overview of each bank recorded in *BankScope*, which identifies ownership for only some banks for limited years. Second, we review each bank's history from its own website. Third, we obtain banks' mergers and acquisitions (M&A) information using the *SDC Platinum* database. Finally, if ownership has not yet been identified after following these three steps, we resort to various other sources available, such as banks' annual reports, central banks' publications, and news reports from the Internet. The list of parent banks and their subsidiaries operating in our selected Asian countries is shown in Appendix 2.

The constructions of other variables are quite standard by following the literature. The volume of loan is adjusted by using CPI to get its real value, and its growth rate is approximated by the first-order difference of its natural logarithms. We calculate the loan interest rate using end-of-year interest income divided by total earning assets, and then obtain their first-order differences to measure the banks' adjustment of their loan price.[10] Liquidity is calculated as the ratio of liquid assets to total assets, and capitalization is measured by the ratio of equity to total assets. The size in our model

[8] In the literature, the quality of *BankScope* data has been assessed as overall good. For example, using 1999 as a reference year, Cunningham (2001) observes that in 15 of 19 emerging market economies, *BankScope* data covers more than 90 percent of the total banking sector assets. The countries considered for the assessment are Argentina, Brazil, Chile, Colombia, Venezuela, Mexico, China, India, Indonesia, Korea, Malaysia, the Philippines, Taiwan, Thailand, the Czech Republic, Hungary, Poland, Russia and Turkey, many of which overlap with our country data set of Asia.

[9] Most of the foreign banks in our dataset are foreign-owned subsidiaries. See Appendix 2 for the list of foreign banks in Asia in our data set.

[10] We are aware that the calculated loan interest rate is only an ex-post measure of banks' price of loans, but unfortunately, contractual (ex-ante) loan interest rates for individual banks are not reported in the *BankScope,* and the ex-post rates are only imperfect measures of the ex-ante rates, although they are highly correlated, as discussed in other studies.

captures the relative dominance (share) of banks in banking markets, calculated as the ratio of a bank's assets to the entire banking sector assets in a host economy. Alternatively, we replaced this relative measure of size by an absolute measure, the natural log of assets (converted to constant US dollars), but our main results do not change. Riskiness is measured by using the ratio of loan loss provision to total loans, and profitability is represented by return on assets (ROA). HHI, as a measure of banking market competitive structure, is calculated as the sum of the square of an individual bank's market share over all banks in a national banking market.

In order to mitigate the effects of abnormally extreme and irregular values on the estimates, we drop the highest and lowest 1st percentile of total assets, growth rates of loans, liquidity, capitalization, riskiness and profitability. Additionally, we also remove the banks without at least 3 consecutive yearly observations. As a result, our dataset is composed of 1570 bank-year observations covering a total of 223 banks.

Before we proceed to estimate the econometric model, it is worthwhile to conduct a simple analysis on the difference between foreign and domestic banks in Asian economies (Appendix 3). Domestic banks are observed to provide loans at a higher growth rate than foreign banks in terms of both mean and median. However foreign banks, although smaller in their market size, have higher liquidity and capitalization ratios and earn higher profits than their domestic counterparts. The identified distinction between foreign banks and domestic banks in their bank characteristics confirms the necessity to control for these factors in order to isolate foreign banks' different behavior caused by their foreign ownership. Since some of the bank characteristics variables may be correlated with each other, they may generate the problem of multicollinearity if included in the model simultaneously. Accordingly we examine the pair-wise correlation between the bank characteristics variables, and do not observe substantially high correlation coefficients between these variables, which indicates little evidence on multicollinearity.

3.3 Econometric Methodology

We estimate our empirical model using two alternative econometric methodologies, the fixed effects estimator and the system GMM estimator. In all estimations, we control for a full set of year-specific effects, and in the system GMM estimation we also control for the host country-specific effects.

The choice of fixed effects estimators is based on the Hausman test, which justifies that fixed effects are preferred over random effects because the regressors are shown to be correlated with the bank-specific variables. However, including the lagged dependent variable in the fixed effects estimation may cause inconsistent estimators when the time dimension is limited (Nickell, 1981). Accordingly, we drop the first-year lag of dependent variable in the fixed effects estimation.

To obtain unbiased, consistent and asymptotically efficient coefficients of the dynamic specification model which has a lagged dependent variable among the regressors, as in our cases of the loan

growth equation and the loan rate equation, we need to correct the possible endogeneity issue. To this end, we adopt the system GMM estimator, following the methodology developed by Arellano and Bover (1995) and Blundell and Bond (1998), and use both level and differenced equations for estimation. It also instruments the lagged dependent variable by using lagged differences for the level equation and lagged levels for the differenced equation. We also obtain robust standard errors to correct for the heteroskedasticity across banks in the panel.[11] Because the system GMM estimator requires no autocorrelation in the idiosyncratic errors, we test the first- and second-order autocorrelation in the first-differenced errors. We find that they are first-order serially correlated but not second-order serially correlated in most tests. This supports the moment conditions used by the system GMM estimator as valid. To test whether the instruments are as a group exogenous, we perform Hansen's *J*-test for over identifying restrictions, and find that in almost all tests the null of the valid model cannot be rejected.

4. Empirical Results

4.1 Benchmark Estimations

We first examine how individual banks adjust their lending and loan interest rates in response to changes in monetary policy. Using the fixed effects estimator and the system GMM estimator, we estimate the loan growth equation and the loan rate equation. The estimation results for these two equations are reported in Tables 1 and 2.

As reported in Table 1, the benchmark estimations of the loan growth equation fit the data relatively well and the estimation results overall are reasonable. The coefficients on control variables, including bank characteristics and host country macroeconomic conditions and market structure, have expected signs with statistical significance overall. First, bank characteristics are shown to play important roles in determining a bank's loan growth, in particular, its liquidity and capitalization. A bank with higher liquidity and larger capitalization tends to increase its loans at a higher growth rate.[12] In line with Kishan and Opiela (2000) and Gambacorta (2005), we also find some evidence that the effects of monetary policy on bank loans are conditional on banks' capitalization. Undercapitalized banks seem to be more responsive to monetary policy shocks in adjusting the volume of their lending than well-capitalized banks.[13] However, we do not find any evidence that banks' characteristics may play a

[11] Clustering the standard errors at the country level and year may be useful (Petersen 2009), as suggested by the referee.

[12] We find no conclusive evidence on the relevance of other bank characteristics to banks' credit provision. Although the coefficient on size is negative and statistically significant in the fixed effects estimation, suggesting that large banks tend to have only a lower credit growth, the sign of the coefficient turns out to be positive and statistically insignificant in the system GMM estimation. Highly profitable banks also seem to increase their loans more than less profitable banks, but this is only supported by the positive and statistically significant coefficients on profitability in the fixed effects estimation. In the system GMM estimation, the statistical significance disappears and even the sign of the coefficient becomes reversed when all interaction terms are included.

[13] The coefficient on the interaction term, *capitalization*×*mp*, in the loan growth equation estimation is highly statistically significant in the fixed-effects estimation and only marginally not significant in the system GMM estimation. However, the

distinctive role in the impacts of monetary policy on banks' lending during the 2008-9 global financial crisis period. Second, macroeconomic conditions are shown to play a role in affecting a bank's loan growth in Asia. The higher the real GDP growth rate, the faster a bank's loan growth. But, the higher the unemployment rate, the slower a bank's loan growth. These macroeconomic variables control for the demand-side effect in determining a bank's loan growth at the macroeconomic level in host banking markets.

A negative sign of the coefficient on the foreign bank variable implies that loan growth is slower for foreign banks than for domestic banks. Negative coefficients on the interaction variable between *foreign* and *crisis* also imply that foreign banks' slow growth of loan becomes even slower during crisis periods. However, these interpretations need some caution because these coefficients are not statistically significant.[14]

We next focus our discussion on the estimates of the loan growth equation associated with monetary policy and the heterogeneous impacts of monetary policy on domestic and foreign banks. First, we find evidence, as shown in Table 1, that banks reduce (increase) their credit in reaction to contractionary (expansionary) monetary policy. The coefficient on *mp* is negative and statistically significant in most of our estimations. As central banks tighten their money supply which leads to an increase in money market rates, banks tend to cut down the growth of their loans. In emerging and developing economies where firms are usually heavily dependent on banks to finance their investment, changes in monetary policy would greatly affect the credit available for firms and then impact their real output activities.

Second, during the *tranquil* periods, we do not find significant evidence that foreign banks differ from domestic ones in adjusting their loans in response to changes in monetary policy. The coefficient on *foreign×mp* shows mixed signs when using different estimation methodologies, and is not statistically significant in most of the regressions.

Third, the 3-way interaction term, *foreign×mp×crisis*, which is our most interested variable, shows a positive sign consistently in the estimation of the loan growth equation, and is statistically significant in almost all estimations.[15] This finding implies that foreign banks are less sensitive to monetary policy in

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coefficient on *capitalization×mp* is shown to be positive in the regression of the loan rate equation, suggesting more capitalized banks tend to charge higher prices to clients in the time of contractionary monetary policy.

[14] The coefficient on *foreign×crisis* detects foreign banks' distinctive behavior during the crisis period, independent of the change in host monetary policy. The coefficient is found consistently negative, although statistically insignificant, when using the growth rate of loans as the dependent variable. This seems to imply that foreign banks would retrench their credit during the 2008-9 global financial crisis period, even host monetary policy had not been changed. This finding may suggest foreign banks' increasing caution when they depend on potential borrowers' "hard information" to provide credit (Mian (2003)).

[15] Since banks' characteristics may be highly correlated to each other, we also experimented to introduce the interaction terms of *characteristics* × *mp* × *crisis* progressively, and find the estimated coefficient on the interaction term, *foreign* × *mp* × *crisis*, is consistent with those reported and statistically significant in almost all regressions. The results are available from the authors upon request.

adjusting the growth rate of their lending during crisis periods. This also indicates that there exists a dampening effect of foreign banks on the potency of monetary policy during the 2008-09 global financial crisis period.

