Foreign bank ownership and risk-taking:
Evidence from emerging economies

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Abstract

This paper addresses the impact of foreign ownership on banks' risk-taking behavior. Using the bank-level panel data of more than 1,300 commercial banks in 32 emerging economies during 2000-2013, we find that foreign owned banks take on more risk than their domestic counterparts. We further examine several factors that may potentially contribute to foreign banks' differentiated riskiness from four perspectives, namely, foreign banks' informational disadvantages, agency problems, the contagious effect of parent banks' financial conditions and the disparity between home and host markets, and find supportive evidence that these factors play a significant role in affecting foreign banks' risk-taking.

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1. Introduction

The recent decades have witnessed a substantial increase in the presence of foreign banks in many emerging economies. With a comprehensive survey on the trends of foreign participation in host banking markets, Claessens and Van Horen (2014a) document that, during the period of 1995-2009, the number of foreign banks increased by 74% and their market share approximately doubled in emerging countries. Although the presence of foreign banks continues to rise nearly all around the world, it is notably more salient in rapidly growing regions like Central and Eastern Europe, Latin America and Asia.[1] Thanks to economic integration, institutional transition, financial liberalization and some other causes,[2] multinational banks expanded their business across borders and even became dominant in some host markets, although their presence seemingly declined in the aftermath of the 2008-9 global financial crisis.[3] Appendix A and B provide a summary regarding the number of foreign banks and their assets as a share of the banking sector total assets in some selected emerging economies in the above three regions.

Albeit a rich body of research, the economic and financial impacts of foreign bank entry on host markets are still an ambiguity. Some suggest that foreign banks can act as a stabilizing force in host countries by increasing the efficiency of domestic banks, encouraging market competition, improving the access of small and medium sized enterprises to credit, and providing steady loans when host markets fall in turmoil (Demirgüç-Kunt et al., 1998; Claessens et al., 2001; Clarke et al., 2001; De Haas and Van Lelyveld, 2006; Berger et al., 2009; Jeon et al., 2011; Bruno and Hauswald, 2014), whereas some others argue that foreign banks may "cherry-pick" the best clients, be a transmission channel of external shocks, and weaken the efficacy of host economic policies, hence introducing more volatilities in the markets where they operate businesses (Sengupta, 2007; Beck and Martínez Pería, 2010; De Haas and Van Lelyveld, 2010, 2014; Gormley, 2010; Wu et al., 2011; Jeon et al., 2013; Kalemli-Ozcan et al., 2013; De Haas, 2014).

In order to evaluate the impact of foreign entry on host banking sectors, various measures of bank performance have been used in extant literature. However, these measures

[1] Since the mid-1990s, significant foreign bank penetrations have also been observed in areas like Central Asia and Sub-Saharan Africa, but these regions have much smaller banking industries and economic might than Central and Eastern Europe, Latin America and Asia.

[2] The motives that lead foreign banks to enter host markets are addressed by Bhattacharya (1994), Focarelli and Pozzolo (2000) and Clarke et al. (2003) among others.

[3] As can be seen from Appendix B, after 2008, the assets of foreign banks as a share of the banking sector total assets decreased in some markets such as Bulgaria, Poland and Ukraine in Central and Eastern Europe, and Chile and Venezuela in Latin America. Claessens and Van Horen (2014b) find that the decrease of foreign banks' presence is heterogeneous across home countries: banks from advanced economies reduced their presence in host markets more greatly than banks from emerging and developing countries.

usually only capture specific dimensions such as banks' credit quantity, interest spreads, efficiency, profitability and portfolio composition,[4] and only a few gauge banks' risk, thus leaving the nexus between bank riskiness and foreign ownership understudied in research. Although owning favorable access to international capital, more sophisticated management and more advanced know-how to screen and monitor borrowers may help foster a sounder financial profile, foreign banks are also susceptible to various disadvantages, as elaborated below, that could offset the above advantages and augment their riskiness.

First, foreign banks face an informational disadvantage in new markets. Thanks to the process of financing in the past, incumbent domestic banks have gathered proprietary information on the creditworthiness of borrowers, and possessed a vantage over new foreign entrants. Some research suggest that, at least at the start-up stage, new banking market entrants will incur higher non-performing loans because they will face a customer pool with a higher share of unprofitable firms that shifted from incumbent banks (Dell'Ariccia et al., 1999; Dell'Ariccia, 2001; Dell'Ariccia and Marquez, 2004).[5] Foreign banks can overcome this informational disadvantage through "learning by lending," thus banks' risk may decrease with the time of their operation in host markets. However, it may take many years for new entrant banks to catch up incumbent ones in terms of profitability (DeYoung and Hasan, 1998; Shaffer, 1998).[6]

Second, foreign banks are exposed to agency problems. Agency problems are prevalent in the banking industry, partially due to the separation of ownership and control that induces managers to pursue their own benefits at the expense of shareholders (Jensen and Meckling, 1976; Gorton and Rosen, 1995; Demsetz et al., 1997).[7] In cross-border banking, if senior