Furthermore, the coefficient on *foreign*×*mp*×*crisis* is larger than that on *mp* plus *mp*×*crisis* (the latter of which is generally insignificant), suggesting that during the 2008-9 global financial crisis period, foreign banks actually responded to host monetary policy in a way opposite to domestic banks in the Asian countries of our sample. As an effort to bail out from a recessionary economy and credit-crunch stricken banks during the 2008-9 global financial crisis period, most monetary authorities in Asia adopted expansionary monetary policy in 2008 and 2009 (with exceptions in Indonesia and Korea in 2008)[16], which led to an increase in loans by domestic banks (reflected by negative numbers for the sum of the coefficients on *mp* and *mp*×*crisis*). However, in contrast to the behavior of domestic banks, foreign banks have been observed only to cut down their lending (reflected by the sum of the coefficients on *mp*, *mp*×*crisis* and *foreign*×*mp*×*crisis*), resulting in less pronounced impacts of eased monetary policy on foreign banks' lending. This provides evidence that foreign banks in Asia weakened the effectiveness of the monetary policy transmission mechanism during the 2008-9 global financial crisis period.

Since we control for banks' different characteristics in our model, the weaker responses of foreign banks to changes in monetary policy should have been driven by reasons which are independent of banks' individual characteristics such as liquidity, capitalization, size, riskiness and profitability. As Cetorelli and Goldberg (2011) suggest, multinational banks manage their liquidity on a global base, such that the liquidity constraints and capital inadequacy in multinational banks during the global financial turmoil cause a "reversed" capital flow, via internal capital markets, from foreign subsidiaries in host countries to their headquarters in home countries. When host central banks relax their monetary policy, subsidiaries in the host country have more deposits available to lend and these resources can be reallocated toward the liquidity-seeking and capital-needing headquarters in the home country. As a result, subsidiaries reduce, rather than increase, their loans within the boundary of host countries in reaction to the expansionary monetary policy.

Table 2 reports the estimation results of the loan rate equation. In the test of how loan interest rates are affected by changes in monetary policy, the coefficient on *mp* in the loan rate equation estimation is shown to be consistently positive and statistically significant in all estimations. This suggests that banks would also increase (decrease) their interest rate on loans as a contractionary (expansionary)

[16] Indonesia conducted a tight monetary policy in 2008 in order to ease the concern of inflation, which rose considerably from 6% to more than 12%. At the end of 2008, inflation still resided on a level higher than 11%. Korea increased its interest rate as well due to the rise of inflation. In 2008, inflation significantly exceeded the upper limit (2.5-3.5%) of the target zone for the first time since the introduction of inflation targeting in 1998. In July, inflation (measured by the rise of CPI) approached to 5.9%, causing the central bank, Bank of Korea (BOK), to increase its base rate in August by 25 basis points to 5.25%. However, since the effect of the unrest in international financial markets reached Korea in the 4th quarter of 2008, BOK changed its monetary policy direction toward expansionary monetary policy by lowering the BOK base rate. However, the overnights call rate increased slightly during the year of 2008. Relative to the previous year, 2008 overall was still a year of contractionary monetary policy. The Bank of Korea switched its monetary policy interest rate from overnight call rate targets to the BOK base rate in March 2008.

monetary policy is conducted. The estimation results of the loan rate equation also show that during crisis periods, foreign banks do not lower their loan interest rates as much as domestic banks, insulating their clients from the increased liquidity provided by the central bank in the host country.[17] This is additional evidence that foreign banks reduce the effectiveness of the monetary policy transmission mechanism during crisis periods by responding to changes in monetary policy in adjusting their loan interest rates not as much as domestic banks.

To better understand the role of foreign banks in the transmission of monetary policy shocks in Asia, we conduct various additional empirical tests using the benchmark estimation equations. They are: (1) How do foreign banks respond differently from domestic banks to the different types of monetary policy shocks, i.e., easy monetary policy vs. tight monetary policy? (2) How is the role of foreign banks different from that of domestic banks depending on the country of origin of foreign banks, i.e., Asian foreign banks vs. global foreign banks? (3) How do foreign banks respond to host country monetary policy differently depending on the extent to which their parent banks are affected by the global financial crisis of 2008-9? (4) How does parent banks' reliance on the wholesale funding market impact their subsidiaries abroad to host monetary policy? and (5) Are the roles of foreign banks in the monetary policy transmission affected by the different modes of entry to the host banking markets in Asia? We examine each of these issues.

4.2 Expansionary vs. Contractionary Monetary Policy

In this section, we divide domestic monetary policies into two phases: expansionary monetary policy and contractionary monetary policy. Most Asian central banks conducted expansionary monetary policy during the 2008-9 global financial crisis to insulate their domestic real economies from global financial retrenchment, with the exceptions of Indonesia and Korea in 2008 (see Table 3a). We examine if easy vs. tight monetary policies have heterogeneous effects on foreign banks' lending, and if foreign banks responded differently to the expansionary monetary policies conducted during the 2008-09 crisis period, compared with to the expansionary policies adopted during non-crisis periods. We divide our observations into two groups, depending on the type of monetary policy conducted by monetary authorities in the Asian countries in our sample. The estimation results are reported in Table 3.

When focusing on the case of expansionary monetary policies, we find that the estimation results reported in Panel A of Table 3 are consistent with our benchmark regression results reported earlier. The coefficient on *foreign×mp×crisis* is positive and highly statistically significant in all regressions of the loan growth equation. This confirms the offsetting effects of foreign banks on the expansionary monetary policies conducted in the Asian economies during the global financial crisis of 2008-9. The estimation results on the loan rate equation, reported in Panel B, show that the coefficient on the 3-

[17] Acharya et al. (2011) also find that foreign banks borrowed more from the Fed's Term Auction Facility, lend less in the interbank market and charge higher interest rate on syndicated loan packages, although using the data of foreign banks in the U.S.

way interaction term, *foreign×mp×crisis*, has a negative sign. This also indicates a buffering effect of foreign banks on the monetary policy transmission in the interest rate, but only statistically significant in the system GMM estimation.

When we only use the sample of contractionary monetary policy, we find no evidence that foreign banks show different responses than domestic banks in 2008-09. This might be driven by fewer cases of conducting tight monetary policies during the 2008-9 global financial crisis period.

4.3 More Severely Affected Parent Banks vs. Less Severely Affected Parent Banks

As suggested by Cetorelli and Goldberg (2010), a lower response of foreign subsidiaries to changes in host country monetary policies during the 2008-09 global financial crisis may be caused by the reduced support from their parent banks in home countries. If so, it is expected that the foreign subsidiaries whose parent banks are more severely impacted by the 2008-9 global financial crisis would cut down their credit more aggressively than their peers whose parent banks are less affected. To test this, we divide foreign subsidiaries into two groups—the subsidiaries whose parent banks are more seriously impaired and others whose parent banks are impaired relatively less during the crisis period. A parent bank is characterized as more affected if the decrease in its conglomerate assets lies within the lowest 10th percentile in the distribution of the growth of total assets of multinational banks during the period of 2000-09.[18, 19] In the estimation equation, we replace the previous dummy variable, *foreign*, by two new dummy variables, *foreign (parent more affected)* and *foreign (parent less affected)*, and add their interactions with *mp* and *crisis*.

The results, reported in Table 4, are consistent with our expectations. When using the growth rate of loans as the dependent variable, the coefficient on the 3-way interaction variable, *foreign (parent more affected)×mp×crisis*, is positive and statistically significant in all regressions (Panel A). This finding implies that when facing an expansionary monetary policy adopted by host country central banks in Asia during 2008-09, the subsidiaries of multinational banks, which lost more assets during the crisis period, reduced their lending more greatly than the subsidiaries whose parent banks are less strained. This finding is consistent with Cetorelli and Goldberg (2010) who find that the crisis-hit multinational banks managed their assets on a global basis and thus caused a retrenchment worldwide.

[18] Alternatively, we also split our sample of foreign banks using the criterion of whether their parent bank experienced a fall of total assets by more/less than 10 percent during the global crisis. The results are very similar to the results reported in Table 4. We also try dividing foreign subsidiaries simply by if their parent banks experience a fall in total assets. The results are still consistent and statistically significant. The subsidiaries whose parent banks are more impacted persistently show lower sensitivity to host monetary policy than not only their domestic counterparts but also the foreign subsidiaries whose parents are less impaired.

[19] The foreign subsidiaries whose parent bank is more severely impacted by the global financial crisis include 9 from U.S., 6 from U.K., 5 each from Netherlands and Korea, 3 each from France and Germany, 2 each from Canada and Australia, and one each from Belgium, Indonesia, Malaysia and South Africa.

For the subsidiaries whose parent banks are relatively less seriously affected, the coefficient on the 3-way interaction term, *foreign (parent less affected)×mp×crisis*, is consistently positive but not statistically significant. This suggests that those foreign subsidiaries whose parents are less affected may also tend to reduce their credit, compared to their domestic counterparts, in response to an expansionary monetary policy. However, this behavioral divergence is unable to be detected with statistical significance. Meanwhile, the coefficient on *foreign (parent more affected)×mp×crisis* is larger than that on *foreign (parent less affected)×mp×crisis*, which implies that the subsidiaries whose parent banks are more seriously affected are not as sensitive to changes in host country monetary policy as the subsidiaries whose parents are less seriously affected.