[4] For example, De Haas and Van Lelyveld (2006, 2014), Ongena et al. (2013a) and Chen and Wu (2014) study the relationship between foreign bank penetration and growth of the credit quantity in host markets. Williams (1998), Claessens et al. (2001) and Martínez Pería and Mody (2004) address how foreign banks' entry affects the net interest margins in domestic banking sectors. Sturm and Williams (2004), Havrylchyk (2006) and Wezel (2010) focus on the efficiency impact of foreign banks. Havrylchyk and Jurzyk (2011a) and Claessens and Van Horen (2012) examine the factors that affect the profitability of foreign banks, and Bhaumik and Piesse (2008), and Degryse et al. (2012) investigate the effect of foreign and domestic ownership on banks' portfolio composition.

[5] Good borrowers are "locked in" the bank-customer relationship with incumbent banks if they are unable to signal their quality to new entrant banks, thus causing the problem of adverse selection to the new entrant banks (Dell'Ariccia et al., 1999).

[6] Although foreign banks are presumed able to acquire the information of host markets by purchasing domestic banks (Panetta et al, 2009), some research find that the bank-firm relationships of the target banks are discontinued after mergers & acquisitions (Sapienza, 2002; Degryse et al., 2005; Montoriol-Garriga, 2008). Meanwhile, foreign banks are found not to necessarily outperform domestic banks in many studies (for example, DeYoung and Nolle, 1996; Berger et al., 2000), seemingly implying that foreign banks can acquire market share via mergers & acquisitions, but not informational advantages.

[7] Agency problems can arise due to some other reasons. For instance, limited liability and deposit insurance schemes may cause bank shareholders to expropriate wealth from debt holders by increasing risk.

managers at the headquarters cannot accurately monitor the managerial efforts and quality of junior officers at foreign subsidiaries, the latter may be motivated to undertake more risk in a fashion of moral hazard, in particular, when they can keep the gains in the subsidiary but share the losses within the conglomerate (Berger and DeYoung, 2001; Goetz et al., 2013; Albertazzi and Bottero, 2014).[8]

Third, foreign banks' riskiness is associated with parent banks' financial health. There are several reasons. First, headquarters may "export" their (good or bad) risk management practices/policies to their foreign affiliates (Berger and DeYoung, 2001), thus causing a positive correlation between subsidiaries' fragility and their parent banks'. Second, when parent banks incur an adverse shock at home, they can conduct a global reallocation of funds toward the headquarters, either to strengthen capitalization or increase the probability to receive governments' bail-out assistance (Cetorelli and Goldberg, 2011, 2012a, 2012b). Consequently, foreign affiliates in the host market may be forced to shrink their loans, liquidate long-term assets, increase intra-group loans to distressed parent banks, or even directly receive risky assets transferred from headquarters (Vogel and Winkler, 2011; Giannetti and Laeven, 2012; Allen et al., 2013), thus likely resulting in contagious effects in the conglomerate and undermining the stability of the foreign affiliates. Third, financial conditions of parent banks in the home country can affect the financing costs of their foreign affiliates. As parent banks' income or assets decrease under detrimental shocks, their foreign affiliates' financing costs increase, which in turn cause losses or increase their leverage risk.

Finally, foreign banks' performance has been found to be related to the disparity in macroeconomic environments and banking market structure between home and host countries. For instance, Goldberg and Saunders (1981) indicate that the interest rate differentials between the U.S. and foreign deposits and loans can significantly determine the growth of foreign banks in the U.S. Berger et al. (2000) and Lensink et al. (2008) suggest that the relatively higher efficiency of foreign banks is attributed to certain favorable market or institutional conditions in home countries. De Haas and Lelyveld (2010) find that a higher GDP growth in the home country exerts a negative influence on subsidiaries' credit growth. Claessens and Van Horen (2012) investigate the impact of some home country characteristics, including the level of economic development and market competition, on foreign banks' profitability. However, the research on the effect of home-host country disparity on bank risk is still sparse, with only a few exceptions like Ongena et al. (2013b), who find that the strength of financial regulation in home markets is significantly associated with banks' lending standards in their foreign affiliates.

[8] Some research suggest that affiliates may share their losses within the conglomerates by receiving subsidy from parent banks via internal capital markets, thus causing inefficient allocation of internal capital (see Scharfstein (1998) and Scharfstein and Stein (2000), for example).