In terms of changes in loan interest rates, as reported in Panel B of Table 4, the coefficients on *foreign (parent more affected)×mp×crisis* and *foreign (parent less affected)×mp×crisis* are, as expected, negative and statistically significant in almost all regressions. This suggests that the foreign subsidiaries whose parent banks are impaired by global financial crisis lowered their loan interest rates not as much as domestic banks, or even raised them, when host country central banks conducted an expansionary monetary policy during the crisis period. The coefficient on *foreign (parent more affected)×mp×crisis* is higher than that on *foreign (parent less affected)×mp×crisis*, and the sum of the coefficients on *mp* and *foreign (parent more affected)×mp×crisis* are negative. This indicates a raise in loan interest rates by the subsidiaries whose parent banks were affected by the 2008-9 global financial crisis more seriously, when host country central banks conduct an expansionary monetary policy during the crisis period. This pattern of loan interest rate adjustments by foreign banks would provide a hampering effect on the effectiveness of the monetary policy transmission mechanism during crisis periods.

4.4 More Wholesale Funding Dependent Parent Banks vs. Less Wholesale Funding Dependent Parent Banks

As the recent global financial crisis demonstrates, major banks sharply reduced their credit due to the dysfunction in wholesale funding markets. In this section, we examine how this illiquidity in wholesale funding markets would impact the Asian banking markets through foreign subsidiaries' lukewarm reaction to host monetary policy. Parent banks that were more dependent on bond and money markets as main funding sources of lending presumably incur illiquidity more seriously than others, and may withdraw funds more aggressively from their subsidiaries abroad, thus resulting in a lower response to host monetary policy.[20]

Following Brei et al. (2011), parent banks' reliance on wholesale funding markets is measured by the share of total assets financed by non-deposits liabilities, i.e. total liabilities (excluding equity) minus total deposits. After calculating the average dependence on non-deposits liabilities for each parent

[20] Consistent with the onset and development of the recent global financial crisis, Demirgüç-Kunt and Huizinga (2010) find that a predominant reliance on non-deposit funding in wholesale capital markets would result in higher banking riskiness.

bank during 2000-2007, we define a bank as highly wholesale funding market dependent if the ratio lies within the top 25th percentile of the distribution. We then replace the initial dummy *foreign* by using two other dummies, *foreign(high wholesale dependence)* for the subsidiaries of highly wholesale-funding-market-dependent parent banks, and *foreign(low wholesale dependence)* for the other subsidiaries of less wholesale-funding-market dependent parent banks.[21] The regression results are reported in Table 5.

The results are in line with our expectations and the findings in Cetorelli and Goldberg (2012b).[22] The buffering effect of foreign banks on host monetary policy is found to be much stronger among foreign bank subsidiaries whose parent banks are more dependent on wholesale funding markets than those whose parent banks are less dependent on those markets. As reported in Panel A of Table 5, in the loan growth equation, the coefficient on the 3-way interaction term, *foreign (parent more dependent)×mp×crisis*, for the former group is statistically significant in all but one regression, while the coefficient for the latter group by contrast is statistically significant in only two of four estimations with the same signs. Meanwhile, in terms of the coefficient size, it is notably larger for subsidiaries whose parent banks are more wholesale funding dependent than others.

As shown in Panel B of Table 5, in the loan rate equation, the effect of monetary policy on loan interest rate also displays a similar pattern. The coefficient on the 3-way interaction term, *foreign (parent more dependent)×mp×crisis*, is statistically significant in all regressions, while the coefficient on *foreign (parent less dependent)×mp×crisis* is not statistically significant. The hampering effect of foreign banks in the monetary policy transmission mechanism in the interest rate channel is shown to be much greater among foreign bank subsidiaries whose parent banks are more dependent on non-deposit wholesale market funding than among subsidiaries whose parents are less dependent on the wholesale markets as funding sources.

Our findings shed some light on the parent banks' funding source channel via which the liquidity shock can propagate to emerging Asian economies through global bank networks, and have important policy implications on the need for international coordination among central banks to provide proper sources of wholesale market funding for global banks to maintain the effectiveness of the monetary policy transmission mechanism in the home and host countries. The Federal Reserve launched the liquidity swap line program in December 2007 to help other central banks have access to additional sources of U.S. dollar funding and replenish their short-term liquidity shortages, which has enhanced the central banks' capacities to inject liquidity or conduct expansionary monetary policies in the host countries.

[21] The subsidiaries whose parent banks are higher in the wholesale funding dependence measure include 10 from U.S., 6 each from France, Netherlands, and U.K., 4 each from Germany and Korea, 3 from Japan, 2 from Australia, and 1 each from Belgium, South Africa, and Spain.

[22] Cetorelli and Goldberg (2012b), using the data of foreign branches in the U.S. during the period of global financial crisis, find that the internal capital market transfer from branches to headquarters are stronger for the multinational banks with higher ex ante exposure to commercial paper market.

4.5 Global Foreign Banks vs. Regional Foreign Banks

In this section, we examine if foreign banks' responses to changes in monetary policy in the host economy are homogeneous to the regional scope and country of origin of foreign banks, that is, whether their responses are different depending on the global vs. regional orientation of foreign banks.

We divide foreign banks into two groups according to the geographical range of the presence of their parents and affiliates. A foreign bank is defined as a "regional" bank if its headquarters is located in one of the Asian economies and its subsidiaries abroad are concentrated mainly in Asia. We define a foreign bank as "global" if its headquarters is registered outside the Asian countries and most of their foreign subsidiaries operate in continents other than Asia.[23] Since global foreign banks are expected to be more greatly integrated with international capital markets, we conjecture that they might be affected more severely than regional foreign banks by the global financial crisis and then be forced to reallocate their assets toward their headquarters in the home country upon the pressure of replenishing liquidity and capital. This may result in more lukewarm responses of their foreign subsidiaries to changes in host monetary policy.

In order to test the heterogeneity of the impact of monetary policy on "regional" and "global" foreign banks, we replace the original dummy, *foreign*, by using two dummies, *foreign(regional)* and *foreign(global)*, and interact them with *mp* and *crisis*, respectively and jointly. The estimation results are reported in Table 6.

We find that both regional and global foreign banks are shown to have a positive coefficient on the 3-way interaction term, *foreign (regional/global)×mp×crisis*, in the regression of the loan growth equation (Panel A, Table 6), and a negative coefficient in the regression of the loan rate equation (Panel B, Table 6). This suggests that both regional and global foreign banks alike adjust the quantity and price of their loans in response to changes in monetary policy in the host country in a way opposite to their domestic counterparts. However, the coefficients on the 3-way interaction terms are statistically significant only for global foreign banks. This provides consistent evidence that the hampering effects of foreign banks to the effectiveness of the monetary policy transmission mechanism in the Asian host economies are most conspicuous among global foreign banks during the global financial crisis of 2008-9. Those global banks seem to play a somewhat positive role during tranquil, non-crisis periods, evidenced by a negative coefficient on *foreign (global)×mp* in the loan growth equation, which implies a supportive role for the intention of monetary policy conducted by monetary authority in the host economy. However, this positive role played by global foreign banks during tranquil periods is shown to be reversed to an adverse role during crisis periods.

[23] The group of "regional" foreign banks is composed of 16 subsidiaries from Singapore, 12 from China and Malaysia respectively, 6 from Taiwan, 5 from Korea, 2 from India, and 1 from Indonesia, Macau, Philippines and Thailand. The "global" foreign banks include 14 subsidiaries from U.S., 11 from U.K and Japan respectively, 8 from Netherlands, 6 from France, 4 from Canada and Germany, respectively, 2 from Australia and South Africa, respectively, and 1 each from Belgium, Liechtenstein, Spain and Saudi Arabia.

The same sign, but smaller size and lack of statistical significance of the coefficient on the 3-way interaction term for regional foreign banks implies that the foreign banks, which are from Asia and are concentrated in the region, are closely integrated with their host economies and do not act distinctively from domestic banks, compared with global banks, during the crisis period in terms of lending loans and setting loan interest rates. The foreign banks' adverse effect on the effectiveness of the monetary policy transmission during the 2008-9 global crisis is shown to be much greater for the non-Asian global foreign banks than the Asian regional foreign banks.

This finding provides evidence that the recent financial crisis which was originated from non-Asian developed countries and was transmitted to emerging Asian countries through the global banking channel. The policy implication of this finding is that to alleviate the (adverse) impact of foreign banks on the effectiveness of host country monetary policy during crisis periods of their home country, the host banking markets need to encourage a diversification of the country of origin of foreign banks to inside and outside the region.

4.6 De Novo Foreign Banks vs. M&A Foreign Banks

Banks enter foreign markets by adopting different modes of entry, which might imply different types and extent of linkages between parent banks in the home country and their foreign subsidiaries in host countries. De novo (or greenfield-established) subsidiaries are expected to be more closely connected with their headquarters in the home country than foreign subsidiaries established through mergers and acquisitions (M&A).[24] If so, a foreign subsidiary that is de novo established would be affected more greatly than a subsidiary established in the host country through M&A by the shocks inflicted on the parent bank in the home country. De Haas and Lelyveld (2006, 2010) suggest that de novo subsidiaries might receive more financial support from their parent banks than M&A subsidiaries, and thus are more likely to be exposed to the financial contagion triggered by less financial resources available from their parent banks.

To examine if the role of foreign banks in the monetary policy transmission differs according to different modes of entry of foreign banks, we replace the dummy, *foreign*, by two dummies representing the different entry modes of foreign banks, *foreign(de novo)* and *foreign(M&A)*. As the liquidity shocks on parent banks cause a liquidity reallocation from foreign subsidiaries to their headquarters, we expect that de novo subsidiaries, which are closely tied to their headquarters, would be more insulated from domestic monetary policy in the host country than M&A foreign banks. We report the empirical results in Table 7.