Despite, as the above literature implies, a variety of factors that may lead to a discrepancy between the riskiness of foreign and domestic banks, only a limited number of works have addressed the nexus between banks' riskiness and types of bank ownership. Demirgüç-Kunt et al. (1998), observing the market share of foreign banks in 80 developed and developing countries in 1988-1995, find that the entry of foreign banks tends to lower the probability that a host country will experience a banking crisis. De Nicolò and Loukoianova (2007) find that the risk profiles of foreign banks are significantly higher than those of domestic private banks. Angkinand and Wihlborg (2010) and Agoraki et al. (2011), employing similar country-level measures of foreign bank penetration, find only competing evidence for a negative/positive linkage between foreign bank presence and the overall stability of the banking sector in host emerging countries. In contrast, Levy Yeyati and Micco (2007) find two-sided effects of foreign bank participation on the financial stability in Latin American countries. Although foreign bank penetration increases the stability of host banking sectors by dampening market competition, foreign banks are per se characterized by a higher risk profile than domestic banks. Given the lack of consensus, whether foreign banks outperform domestic banks in terms of financial stability still remains a question to be answered.[9]

In this paper, we make a complementary extension for the existing literature by focusing on the impact of foreign ownership on banks' riskiness in host emerging markets. We find that, after controlling for a variety of risk determinants, foreign ownership is still negatively and significantly associated with the measures of bank stability, suggesting that foreign banks are engaged in higher credit risk than their domestic counterparts. This result is robust to alternative measures of bank risk and different econometric methodologies. We then examine the factors that may, at least partially, account for foreign banks' differentiated riskiness from the above-mentioned four perspectives, i.e., informational barriers, agency problems, the spillover of parent banks' risk and the disparity between home and host countries, and find some supportive evidence that these factors play a significant role in affecting foreign banks' risk-taking.

Our paper differs from prior literature in a number of ways. First, different from the earlier works that mostly concentrate on banks' performance such as credit growth, profitability and efficiency, we assess the linkage between foreignness and the riskiness of banks, which is measured by three Z-score based indicators. Second, our research combines two strands of growing literature, i.e., the economic impacts of foreign bank penetration and the determinants of bank risk. Compared to the works that use country-level data or aggregate

[9] Albeit not a direct examination on the impact of foreign ownership on riskiness, Berger et al. (2015) find that banks that are engaged in international business are associated with higher risk than purely domestic banks, whereas Buch et al. (2013) only find a weak relationship between internationalization of banks and bank risk.

measures to reflect foreign penetration (Demirgüç-Kunt et al., 1998; Angkinand and Wihlborg, 2010; Agoraki et al., 2011), we use bank-level data and distinguish foreign banks by manually identifying the year-by-year domestic/foreign ownership of more than 1,300 commercial banks in 32 emerging markets. We focus our analysis to emerging markets where the level of foreign bank penetration into host banking markets has increased significantly in recent year.

Meanwhile, in order to overcome the problem of spurious regression and distinguish the impact of foreign ownership on banks' fragility, we control for a range of risk determinants based on a careful review of extant research, including banks' characteristics, financial regulations, macroeconomic conditions, market structure and some others. Third, in the limited studies on the association between foreignness and bank riskiness, the reasons why foreign banks exhibit heterogeneous riskiness from domestic ones are usually not empirically investigated (De Nicolò and Loukoianova, 2007; Levy Yeyati and Micco, 2007). We extend these works in this paper by identifying the factors that may contribute to the different level of riskiness of foreign banks from that of domestic counterparts

With important policy implications, our findings suggest a potential trade-off between a bright and a dark side of foreign banks' participation in emerging economies. Despite serving as a steadier lending source than domestic banks in the episodes of host economy financial disorders,[10] foreign banks are in general associated with higher riskiness which may in turn introduce unexpected shocks into host markets. As our results show, the extra riskiness of foreign banks are found attributed to factors such as the informational difficulty exposed to foreign entrants, the agency problems between affiliates and their parent banks, the riskiness of parent banks and the difference between home and host conditions. Were these factors to change unfavorably, foreign banks' risk might build up and consequently undermine the financial soundness of host markets. A diversification of the financial and informational sources of foreign banks and an international cooperation and coordination on financial supervision are advised as critically important to maximize the net benefit of financial liberalization for emerging economies.

The rest of the paper is organized as follows. Section 2 introduces our data and main variables, followed by the model described in Section 3. In Section 4, we report the results of our baseline model and robustness tests. Section 5 examines several factors that account for the differentiated riskiness of foreign banks, and Section 6 summarizes and concludes.

[10] It has been well documented that, before the 2008-9 global financial crisis, foreign banks supply more stabilized loans in the periods of host financial turmoil (see Dages et al. (2000), Martínez Pería et al. (2002), De Haas and Van Lelyveld (2006), for example). However, recent works find that foreign banks tend to amplify the effect of the 2008-9 crisis in host markets by reducing their lending more greatly or by responding to monetary policy less sensitively than domestic banks in host economies (Ongena et al., 2013a; De Haas and Van Lelyveld, 2014; Jeon and Wu, 2014; Allen et al., 2015).