[24] It has been reported in the literature that greenfield subsidiaries are more closely integrated within the conglomerate, and have better access to funds from their parents or other subsidiaries (see, for example, De Haas and Lelyveld (2006) and Havrylchyk and Jurzyk (2006)). In contrast, M&A banks take the existing personnel and portfolio of the incumbent institutions and, therefore, are typically less integrated within the conglomerate (Curry et al. (2003)).

To be consistent with our expectations, in the loan growth equation as reported in Panel A of Table 7, the coefficients on the interaction term, *foreign(de novo)×mp*, are mostly negative and statistically significant, and the coefficient on the 3-way interaction term, *foreign(de novo)×mp×crisis*, is positive and statistically significant in all regressions. To the contrary, the coefficients on the 2-way and 3-way interaction terms for the M&A subsidiaries are mixed in sign and statistically insignificant in most regressions. This suggests that when central banks conduct expansionary monetary policy, greenfield foreign bank subsidiaries increase their loans even more than domestic banks in the host countries during tranquil periods, but they actually curtail, instead of expand, their loans during the 2008-9 global financial crisis period when their parent banks in the home country suffer from a sharp fall in liquidity and capital. During crisis periods, de novo foreign subsidiaries are shown to inflict more conspicuous hampering effects on the host country's monetary policy than M&A foreign subsidiaries.

When using the change in loan interest rates as the dependent variable, the coefficient on *foreign(de novo)×mp×crisis* is negative and statistically significant in most all regressions (Panel B). This is interpreted as that during the crisis period, greenfield subsidiaries are reluctant to reduce, or even increase, their loan interest rate in response to the expansionary monetary policy. From both perspectives of loan growth and loan interest rates, it is shown that host monetary policy only generates less pronounced effects on de novo foreign banks' lending than M&A foreign banks' lending. For M&A foreign subsidiaries, we do not find conclusive evidence that they respond differently from domestic banks to changes in host country's monetary policy during tranquil periods as well as crisis periods.

Many Asian countries have increased the extent of the liberalization of their banking sectors after the 1997-9 Asian financial crisis by allowing higher shares of foreign bank ownership via merging and acquiring domestic banks more often than establishing de novo foreign banks. Due to the heritage of management and customer pools from domestic predecessors, M&A foreign banks are expected be more deeply integrated with domestic banks and economies, and as a result, more likely affected by changes in domestic monetary policies than de novo foreign banks, but less affected by the contagion of adverse shocks afflicted on parent banks in the home country.

5. Robustness Tests

In this section we conduct various robustness tests to access whether our main findings on the role of foreign banks on the effectiveness of the monetary policy transmission mechanism in the emerging and developing Asian countries are affected when further modification of the sample set or alternative measures and estimations are used for our analysis.

First, we use an alternative measure of the host monetary policy, which is the change in the interest rate adjusted by inflation, i.e. the variation in real interest rates. The results from using real terms, reported in Table 8, test 1, are consistent with our benchmark estimation results reported earlier for

both changes in loan growth and loan interest rates in nominal term. This implies that as monetary policy is eased in real terms during the global financial crisis of 2008-9, foreign bank subsidiaries reduced, instead of increased, their loan provision and adjusted the price of their loans by a smaller magnitude than did domestic banks.

Second, we re-estimate the loan growth and loan rate equations after dropping the banks in Hong Kong SAR and Singapore from our sample. The reason is that since these two economies, as regional financial centers, serve not only local clients but also customers from other countries, the sensitivity of banks' lending and loan rates to domestic monetary policies may be different from banks in other Asian economies. In addition, the Hong Kong Monetary Authority adopts the Currency Board System for the stability of exchange rates, and does not conduct regular monetary policies. The results, as reported in Table 8, test 2, are consistent with our findings from the benchmark estimations that foreign banks buffer the effects of host monetary policies on bank lending during the global financial crisis of 2008-9. In the estimations of the loan growth equation, the coefficient on *foreign×mp×crisis* is positive and statistically significant in the system GMM estimations and only marginally not significant in the fixed effects estimations. And in the estimations of the loan interest rate equation, the coefficient on the three-way interaction term is negative and also statistically significant in most regressions. These robust estimation results confirm that our main findings are not driven by the banks which would be less policy responsive due to the global business scope beyond their host countries like Hong Kong and Singapore.

Third, we extend the period of global financial crisis from 2008-9 to 2007-9 to take into account earlier episodes of financial turmoil even before Lehman Brothers collapsed in 2008. We find that the results are qualitatively consistent (Table 8, test 3) with our benchmark estimation results, but the coefficient on the 3-way interaction term is only statistically significant in the system GMM estimations for the loan growth equation. Most banks in Asia experienced credit expansion before the fall of Lehman Brothers, which seems to dampen the statistical significance of foreign banks' contractionary responses to monetary policy afterwards. Although not reported, we also experimented to divide the 2008-09 crisis dummy into two separate yearly dummies. It is found that foreign banks' inert responses to changes in host monetary policy took place more during 2009 than 2008, implying that the foreign banks in the Asian economies were affected by the contagion of the recent global financial crisis from the U.S. and Europe rather gradually with the culminating effects realized in 2009.

Fourth, it can be argued that when the central bank in the host country conducts an expansionary monetary policy during the crisis periods, the reduction in loans by foreign banks might be driven simply by the demand side. To test if this argument is true, we add four more regressors which account for macroeconomic-level demand factors by interacting *GDP growth rate* with *foreign* and *crisis*, and *unemployment* with *foreign* and *crisis*. If foreign banks reduce their loans because of the lowered demand during the crisis period, rather than the global reallocation of liquidity and capital from foreign bank subsidiaries in host countries toward their headquarters in the home country, the statistical significance of the coefficient on *foreign×mp×crisis* would diminish. As shown in Table 8,

test 4, we find that the estimation results are still consistent with our benchmark results. The coefficient on the interaction variable, *foreign*×*mp*×*crisis*, still shows an expected sign and is statistically significant in all regressions, not affecting our main findings from the benchmark estimations reported earlier. This lends support to our conjecture that, when parent banks suffer from reduced liquidity and limited access to alternative funding sources, foreign banks are forced to lower the growth of their loans in local markets due to a global reallocation of capital or liquidity toward headquarters in the home countries, rather than mostly due to a weakened demand for foreign banks' loans from their customers in the host countries.

Finally, as some research find, foreign banks may react to *home* economic conditions by changing their lending in *host* markets (Peek and Rosengren (2000), Goldberg (2001), Martinez Peria et al. (2005)). In this robustness test (Table 8, test 5), we add home countries' monetary policy and its interaction with crisis, and meanwhile the real GDP growth rate in home countries and its interaction with crisis are also introduced in our regressions in order to control for the spillover effects of business cycle from home countries to host markets.[25] Our finding is not changed qualitatively and in most cases the estimated coefficients of interest remain to be statistically significant with the same sign. Although not reported, the individual term, *home monetary policy,* and its interaction term, *home monetary policy* × *crisis,* show mixed sign in the equation of loan growth and are not statistical significant, failing to provide consistent evidence on whether and how foreign banks' lending in host markets would be impacted by their home monetary policy.

6. Conclusion

Although the level of penetration of foreign banks into the domestic banking sectors is observed to be on a steadily ascending trend in Asia, particularly in the wake of the 1997-98 Asian financial crisis, there has not been much research that explores the impact of the foreign bank presence on the bank lending channel as a monetary policy transmission mechanism in the Asian emerging economies. This paper presents consistent evidence that there exist heterogeneous responses on loan growth and loan interest rates between domestic banks and foreign-owned banks in response to changes in monetary policy in the host emerging Asian economies during the recent global financial crisis of 2008-9.

We find that, first, foreign banks overall do not show distinctive behavior from domestic banks in adjusting loan growth and loan interest rates in host Asian banking markets during non-crisis, tranquil periods, and second, during crisis periods, however, foreign banks play a buffering or even hampering role in affecting the monetary policy transmission mechanism by adjusting loan growth and loan interest rates in a way opposite to domestic banks. The empirical results are robust to various alternative measures, different sample countries and periods, incorporating demand factors in the

[25] We construct a series of home monetary policy indicator by using the first-difference of home countries' money market rate. For *domestic* banks, the value in this series is equal to 0.

estimations, and considering changes in monetary policy in home countries. This finding is consistent with the proposition that, when global banks encounter liquidity shocks in their home countries, they conduct a global reallocation of liquidity from foreign subsidiaries in host countries to the parent banks in home countries using internal capital markets (Cetorelli and Goldberg (2011), Jeon et al. (2013)) As a result, global banks cause a dampening effect on the potency of monetary policy conducted by monetary authorities in the host countries of their subsidiaries overseas.

In addition, we present empirical evidence that the buffering effects of foreign banks in the Asian banking markets on the efficiency of monetary policy transmission during crisis periods become more conspicuous, (1) when an expansionary monetary policy, instead of a contractionary monetary policy, is conducted in the host countries; (2) for foreign banks whose parent banks in home countries are more adversely affected; (3) for foreign banks whose parent banks are more dependent on non-deposits, wholesale markets funding; (4) for global foreign banks more than Asia-regional foreign banks; and (5) for foreign banks which entered the host banking markets via a greenfield entry mode rather than an M&A entry mode.

Our findings suggest an important policy implication for both policy makers and banking regulators that, when monetary authorities in host countries conduct monetary policies—expansionary or contractionary--during crisis periods to bail them out from the credit crunch and spillover effects of financial shocks from abroad, they must take into account the buffering or hampering effects of foreign banks on the effectiveness of the monetary policy transmission mechanism in the host countries. The magnitude of the offsetting effects by foreign banks varies according to different factors originated from various bank-specific, host banking-market specific, and policy-specific conditions, as identified in this paper.[26] This challenge facing monetary authorities in emerging Asian economies is expected to remain significant and become even larger as the level of foreign bank penetration in the Asian banking markets continues rising in the near future.