2. Data and variables

We use unbalanced bank-level panel data collected for more than 1,300 banks in 32 emerging economies located in Eastern and Central Europe, Latin America and Asia during the period of 2000-2013.[11] Only commercial banks are included in our sample to minimize any possible bias due to the different nature and business scope among banks that have different objectives and conduct businesses in different specializations. In order to avoid selection bias, we include in our dataset not only existing banks, but also those that have ceased business operation. We collected the data to be used to measure banks' risk-taking behavior and individual banks' characteristics from Bureau van Dijk's *Bankscope* database and authors' own calculations as described below.

2.1. Banks' risk-taking

As commonly employed in extant literature (see Laeven and Levine, 2009; Houston et al., 2010; Demirgüç-Kunt and Huizinga, 2010, and many others), our primary measurement for levels of individual banks' risk-taking is the time-varying *Z-score*, which is formally expressed as follows:

$$Z_{it} = \frac{ROA_{it} + EA_{it}}{\sigma(ROA)_{it}} \tag{1}$$

where ROA_{it} denotes the return on assets of bank i in year t, EA_{it} represents the ratio of equity over total assets, and $\sigma(ROA)_{it}$ is the standard deviation of return on assets. We follow Schaeck and Cihák (2010) and Beck et al. (2013) by using a three-consecutive-year rolling window to calculate $\sigma(ROA)_{it}$, rather than the full sample period.[12] This practice allows for the time variation in the denominator, thus avoiding the change of *Z-scores* that is only driven by the variation of bank profitability and capitalization. Interpreted as the number of standard deviations by which returns have to decrease to wipe out all equity owned by the bank (Roy, 1952), the *Z-score* can be viewed as the inverse of the probability of bank failure. A higher value of the *Z-score* suggests a higher stability of the bank, or put differently, a lower reading of the *Z-score* implies the bank's higher exposure to insolvency risk.[13]

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[11] Namely, the selected emerging markets include: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Moldova, Macedonia, Poland, Romania, Slovakia, Slovenia, Ukraine (Central and Eastern Europe); Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Paraguay, Peru, Uruguay, Venezuela (Latin America); China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand (Asia).

[12] We also experiment using a five-year rolling window to calculate Z-scores and find that our main results do not change qualitatively and remain statistically significant. However, using a five-year rolling time will cause a considerable reduction in the number of our observations. The results are available upon request.

[13] Because the *Z-score* is highly skewed, we apply the natural logarithm to (1+ *Z-score*) to smooth

An advantage of using the *Z-score* as the primary proxy of bank risk is that it allows us to further investigate what drives the variation of bank riskiness, or alternatively speaking, whether foreign banks' riskiness is more associated with their asset side or their liability side. We later use the three components of the *Z-score*, i.e., *ROA*, *EA* and $\sigma(ROA)$, as alternative dependent variables, which are interpreted as the gauge of banks' profitability, leverage risk and asset portfolio risk, respectively.

However, a simple comparison between the values of *Z-scores* across different countries may lead to biased conclusions, since it can be argued that banks' *Z-scores* in some countries may be in general higher or lower than those in other countries, thus a higher figure of the *Z-score* at Bank A in country 1 than Bank B in country 2 may not necessarily mean that Bank A is placed at a position relatively less risky than Bank B. In order to overcome this problem, we normalize *Z-scores* for each country respectively as follows:

$$Z\_n_{ijt} = \frac{Z_{ijt} - min(Z_j)}{max(Z_j) - min(Z_j)} \quad \text{for country } j=1, 2 \ldots \tag{2}$$

where $min(Z_j)$ and $max(Z_j)$, respectively, denote the minimum and maximum value of *Z-scores* for banks in country *j* over the sample period. The results thus lie in the rage of [0, 1], indicating the relative level of riskiness that banks are exposed to in their markets. A higher value in *Z_n* suggests that the bank has a relatively greater stability/lower insolvency risk in comparison to its counterparts across markets.

Finally, we borrow the concept of the "X-efficiency of stability" from Fang et al. (2014) and Tabak et al. (2012), who assume the *Z-score* as the outcome of banks' production choice under the trade-off of return and risk, and suggest that the same *Z-scores* may be associated with banks' different deviation from their potentially highest financial stability. We estimate the X-efficiency of banks' financial stability by applying the stochastic frontier approach (SFA) to the following production function:

$$\begin{aligned}\ln\left(\frac{Z}{w_3}\right)_{it} = {} & c + \frac{1}{2}\sum_{h=1}^{3}\alpha_h \ln(y_h)_{it} + \frac{1}{2}\sum_{h=1}^{3}\sum_{k=1}^{3}\alpha_{hk}\ln(y_h)_{it}\ln(y_k)_{it} + \sum_{m=1}^{2}\beta_m \ln\left(\frac{w_m}{w_3}\right)_{it} + \frac{1}{2}\sum_{m=1}^{2}\sum_{n=1}^{2}\beta_{mn}\ln\left(\frac{w_m}{w_3}\right)_{it}\ln\left(\frac{w_n}{w_3}\right)_{it} \\ & + \frac{1}{2}\sum_{h=1}^{3}\sum_{m=1}^{2}\phi_{hm}\ln(y_h)_{it}\ln\left(\frac{w_m}{w_3}\right)_{it} + \lambda \ln EQ_{it} + \frac{1}{2}\sum_{h=1}^{3}\eta_i \ln EQ_{it}\ln(y_h)_{it} + \frac{1}{2}\sum_{m=1}^{2}\rho_m \ln EQ_{it}\ln\left(\frac{w_m}{w_3}\right)_{it} \\ & + \delta_1 T + \delta_2 T^2 + \varepsilon_{it}\end{aligned} \tag{3}$$

$$\varepsilon_{it} = u_{it} - v_{it} \tag{4}$$

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higher values (Beck et al., 2013). Using 1+ *Z-score* instead of using simply *Z-scores* is to avoid the truncation of the *Z-score* at zero. We denote ln(1+ *Z-score*) as the *Z-score* in the latter part of the paper for brevity. Prior to our calculation of the *Z-score*, we removed the outliers of $ROA_{i,t}$ and $EA_{i,t}$ above the 99th percentile and below the 1st percentile of the sample distribution to rule out abnormality or probable measurement errors.

where y_i represents three bank outputs, namely, loans (y_1), securities (y_2) and other non-interest related operations (y_3), w_i denotes three input prices, i.e., price of funds (w_1), price of fixed capital (w_2), and price of labor (w_3), and *EQ* is banks' equity, which is included as a netput. *T* denotes the time trend.[14] The error term, ε_{it}, is distinguished into two parts. The first part, u_{it}, denotes the random noise, assumed normally distributed ($u_{it} \sim N(0,\sigma_u^2)$), and represents the measurement errors and other uncontrollable factors. The second part, v_{it}, assumed half-normally distributed ($v_{it} \sim N^{+}(0,\sigma_v^2)$), captures the banks' inefficiency to conduct a production that can render an optimal financial stability. Estimating a single frontier for all banks across countries allows the X-efficiency item, v_{it}, to be compared against the same baseline (Tabak et al., 2012). We use the method of Battese and Coelli (1995) to estimate equation (3) and then adopt the Battese and Coelli (1988) estimator to convert v_{it} into $Z\_v_{it} = E(\exp(-v_{it}|\varepsilon)$, a term with a similar pattern of *Z* and *Z_n*, where a higher value in the range (0, 1) denotes a closer distance to the implicit greatest stability, interpreted as a lower risk-taking level of the bank.

2.2. Bank ownership

In line with the common practice of related works, we define a bank as foreign owned if more than 50% of its capital is held by foreign banks, firms, individuals or organizations. We track the year-by-year domestic/foreign ownership status for each bank in our sample by taking the following steps: First, we check the brief overview of banks documented in *Bankscope*, which records the ownership information for some banks in the most recent year. Second, we visit banks' website to review their historical profile, where important events, such as the establishment and the change of controlling shareholders, are usually documented. Third, we obtain banks' mergers and acquisitions (M&A) information from another comprehensive database, the *SDC Platinum*, which provides relevant information on cross-border banking M&A, including the time and the identity of acquirers. Finally, we resort to various other information sources, such as banks' annual reports, central banks' publications and news reports from the Internet, to identify the ownership status for remained banks. At the end, we identify 663 foreign-owned banks, originated from 65 home countries and controlled by 289 ultimate owners.[15] Foreign banks in our data are distinguished by a dummy, *foreign*, which equals to 0/1 for domestic-/foreign-owned banks.[16]

[14] We assume a standard production function by following related literature. w_1 is proxied by the ratio of interest expenses to total deposits and other funds, w_2 is measured by the ratio of (overhead cost – personnel expenses) to fixed assets, and w_3 is calculated by the ratio of personnel expenses over total assets. The normalization by w_3 ensures price homogeneity.

[15] Among these ultimate owners, 217 are multinational banks with available financial information.

[16] There are some subtle differences between our ownership identification with some earlier works.

Meanwhile, we follow similar steps to identify domestic government-owned banks, defined as banks with 50% or more of government-owned capital, and then isolate these banks by using another dummy, *state*. That is, our sample banks are classified into three groups: domestically private-owned banks, domestically state-owned banks, and foreign banks. It has been widely expected that state-owned banks are more likely involved in risky bets, due to either the intervention of politicians or implicit government protection (Mian 2003; Iannotta et al., 2013).

2.3. Bank characteristics

In order to assess the impact of foreign ownership under the *ceteris paribus* condition, we control for a series of bank characteristics that may be correlated with bank ownership and relevant for bank risk-taking. First, we control for the size of individual banks, which is the natural logarithm of bank total assets in millions of constant US dollars.[17] Large banks may be engaged in more risky activities if they believe they are "too big to fail" and would be bailed out by the government when they fall in crisis (Brandao Marques, et al., 2013; Afonso, et al., 2014). Second, we include bank liquidity, defined as the ratio of liquid assets to total assets, as a potential factor that may affect bank risk-taking. The liquid assets held by banks may help insulate their loans from being affected by monetary shocks (Cornett et al., 2011), yet it is also likely that banks may store more liquid assets when they expect to face a higher volatility on returns (Alger and Alger, 1999). Therefore how bank liquidity is associated with bank risk-taking is still theoretically uncertain.