[26] The regulatory arbitrage incentives across countries may be another factor to influence the role of foreign banks in monetary policy transmission (Houston, Lin and Ma (2012)).

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Table 1. The Effect of Changes in Monetary Policy on Loan Growth of Domestic and Foreign Banks in Asia, 2000-2009

Dependent variable:	Fixed effects		System GMM	
$\Delta ln(loans)_{i,j,t}$	(1)	(2)	(3)	(4)
$\Delta \ln(loans)_{i,j,t-1}$			.052	.022
			(.443)	(.744)
foreign	-4.006	-5.023	-8.296	-2.635
	(.405)	(.288)	(.325)	(.757)
crisis	-4.371*	-5.443**	1.293	1.863
	(.070)	(.039)	(.698)	(.608)
mp	-.747**	-1.058	-1.303*	-2.963*
	(.018)	(.111)	(.082)	(.098)
foreign × crisis	-2.379	-2.320	-1.081	-3.137
	(.456)	(.438)	(.881)	(.656)
mp × crisis	.588	-1.492	-2.173	-3.971
	(.539)	(.544)	(.189)	(.462)
foreign × mp	-.728	-1.226**	.826	-1.152
	(.207)	(.031)	(.502)	(.293)
foreign × mp × crisis	2.716*	2.239	6.570**	6.955*
	(.083)	(.164)	(.024)	(.081)
Bank characteristics				
liquidity	.393***	.333***	.366***	.336***
	(.000)	(.000)	(.001)	(.002)
liquidity × mp		-.019*		.002
		(.098)		(.944)
liquidity × mp × crisis		.087		.010
		(.182)		(.935)
capitalization	.202	.426*	.768**	.712**
	(.323)	(.064)	(.016)	(.037)
capitalization × mp		.076***		.125**
		(.008)		(.045)
capitalization × mp × crisis		-.106		.170
		(.545)		(.674)
size	-1.142**	-1.142**	1.369	1.512
	(.036)	(.024)	(.188)	(.154)
size × mp		.035*		.109
		(.096)		(.513)
size × mp × crisis		-.115		.021
		(.175)		(.958)
riskiness	.259	.703*	-.313	1.148
	(.503)	(.074)	(.688)	(.221)
riskiness × mp		.090		.191**
		(.168)		(.014)
riskiness × mp × crisis		.080		.291
		(.898)		(.826)
profitability	1.140**	1.506***	.705	1.699*
	(.021)	(.003)	(.403)	(.089)
profitability× mp		-.037		-.129
		(.709)		(.306)
profitability × mp × crisis		1.243		.239
		(.129)		(.908)
Host country macroeconomic conditions and market structure				
real GDP growth rate	.470**	.356**	.774***	.726***
	(.022)	(.040)	(.003)	(.001)
unemployment	-2.135**	-2.335***	-1.801	-1.721
	(.022)	(.010)	(.127)	(.257)
financial depth	-.019	-.063	-.244	-.259
	(.832)	(.502)	(.215)	(.211)
HHI	12.185	5.174	-109.98*	83.840
	(.795)	(.909)	(.055)	(.354)
year dummy	Yes	Yes	Yes	Yes
country dummy	No	No	Yes	Yes
observations	1463	1463	1463	1463
(banks)	(216)	(216)	(216)	(216)
R^2	.146	.166		
AR(1)/AR(2)			.000/.264	.000/.102
Hansen J test			.696	.472

Notes: *p*-values are in parenthesis. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 2. The Effect of Changes in Monetary Policy on Loan Interest Rates of Domestic and Foreign Banks in Asia, 2000-2009

Dependent variable:	Fixed effects		System GMM	
$\Delta loan\ rate_{i,j,t}$	(1)	(2)	(3)	(4)
$\Delta \ln(loans)_{i,j,t-1}$			.015	-.052
			(.808)	(.420)
foreign	.073	.073	.570	.951
	(.826)	(.829)	(.625)	(.379)
crisis	.137	.126	-.524	-.424
	(.617)	(.651)	(.159)	(.251)
mp	.450***	.341***	.502***	.455**
	(.000)	(.000)	(.000)	(.034)
foreign × crisis	-.901***	-.899***	-1.027*	-1.093*
	(.001)	(.001)	(.068)	(.068)
mp × crisis	-.208**	-.168	-.084	-.818
	(.040)	(.377)	(.642)	(.111)
foreign × mp	-.058	-.129***	.011	.116
	(.208)	(.008)	(.930)	(.498)
foreign × mp × crisis	-.290**	-.263*	-.488*	-.670*
	(.026)	(.067)	(.086)	(.088)
Bank characteristics				
liquidity	-.006	-.007	-.009	-.007
	(.355)	(.327)	(.556)	(.612)
liquidity × mp		.000		.001
		(.796)		(.832)
liquidity × mp × crisis		.001		.012
		(.855)		(.375)
capitalization	-.050***	-.026	-.027	-.002
	(.007)	(.165)	(.310)	(.943)
capitalization × mp		.008***		.007
		(.008)		(.115)
capitalization × mp × crisis		.002		.013
		(.844)		(.410)
size	.049	.048	-.045	.001
	(.159)	(.169)	(.539)	(.980)
size × mp		-.002		.001
		(.276)		(.964)
size × mp × crisis		-.002		.044
		(.750)		(.322)
riskiness	-.058	-.037	-.001	-.172*
	(.219)	(.515)	(.981)	(.065)
riskiness × mp		.001		-.025***
		(.909)		(.006)
riskiness × mp × crisis		-.021		.206
		(.683)		(.185)
profitability	-.138**	-.094	-.063	-.242**
	(.020)	(.148)	(.500)	(.028)
profitability× mp		.006		-.021
		(.508)		(.155)
profitability × mp × crisis		-.046		-.081
		(.568)		(.527)
Host country macroeconomic conditions and market structure				
real GDP growth rate	.016	.016	-.038*	-.014
	(.271)	(.282)	(.089)	(.473)
unemployment	-.033	-.051	-.399***	-.311**
	(.595)	(.426)	(.009)	(.029)
financial depth	-.006	-.008	.013	.012
	(.312)	(.143)	(.120)	(.102)
HHI	5.329	5.901	5.698	1.085
	(.181)	(.124)	(.168)	(.813)
year dummy	Yes	Yes	Yes	Yes
country dummy	No	No	Yes	Yes
observations	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)
R^2	.359	.374		
AR(1)/AR(2)			.000/.330	.000/.280
Hansen J test			.328	.362

Notes: *p*-values are in parenthesis. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 3. The Effect of Changes in Monetary Policy on Loan Growth and Loan Interest Rates of Domestic and Foreign Banks in Asia, 2000-2009: Expansionary vs. Contractionary Monetary Policy

	Panel A: Dependent variable: $\Delta ln(loans)_{i,j,t}$				Panel B: Dependent variable: $\Delta loan\ rate_{i,j,t}$			
	Fixed effects		System GMM		Fixed effects		System GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Expansionary policy				
mp	-1.074**	-1.940*	-.159	-3.064*	.533***	.550***	.386***	.354*
	(.029)	(.082)	(.822)	(.080)	(.000)	(.000)	(.000)	(.053)
foreign × mp	-1.163	-2.110**	.687	.256	-.057	-.154**	-.047	.042
	(.294)	(.022)	(.549)	(.844)	(.481)	(.029)	(.710)	(.729)
foreign × mp × crisis	7.680**	7.432**	7.305**	6.029*	-.334	-.332	-.653**	-.669*
	(.014)	(.017)	(.018)	(.096)	(.205)	(.175)	(.018)	(.073)
observations	874	874	874	874	872	872	872	872
(banks)	(202)	(202)	(202)	(202)	(202)	(202)	(202)	(202)
R^2	.231	.261			.382	.416		
AR(1)/AR(2)			.000/ .780	.000/ .526			.000/.920	.000/.639
Hansen J test			.449	.516			.464	.543
				Contractionary policy				
mp	2.086	2.562	-2.151***	-5.380*	.679***	1.031***	.609***	.811***
	(.247)	(.325)	(.007)	(.063)	(.000)	(.000)	(.000)	(.000)
foreign × mp	-6.601***	-7.183***	.823	2.190	-.331**	-.219*	-.027	-.065
	(.000)	(.000)	(.534)	(.420)	(.011)	(.067)	(.815)	(.739)
foreign × mp × crisis	.849	-.893	19.700*	11.175	.355	-.149	.638	.552
	(.794)	(.822)	(.099)	(.563)	(.250)	(.660)	(.303)	(.508)
observations	589	589	589	589	588	588	588	588
(banks)	(197)	(197)	(197)	(197)	(197)	(197)	(197)	(197)
R^2	.163	.194			.183	.223		
AR(1)/AR(2)			.013/ .430	.042/.879			.005/.841	.012/.825
Hansen J test			.469	.708			.150	.189

Notes: To save space, we only report the most relevant variables. In all regressions, variables of bank individual characteristics, host macroeconomic conditions and banking market structure are included. In regression (2), (4), (6) and (8), the interaction of bank characteristics and monetary policy (*mp*) and 2008-09 crisis dummy are also included. *p*-values are in parentheses. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 3a. Monetary Policy Phases in Asian Countries, 2000-2009

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hong Kong SAR	+	−	−	−	+	+	−	−	−	−
Indonesia	−	+	−	−	−	+	+	−	+	−
Korea	+	−	−	−	−	−	+	+	+	−
Malaysia	−	+	−	+	−	+	+	+	−	−
Philippines	+	−	−	−	+	+	+	−	−	−
Singapore	+	−	−	−	+	+	+	−	−	−
Thailand	+	+	−	−	−	+	+	−	−	−

Note: “+” represents contractionary monetary policy, and “-” denotes expansionary monetary policy.