The third factor that we control for is banks' operational efficiency, proxied by the ratio of banks' overhead cost to the sum of net interest revenue and non-interest income, thus a higher value in this ratio suggests lower efficiency in banks' management. Many papers have documented a negative relationship between banks' efficiency and their riskiness (Berger and DeYoung, 1997; Fiordelisi et al., 2011). Fourth, following Demirgüç-Kunt and Huizinga (2010), we take the diversification of banks' income and funding as control variables. They are measured, respectively, by the ratio of non-interest income to total operating income and the non-deposit short-term funding as a share of the total short-term funding. Conventional wisdom posits that a higher extent of diversification may translate into lower bank risk and stabilized returns, but many empirical works find conflicting evidence (Demsetz and Strahan, 1997; DeYoung and Roland, 2001; Stiroh, 2004). Fifth, the growth rate of real bank assets is

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For example, we differ from Claessens and Van Horen (2014a) by defining foreign banks' ownership and home country based on their ultimate, rather than immediate, owner. Different from Arena et al. (2006) who only classify the banks from industrialized OECD countries as "foreign", we treat any bank whose majority owner is not from the host country as "foreign".

[17] Our results are not changed when we experiment by using the relative size of banks, measured by bank assets as a share of the entire banking sector assets.

also incorporated into our estimation. A higher growth pace of assets may lead banks to more risk if it reflects an imprudently aggressive expansion strategy (Keeton, 1999; Foos et al., 2010).[18]

2.4. Financial regulation

As confirmed by rich evidence presented in works including Barth et al. (2004, 2008), González (2005) and Laeven and Levine (2009), financial regulatory rules are an important determinant of the stability of the banking sector. Although higher regulation stringency is widely expected to foster prudential financial activities, it may also result in some undesired outcomes by inducing rent-seeking behavior and reducing the potential benefits from diversification and economies of scale, thus likely engendering a higher level of financial vulnerability.

We control for the regulatory strength from four aspects, specifically, the requirement on capital adequacy, the restriction on banks' activity mix, the power of supervisory officials, and the extent to which banks are subject to market discipline. Using the survey data provided by Barth et al. (2004, 2008, 2013) and following the methodology suggested by Barth et al. (2004), we build country-level time-series indices for each of the above four regulation aspects for each of the 32 emerging economies in our sample.[19]

For instance, the index of capital regulation is based on the answers to 9 survey questions such as: whether the minimum capital-asset ratio requirement is risk-weighted in line with the Basel guidelines, whether the minimum ratio varies as a function of market risk, whether the sources of funds to be used as capital are verified by the regulatory authorities, and others. Summing up the answers (1 for "yes" and 0 for "no") yields a value that denotes the strictness of regulation on capital requirement. The index of banks' activity restriction combines the information on whether banks are allowed to engage in the activities of securities, insurance and real estate. The index of official supervisory power reflects the authorities owned by supervisory agencies to intervene in banks' structure and operation. And the index of market discipline captures the extent to which banks are exposed to private monitoring and public supervision for not assuming excessive risk. A higher score in these indices denotes more stringent regulations, respectively, on banks' capital adequacy, permissible activity mix, the oversight power of supervisory officials, and banks' exposure to market discipline.

[18] When constructing the above bank characteristics, we remove outliers by first deleting those most likely erroneous records and then exclude the values lying below the 1st percentile or above the 99th percentile of the sample distributions of these bank characteristic variables.

[19] Because the regulatory and supervisory status are not surveyed each year by Barth et al. (2004, 2008, 2013), we assume that the regulation strength will be constant during the period between the previous and the current survey.

2.5. Macroeconomic conditions

The cyclicality of bank stability has been well documented in prior literature (see Demirgüç-Kunt and Detragiache (1998) and Marcucci and Quagliariello (2009) for example). We include two macroeconomic variables to control for the effect of business cycles, namely, the growth rate of real GDP and the inflation rate. Real GDP is calculated by using nominal GDP adjusted by the GDP deflator, and the inflation rate is the percentage change in the consumer price index. Since some countries experienced chronically higher/lower GDP growth rate or inflation rate than other countries, we apply the Hodrick-Prescott filter to these two macroeconomic series and use the cyclical parts as the proxies of business cycles.[20] Interpreted as the extent by which a variable in a specific year is deviated from its long-term trend, a positively higher value suggests the variable is relatively higher than its regularity, and vice versa.[21]

A recently flourishing line of research, referred to as the "risk-taking channel of monetary policy", has suggested that the innovation of central banks' monetary stance can be a significant determinant of bank risk (Borio and Zhu, 2012; Jiménez et al., 2014; and many others). Inspired by Bernanke and Mihov (1998), we construct a structural vector autoregression (VAR) model for each economy, composed of five macroeconomic variables, i.e., the short-term interest rate, the growth rate of real GDP, the inflation rate, the depreciation of exchange rates and the real growth rate of financial credit, and then use the residuals of the interest rate equation to represent the innovations to monetary policy.[22] A higher (lower) value in this indicator suggests a contractionary (expansionary) policy

[20] For example, the real GDP growth rate in China in 2013 was 7.7%, notably higher than that of many other economies. However, the cyclical part of its Hodrick-Prescott filtered GDP growth rate was only −0.63%, suggesting the current real GDP growth rate is below its long-term trend and likely leading to a deterioration of bank stability.