Table 4. The Effect of Changes in Monetary Policy on Loan Growth and Loan Interest Rates of Domestic and Foreign Banks in Asia, 2000-2009: Foreign Bank Subsidiaries whose Parent Banks are more Adversely Affected vs. Subsidiaries whose Parent Banks are less Affected

	Panel A: Dependent variable: $\Delta ln(loans)_{i,j,t}$				Panel B: Dependent variable: $\Delta loan\ rate_{i,j,t}$			
	Fixed effects		System GMM		Fixed effects		System GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mp	-.671**	-1.142*	-1.000*	-2.795	.445***	.359***	.460***	.421*
	(.030)	(.096)	(.093)	(.115)	(.000)	(.000)	(.000)	(.080)
foreign (parent more affected)× mp	.764	.553	1.023	-.736	-.034	-.090	-.187	.007
	(.321)	(.427)	(.413)	(.597)	(.440)	(.136)	(.307)	(.967)
foreign (parent less affected) × mp	-1.277*	-1.622***	-.131	-1.500	-.060	-.101*	.106	.170
	(.068)	(.006)	(.913)	(.240)	(.283)	(.086)	(.574)	(.334)
foreign (parent more affected)× mp × crisis	8.944***	7.938***	10.903**	10.374*	-.691**	-.743**	-1.103*	-1.314*
	(.001)	(.003)	(.023)	(.088)	(.020)	(.028)	(.092)	(.087)
foreign (parent less affected) × mp × crisis	1.412	1.128	2.751	4.095	-.222*	-.268*	-.614*	-.588
	(.443)	(.528)	(.400)	(.251)	(.093)	(.063)	(.078)	(.139)
observations	1463	1463	1463	1463	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
R^2	.168	.186			.362	.369		
AR(1)/AR(2)			.000/.419	.000/.125			.000/.570	.000/.174
Hansen J test			.697	.736			.303	.281

Notes: To save space, we only report the most relevant variables. In all regressions, variables of bank individual characteristics, host macroeconomic conditions and banking market structure are included. In regression (2), (4), (6) and (8), the interaction of bank characteristics and monetary policy (*mp*) and 2008-09 crisis dummy are also included. *p*-values are in parentheses. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 5. The Effect of Changes in Monetary Policy on Loan Growth and Loan Interest Rates of Domestic and Foreign Banks in Asia, 2000-2009: Foreign Bank Subsidiaries whose Parent Banks are more Dependent on Wholesale Funding vs. Subsidiaries whose Parent Banks are Less Dependent on Wholesale Funding

	Panel A: Dependent variable: $\Delta ln(loans)_{i,j,t}$				Panel B: Dependent variable: $\Delta loan\ rate_{i,j,t}$			
	Fixed effects		System GMM		Fixed effects		System GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mp	-.687**	-1.226*	-1.156	-1.496	.447***	.336***	.432***	.419*
	(.028)	(.056)	(.151)	(.304)	(.000)	(.000)	(.000)	(.067)
foreign (parent more dependent)× mp	.225	-.416	1.345	-1.767	-.011	-.069	-.065	.046
	(.762)	(.612)	(.273)	(.182)	(.867)	(.328)	(.686)	(.811)
foreign (parent less dependent) × mp	-1.105	-1.508**	.435	-2.080*	-.074	-.155***	.142	.169
	(.122)	(.012)	(.789)	(.075)	(.158)	(.004)	(.380)	(.373)
foreign (parent more dependent)× mp × crisis	6.156*	4.966	8.036*	9.981*	-.698**	-.837**	-1.120*	-1.304*
	(.066)	(.139)	(.092)	(.097)	(.023)	(.016)	(.067)	(.069)
foreign (parent less dependent) × mp × crisis	1.291	.912	6.084*	7.947*	-.157	-.128	-.285	-.269
	(.434)	(.581)	(.077)	(.059)	(.224)	(.332)	(.384)	(.498)
observations	1463	1463	1463	1463	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
R^2	.159	.176			.366	.383		
AR(1)/AR(2)			.000/.179	.000/.103			.000/.473	.000/.145
Hansen J test			.703	.489			.226	.131

Notes: To save space, we only report the most relevant variables. In all regressions, variables of bank individual characteristics, host macroeconomic conditions and banking market structure are included. In regressions (2), (4), (6) and (8), the interaction of bank characteristics and monetary policy (*mp*) and 2008-09 crisis dummy are also included. *p*-values are in parentheses. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 6. The Effect of Changes in Monetary Policy on Loan Growth and Loan Interest Rates of Domestic and Foreign Banks in Asia, 2000-2009: Global vs. Regional Foreign Banks

	Panel A: Dependent variable: $\Delta ln(loans)_{i,j,t}$				Panel B: Dependent variable: $\Delta loan\ rate_{i,j,t}$			
	Fixed effects		System GMM		Fixed effects		System GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mp	-.661**	-.940	-.976	-2.868	.448***	.342***	.499***	.454**
	(.035)	(.162)	(.138)	(.172)	(.000)	(.000)	(.000)	(.036)
foreign (regional)× mp	-.073	-.680	1.658	1.033	-.007	-.114**	.056	.081
	(.909)	(.277)	(.149)	(.520)	(.880)	(.042)	(.708)	(.593)
foreign (global) × mp	-1.390	-1.746**	-2.083	-3.310	-.113*	-.136**	-.035	.120
	(.108)	(.018)	(.266)	(.126)	(.081)	(.042)	(.872)	(.616)
foreign (regional)× mp × crisis	.976	.970	5.368*	4.797	-.134	-.075	-.214	-.298
	(.585)	(.622)	(.075)	(.270)	(.304)	(.586)	(.501)	(.451)
foreign (global) × mp × crisis	4.184*	3.667	9.941*	8.808*	-.445**	-.454**	-1.003**	-1.198**
	(.062)	(.116)	(.069)	(.097)	(.029)	(.034)	(.028)	(.026)
observations	1463	1463	1463	1463	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
R^2	.156	.171			.365	.378		
AR(1)/AR(2)			.000/.178	.000/.054			.000/.452	.000/.323
Hansen J test			.449	.503			.247	.219

Notes: To save space, we only report the most relevant variables. In all regressions, variables of bank individual characteristics, host macroeconomic conditions and banking market structure are included. In regressions (2), (4), (6) and (8), the interaction of bank characteristics and monetary policy (*mp*) and 2008-09 crisis dummy are also included. *p*-values are in parentheses. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 7. The Effect of Changes in Monetary Policy on Loan Growth and Loan Interest Rates of Domestic and Foreign Banks in Asia, 2000-2009: De Novo vs. M&A Foreign Bank Subsidiaries

	Panel A: Dependent variable: $\Delta ln(loans)_{i,j,t}$				Panel B: Dependent variable: $\Delta loan\ rate_{i,j,t}$			
	Fixed effects		System GMM		Fixed effects		System GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mp	-.652**	-1.310**	-1.039	-1.799	.444***	.322***	.434***	.379*
	(.037)	(.039)	(.181)	(.446)	(.000)	(.000)	(.000)	(.100)
foreign (de novo)× mp	-1.155*	-1.799***	1.090	-3.016**	-.071	-.154***	.088	.165
	(.090)	(.002)	(.466)	(.042)	(.209)	(.004)	(.536)	(.434)
foreign (M&A) × mp	.306	.077	-.526	-1.547	-.028	-.070	-.094	-.050
	(.668)	(.910)	(.683)	(.275)	(.564)	(.240)	(.680)	(.833)
foreign (de novo)× mp × crisis	5.038**	4.631*	9.235*	8.330*	-.314*	-.368	-.802*	-.993*
	(.043)	(.076)	(.087)	(.073)	(.099)	(.132)	(.072)	(.094)
foreign (M&A) × mp × crisis	.085	-.674	6.804	2.058	-.287*	-.232	.085	.019
	(.956)	(.671)	(.272)	(.558)	(.064)	(.136)	(.892)	(.976)
observations	1463	1463	1463	1463	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
R^2	.156	.179			.366	.382		
AR(1)/AR(2)			.000/.727	.000/.070			.000/.368	.000/.315
Hansen J test			.157	.316			.252	.221

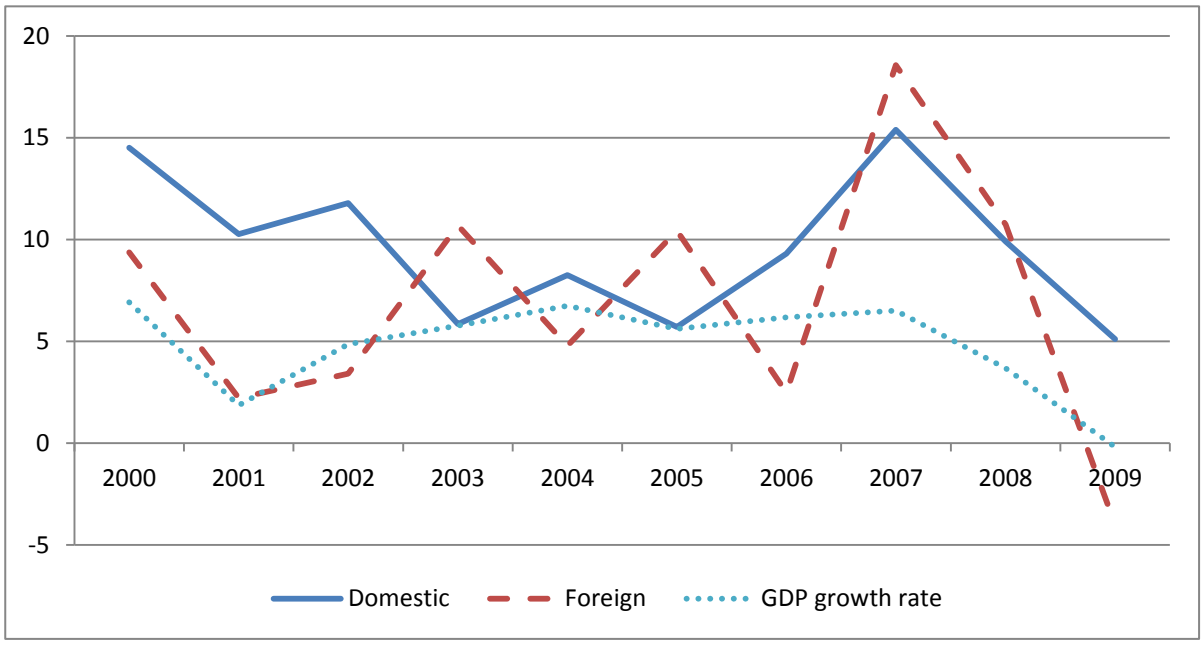
Notes: To save space, we only report the most relevant variables. In all regressions, variables of bank individual characteristics, host macroeconomic conditions and banking market structure are included. In regressions (2), (4), (6) and (8), the interaction of bank characteristics and monetary policy (*mp*) and 2008-09 crisis dummy are also included. *p*-values are in parentheses. ***: 1% significance level; ** 5% significance level; * 10% significance level.