[21] In order to overcome the potential problems associated with the shortage of data, we use the largest available number of macroeconomic data to exercise the Hodrick-Prescott filter and use only the cyclical parts during the period of 2000-2013 as the proxies of business cycles in our regressions.

[22] In comparison to some other frequently employed proxies of monetary policy, for example, the level or the first difference of interest rate, our indicator captures the interest rate innovations independent of non-policy macroeconomic shocks, such as the growth of aggregate output and currency depreciation, and thus is suggested as a proper indicator of central banks' exogenous monetary policy adjustments. We use the largest number of available observations of the above five variables to estimate the VAR model but use only the interest rate equation residuals during the period of 2000-2013 as the proxies of monetary policy in our regressions. To identify the VAR model, we impose the Cholesky restriction by assuming the order of the variables as {*i, b, e, p, y*} where the symbols represent, respectively, interest rate, the growth rate of financial credit, the depreciation of exchange rates, inflation rate and the real GDP growth rate. The variables ahead are assumed to be affected by the latter ones only with one-period lag, but not contemporaneously, while the latter variables are affected by those ahead both contemporaneously and with one-period lag. We also experimented with alternative orders of the variables, for example, {*y, p, i, b, e*} and {*y, p, b, e, i*}, and find our results are not much sensitive to the order of these variables. The results are available upon request.

adjustment. The main source of macroeconomic data is IMF's *International Financial Statistics*.

A number of our sample countries experienced financial crises during the period of 2000-2013. Since banks would usually incur higher risk during crisis periods, we include in our estimations a binary dummy variable for the episodes of financial crises. Data for crisis periods are collected from Laeven and Valencia (2013). We also assume that financial sectors in all countries are affected by the recent global financial crisis and let this crisis dummy be equal to one for all countries in 2008-2009.

2.6. Other variables

Only mixed results are reported in extant literature regarding the impact of market structure on bank soundness. Some works argue that financial stability tends to decrease with market competition (Beck et al., 2006, 2013), whereas some others suggest the opposite (Boyd and De Nicolò, 2005; Boyd et al., 2006). We gauge the banking market competition by using the Lerner index, which is constructed based on the common practice in extant literature (for example, Berger et al. (2009) and Anginer et al. (2014)). A higher figure in this index implies a higher market power/a lower competition prevailing in the banking sector.

We also control for financial depth, measured by the ratio of domestic credit to private sector over GDP, as a potential determinant of the risk-taking levels of banks. Only discussed in a few works like Mannasoo and Mayes (2009) and Delis and Kouretas (2011), the effect of financial depth on financial soundness can be ambiguous. On one hand, a higher prominence of banks in providing credit could imply a higher sophistication of the banking sector, while on the other hand it may also reflect the credit constraints faced by borrowers, thus likely generating competing impacts on the stability of banking markets.

A long list of literature has assessed extensively the efficacy of deposit insurance systems on financial stability (Keeley, 1990; Demirgüç-Kunt and Detragiache, 2002; Demirgüç-Kunt and Huizinga, 2005). Deposit insurance, launched as a safeguard against bank run, has also been attributed as a source of moral hazard, which may facilitate more bank credit to high-risk, high-return projects. Using the data from Demirgüç-Kunt et al. (2013) and following Barth et al. (2004), we construct a composite index by summing up the design features of deposit insurance schemes, such as the coverage limit as a share of GDP per capita, the source of funding, the compulsoriness of membership and others, to measure the strength of the deposit insurance coverage.

Finally, as La Porta et al. (1997, 1998) and Levine (1999) have argued, institutional environments, including the effectiveness of contract enforcement and the legal protection on creditors, also affect financial development significantly. Following the literature of "law and finance," we include the quality of institutions in our regression by using the indicator of the

rule of law as the proxy. We obtain the data of the rule of law index from the World Bank's Worldwide Governance Indicators (Kaufmann et al., 2010).