Table 8. Robustness Tests

	Panel A: Dependent variable: $\Delta ln(loans)_{i,j,t}$				Panel B: Dependent variable: $\Delta loan\ rate_{i,j,t}$			
	Fixed effects		System GMM		Fixed effects		System GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Robustness test 1: alternative measure of monetary policy								
mp	-.840***	-1.103**	-.909**	-.452	.305***	.314***	.381***	.335***
	(.000)	(.021)	(.049)	(.652)	(.000)	(.000)	(.000)	(.003)
foreign × mp	-.553	-.894**	.284	-.457	-.032	-.064**	.022	.047
	(.175)	(.021)	(.735)	(.514)	(.245)	(.040)	(.721)	(.624)
foreign × mp ×	1.340**	1.136*	2.490*	3.487**	-.092**	-.048	-.203**	-.216*
crisis	(.031)	(.074)	(.059)	(.046)	(.045)	(.355)	(.018)	(.079)
observations	1463	1463	1463	1463	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
R^2	.167	.193			.346	.359		
AR(1)/AR(2)			.000/.196	.000/.187			.000/.296	.000/.234
Hansen J test			.662	.555			.193	.202
Robustness test 2: without Hong Kong SAR and Singapore								
mp	-.580*	-1.027	-.236	-3.047	.470***	.447***	.386***	.449***
	(.076)	(.153)	(.735)	(.136)	(.000)	(.000)	(.000)	(.004)
foreign × mp	-.695	-1.510**	.441	-1.163	-.077	-.142**	.035	.117
	(.301)	(.015)	(.671)	(.281)	(.131)	(.013)	(.741)	(.389)
foreign × mp ×	2.458	2.413	7.858**	9.501**	-.270*	-.270*	-.453*	-.466
crisis	(.130)	(.162)	(.013)	(.021)	(.054)	(.083)	(.096)	(.174)
observations	1134	1134	1134	1134	1134	1134	1134	1134
(banks)	(161)	(161)	(161)	(161)	(161)	(161)	(161)	(161)
R^2	.184	.213			.379	.382		
AR(1)/AR(2)			.000/ .325	.000/ .239			.000/.317	.000/.224
Hansen J test			.890	.969			.871	.893
Robustness test 3: the extended crisis period of 2007-09								
mp	-.569*	-1.204*	-1.995*	-2.656	.444***	.314***	.503***	.421**
	(.082)	(.069)	(.065)	(.164)	(.000)	(.000)	(.000)	(.044)
foreign × mp	-.649	-1.223**	.557	-1.413	-.074	-.151***	-.006	.091
	(.292)	(.040)	(.701)	(.263)	(.119)	(.003)	(.962)	(.610)
foreign × mp ×	1.009	1.481	5.942*	4.988*	-.108	-.042	-.121	-.199
crisis	(.444)	(.283)	(.087)	(.081)	(.279)	(.687)	(.679)	(.522)
observations	1463	1463	1463	1463	1460	1460	1460	1460
	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
(banks)								
R^2	.145	.165			.349	.371		
AR(1)/AR(2)			.000/ .373	.000/ .132			.000/.330	.000/.337
Hansen J test			.292	.483			.341	.362
Robustness test 4: to add *foreign* × *real GDP growth* × *crisis* and *foreign* × *unemployment* × *crisis*								
mp	-.629*	-1.072*	-.696	-3.644*	.426***	.327***	.501***	.431*
	(.051)	(.088)	(.324)	(.052)	(.000)	(.000)	(.000)	(.053)
foreign × mp	-.773	-1.284**	-.170	-.641	-.035	-.103**	.013	.127
	(.145)	(.017)	(.886)	(.616)	(.435)	(.024)	(.914)	(.481)
foreign × mp ×	3.092*	3.006*	9.494***	7.331*	-.697***	-.655***	-.597*	-.838*
crisis	(.059)	(.087)	(.009)	(.078)	(.000)	(.000)	(.080)	(.068)
observations	1463	1463	1463	1463	1460	1460	1460	1460
(banks)	(216)	(216)	(216)	(216)	(216)	(216)	(216)	(216)
R^2	.156	.178			.371	.385		
AR(1)/AR(2)			.000/.266	.000/.167			.000/.439	.000/.126
Hansen J test			.586	.579			.336	.362
Robustness test 5: add *home country monetary policy* × *crisis* and *home country real GDP growth* × *crisis*								
mp	-.731**	-1.161*	-2.091***	-3.383*	.454***	.347***	.343***	.444**
	(.020)	(.079)	(.007)	(.056)	(.000)	(.000)	(.000)	(.011)
foreign × mp	-.710	-1.197**	1.430	-.507	-.065	-.136***	.132	.128
	(.220)	(.033)	(.239)	(.676)	(.156)	(.005)	(.185)	(.337)
foreign × mp ×	2.822*	2.232	8.051***	8.570*	-.318**	-.289*	-.518**	-.557
crisis	(.097)	(.180)	(.010)	(.057)	(.035)	(.063)	(.043)	(.125)
observations	1458	1458	1458	1458	1455	1455	1455	1455
	(215)	9215)	(215)	(215)	(215)	(215)	(215)	(215)
(banks)								
R^2	.154	.175			.363	.379		
AR(1)/AR(2)			.000/.128	.000/.059			.000/.200	.000/.037
Hansen J test			.550	.535			.417	.249

Notes: To save space, we only report the estimation results on the most relevant variables. In all regressions, variables of bank individual characteristics, host macroeconomic conditions and banking market structure are included. In regression (2), (4), (6) and (8), the interaction of bank characteristics and monetary policy (*mp*) and 2008-09 crisis dummy are also included. *p*-values are in parentheses. ***: 1% significance level; ** 5% significance level; * 10% significance level.

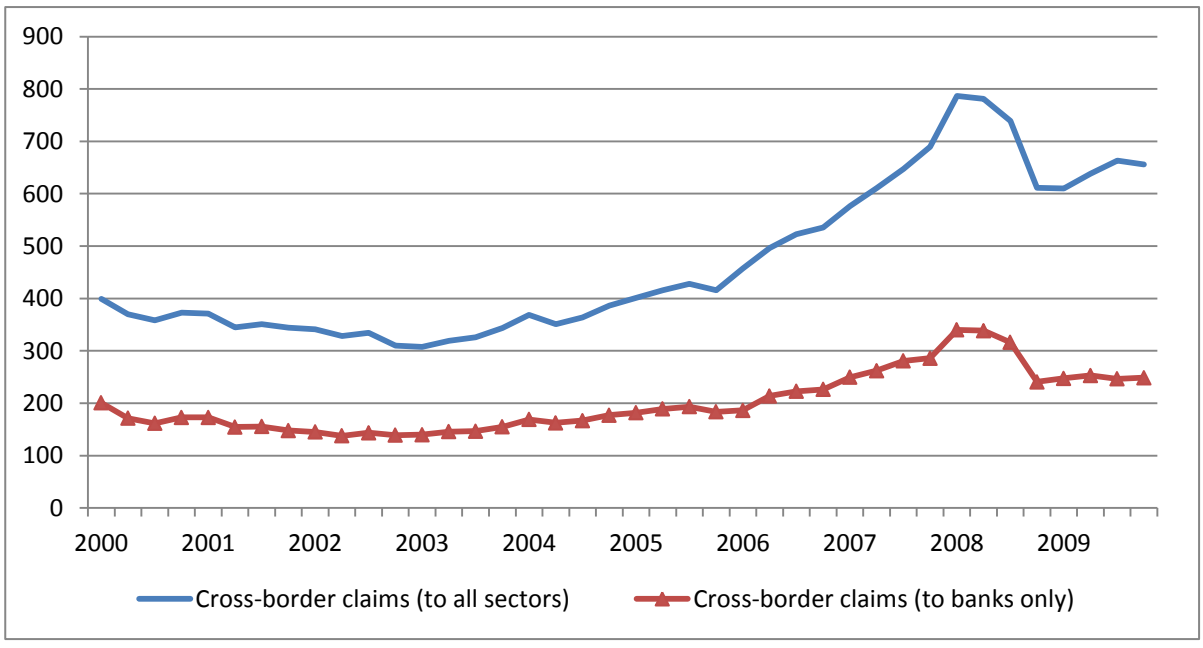
Figure 1. Average Loan Growth Rates of Domestic and Foreign Banks (year-on-year, in %), 2000-2009



Notes: Banks' loan and GDP are in real terms.

Source: BankScope, IFS and authors' own calculation.

Figure 2. Foreign Banks' Cross-Border Lending to the Asian Economies (in $billion), 2000-2009



Notes: Foreign banks include all BIS reporting banks that have different nationality from host economies.

Source: BIS and authors' own calculation.

Appendix 1. Foreign Bank Penetration Levels in Asia (2000-2009)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hong Kong	Assets	88.608	91.168	91.874	92.082	92.282	91.802	91.803	91.655	93.058	93.181
	Number	76.744	80.488	80.952	79.487	77.143	75.000	77.419	75.862	77.778	78.261
	Number: Domestic/foreign	10/33	8/33	8/34	8/31	8/27	8/24	7/24	7/22	6/21	5/18
Indonesia	Assets	5.025	4.325	6.426	15.435	22.109	26.380	25.499	27.994	28.289	27.869
	Number	33.333	32.727	32.075	35.714	40.000	43.636	40.351	50.909	50.943	56.250
	Number: Domestic/foreign	40/20	37/18	36/17	36/20	33/22	31/24	34/23	27/28	26/27	21/27
Korea	Assets	4.499	4.412	4.560	13.050	16.454	16.445	17.395	16.197	17.879	16.570
	Number	10.526	11.111	11.765	17.647	23.529	23.529	18.750	20.000	20.000	20.000
	Number: Domestic/foreign	17/2	16/2	15/2	14/3	13/4	13/4	13/3	12/3	12/3	12/3
Malaysia	Assets	26.240	23.507	22.474	24.092	24.265	22.243	22.386	23.577	23.459	22.327
	Number	52.000	50.000	50.000	50.000	52.000	52.000	54.167	56.522	56.522	56.522
	Number: Domestic/foreign	12/13	12/12	13/13	13/13	12/13	12/13	11/13	10/13	10/13	10/13
Philippines	Assets	2.595	1.338	2.565	2.486	1.486	1.619	1.716	1.171	1.058	.972
	Number	24.138	17.857	18.182	15.152	12.500	16.667	20.690	16.667	13.636	13.636
	Number: Domestic/foreign	22/7	23/5	27/6	28/5	28/4	25/5	23/6	20/4	19/3	19/3
Singapore	Assets	4.754	6.305	6.881	5.767	4.016	5.059	4.818	5.918	5.658	5.133
	Number	50.000	57.142	61.538	58.333	50.000	54.545	58.333	58.333	58.333	54.545
	Number: Domestic/foreign	9/9	6/8	5/8	5/7	5/5	5/6	5/7	5/7	5/7	5/6
Thailand	Assets	6.197	6.257	6.025	5.856	3.961	4.836	4.712	5.315	5.504	6.626
	Number	22.222	22.222	21.053	21.053	16.667	15.000	15.000	15.000	15.000	22.222
	Number: Domestic/foreign	14/4	14/4	15/4	15/4	15/3	17/3	17/3	17/3	17/3	14/4

Notes: Assets presents the share of foreign banks' assets in banking sector total assets, and numbers represent the ratio of the number of foreign banks to the total number of banks in the banking sector.

Appendix 2a. List of Multinational Banks which Operate Foreign Subsidiaries in Asia, 2000-2009

	Multinational bank	Home country	Host countries
	U.S. and Canada		
1	Bank of America	US	HK(2), MY
2	Bank of New York Mellon	US	HK
3	Bank of Nova Scotia (The) - SCOTIABANK	CA	HK, MY
4	Canadian Imperial Bank of Commerce	CA	HK, SG
5	Citigroup	US	HK(3), KR, MY, PH, SG
6	JP Morgan Chase	US	HK(2), MY
7	Lone Star Fund	US	KR
8	Newbridge Capital	US	KR
9	Royal Bank of Canada	CA	SG
10	Toronto Dominion Bank	CA	SG
	Europe		
11	ABN Amro	NL	MY, PH, TH
12	Banco Santander	ES	PH
13	Bayerische Landesbank	DE	SG
14	BNP Paribas	FR	ID
15	Commerzbank AG	DE	ID
16	Credit Agricole S.A.	FR	ID
17	Credit Lyonnais	FR	ID
18	Deutsche Bank AG	DE	MY
19	Fortis	BE	HK
20	HSBC	GB	HK(2), ID, MY
21	ICB Financial Group Holdings AG	CH	ID
22	ING Bank	NL	ID, SG
23	Rabobank Group	NL	ID(2), SG
24	Royal Bank of Scotland Group	GB	ID, MY
25	Societe Generale	FR	ID, KR, TH
26	Standard Chartered	GB	HK(3), ID, KR, MY, TH
27	WestLB AG	DE	SG
	Japan		
28	Bank of Tokyo - Mitsubishi UFJ	JP	ID, MY, PH
29	Dai-Ichi Kangyo Bank Ltd DKB	JP	HK
30	Fuji Bank	JP	ID
31	Mizuho Financial Group	JP	HK, ID
32	Resona Bank	JP	ID
33	Sumitomo Mitsui Banking Corporation	JP	ID, SG
34	UFJ Bank	JP	ID
	Other Asian economies		
35	Allied Banking Corporation	PH	HK
36	Banco Delta Asia S.A.R.L.	MO	HK
37	Bangkok Bank Public Company Limited	TH	MY
38	Bank of Baroda	IN	HK
39	Bank of China	CN	HK(4), MY
40	Bank of India	IN	ID
41	Bank Internasional Indonesia	ID	HK
42	China Construction Bank	CN	HK(2)
43	China Merchants Bank Co Ltd	CN	HK
44	Chinatrust Financial Holding Company	TW	HK, ID, PH
45	Chohung Bank	KR	HK
46	CIMB Bank Berhad	MY	ID, TH
47	CITIC Industrial Bank	CN	HK
48	DBS Group	SG	HK(2), ID(2), PH, TH

49	Fubon Financial Holding Co Ltd	TW	HK
50	Grand Commercial Bank	TW	HK
51	Hana Bank	KR	ID
52	Hong Leong Bank Berhad	MY	HK(2), PH, SG
53	Industrial & Commercial Bank of China (The) - ICBC	CN	HK(2), ID
54	Khazanah Nasional Bhd	MY	ID
55	Kookmin Bank	KR	HK
56	Korea Exchange Bank	KR	ID
57	Malayan Banking Berhad (Maybank)	MY	ID(2), PH
58	Mega International Commercial Bank	TW	TH
59	Oversea-Chinese Banking Corporation Limited OCBC	SG	ID(2), MY
60	Overseas Union Bank	SG	MY
61	Public Bank Berhad	MY	HK
62	RHB Capital Bhd	MY	ID
63	Shanghai Commercial & Savings Bank	TW	HK
64	Shinhan Bank	KR	HK
65	Southern Bank Berhad	MY	SG
66	United Overseas Bank	SG	ID(2), MY, PH, TH(2)
67	Woori Bank	KR	ID
	Other		
68	Absa Group	ZA	HK
69	Australia and New Zealand Banking Group	AU	ID
70	Commonwealth Bank of Australia	AU	ID
71	Islamic Development Bank	SA	ID
72	LGT Bank in Liechtenstein	LI	SG
73	National Australia Bank	AU	SG
74	Standard Bank Group	ZA	HK

Note: The number of subsidiaries in parenthesis. AU=Australia, BE=Belgium, CA=Canada, CN=China, DE=Germany, ES=Spain, FR=France, GB=U.K., HK=Hong Kong SAR, ID=Indonesia, IN=India, JP=Japan, KR=Korea, LI= Liechtenstein, MO=Macau, MY=Malaysia, NL=Netherlands, PH=Philippines, SA=Saudi Arabia, SG=Singapore, TH=Thailand, TW=Taiwan, US=U.S.A., ZA=South Africa.

Appendix 2b. Distribution of the Home Country of Foreign Banks Subsidiaries during the Period 2000-2009

	U.S.	Europe	Japan	Other Asian Countries	Other	Total
Hong Kong	8	6	2	28	4	48
Indonesia	0	12	6	17	3	38
Korea	3	2	0	0	0	5
Malaysia	3	5	1	5	1	15
Philippines	1	2	1	5	0	9
Singapore	1	5	1	2	4	13
Thailand	0	3	0	5	0	8
Total	16	35	11	62	12	136

Appendix 3. The Summary Descriptive Statistics: Domestic vs. Foreign Banks in Asia, 2000-2009

Panel A: Mean, standard deviation and median				Panel B: Correlation coefficient						
				Domestic banks						
	Mean	Std. dev	Median	Δln(loans)	Δ(loan rate)	liquidity	capitalization	size	riskiness	profitability
Δln(loans)	9.979	20.145	7.283	1						
Δ (loan rate)	-.382	2.143	-.282	-.103***	1					
liquidity	22.477	16.182	18.417	.173***	-.104***	1				
capitalization	10.309	6.631	9.095	-.039	-.086**	.011	1			
size	5.793	7.304	2.442	-.064*	.039	-.126***	-.182***	1		
riskiness	1.478	2.840	.888	-.010	-.049	-.047	-.039	.024	1	
profitability	.764	1.987	.930	.090***	-.073**	.116***	.231***	.025	-.573***	1
				Foreign banks						
	Mean	Std. dev	Median	Δln(loans)	Δ(loan rate)	liquidity	capitalization	size	riskiness	profitability
Δln(loans)	7.656	26.209	5.797	1						
Δ(loan rate)	-.467	2.451	-.344	-.109***	1					
liquidity	28.957	17.644	25.417	-.025	-.069*	1				
capitalization	14.618	9.403	11.999	.024	-.131***	.132***	1			
size	2.412	6.290	.650	-.001	.031	-.070*	-.266***	1		
riskiness	1.163	3.241	.559	-.006	-.084**	-.097**	-.009	-.058	1	
profitability	1.373	2.286	1.370	.083**	-.084**	.104***	.285***	-.004	-.549***	1

Note: ***: 1% significance level; ** 5% significance level; * 10% significance level.