2.7. Descriptive statistics

The definition of variables and the source of data are presented in Table 1, and we report the relevant descriptive statistics for these variables in Table 2. We first report the mean, the standard deviation and the median values in Panel A. The *Z-score* is distributed with the mean value at 3.315 and the standard deviation 1.146. Although not reported, the range of the *Z-score* is from the minimum -3.696 and the maximum 8.301. The fairly high standard deviation and the wide range of *Z-scores* imply a considerable variation on the level of riskiness across banks. The mean value for the dummy, *foreign*, is .441, interpreted as that approximately 44% of observations in our sample are those of foreign-owned banks.[23]

[Table 1]

[Table 2]

We then divide our observations according to banks' domestic/foreign ownership and compare their mean values in Panel B. The univariate *t* tests are conducted to compare if the mean values of these variables for domestic banks are larger than/identical to/smaller than those for foreign banks. For all three indicators of bank stability, i.e., *Z*, *Z_n* and *Z_v*, the mean value for domestic banks is significantly higher than that for their foreign counterparts, seemingly suggesting a more risky profile characterized by the latter. This discrepancy between the mean values of risk indicators for domestic and foreign banks is found persistent, instead driven by occasional shocks. In Appendix C, we compare the mean values of the risk measures for domestic and foreign banks year by year, and find that in the majority of these periods, foreign banks are associated with significantly lower financial stability than domestic ones.

We also find that foreign banks differ from domestic banks in many dimensions, not only their individual characteristics but also the macroeconomic and regulatory environments where they reside. The results of *t* tests suggest that foreign banks are more liquid and more income and funding diversified, yet meanwhile associated with smaller size, higher cost-to-income ratio and a lower asset growth rate than their domestic counterparts. In addition, it seems that foreign banks are more likely located in markets with lower cyclical volatility, less strict financial regulation, higher market competition, greater prominence of the banking sector, and stronger rule of law. These results confirm the necessity to control for these variables to avoid the problem of spurious regression.

The pairwise correlations between the key variables are presented in Appendix D. *Z-scores*

[23] In terms of the number of foreign banks in our sample, approximately 49% of banks are foreign owned.

and foreign ownership is shown negatively and significantly correlated, also suggesting an inferior stability status for foreign banks, and the correlations between foreign ownership and other variables are also consistent with the results of Table 2. The bank characteristic variables, and the financial regulatory variables, are found not highly correlated with each other, implying that a joint inclusion of these variables will not cause serious multicollinearity problems.

3. Model and methodology

Our baseline econometric model is described as follows:

$$Risk_{it} = c + \beta \cdot foreign_{it} + \phi \cdot state_{it} + \lambda \cdot Char_{it} + \sigma \cdot Macro_{jt} + \zeta \cdot Regu_{jt} + \eta \cdot other + f_i + \varepsilon_{it} \quad (5)$$

where the dependent variable, $Risk_{it}$, is our indicator of banks' financial riskiness, i.e., *Z*, *Z_n*, and *Z_v*, respectively, in our regressions. $foreign_{it}$ and $state_{it}$ are ownership dummies for foreign-owned and domestically government-owned banks, respectively. $Char_{it}$, $Macro_{jt}$ and $Regu_{jt}$ represents the series of bank characteristics of bank *i*, the proxies for bank regulation rules and the macroeconomic conditions for country *j*, respectively, as described in Section 2.3-2.5. *other* is the vector containing the variables for market competition, financial depth, the strength of the deposit insurance coverage, the rule of law and year dummies. f_i is the time-invariant bank-specific effect and ε_{it} is the idiosyncratic error. β, ϕ, λ, σ, ζ and η are the coefficients to be estimated. To mitigate the problem of endogeneity, we use one-year lag of each of the bank characteristic variables.

The benchmark model is estimated by using the fixed-effects estimator, which is chosen based on the Hausman test that suggests the fixed-effects estimator is preferable to the random-effects estimator because the regressors are shown correlated with the time-invariant bank-specific variables. We use heteroskedasticity and within-panel serial correlation robust standard errors in our estimations. To check the robustness of our main results, we also employ various alternative econometric methodologies later.

4. Empirical results

4.1. Baseline results

We estimate the benchmark model by including only the ownership dummies and the bank characteristics first, and then adding the macroeconomic conditions, regulatory variables and others in regression. The estimation results are reported in Table 3.

[Table 3]

First, the coefficient on the dummy *foreign* is negative and statistically significant in all

regressions. Consistent with De Nicolò and Loukoianova (2007), Levy Yeyati and Micco (2007) and Boubakri et al. (2013),[24] our results suggest that foreign banks are associated with a more risky profile than domestic private banks, after having controlled for the impacts of other potentially relevant risk determinants. Not only characterized by a significantly lower *Z*, which is interpreted as a greater risk-taking level in absolute terms, foreign banks are also found placed on a disadvantageous position in comparison to domestic private banks when using *Z_n* as the proxy of the relative riskiness of banks. The results based on *Z_v* indicate that the realized financial stability by foreign banks is more distant to their implicit optimal level, pointing towards a higher risk-taking level by foreign banks as well. Quantitatively, when using *Z* as the measure of bank risk and having excluded the impacts of all other factors (Table 3 column (2)), our result suggests that the average riskiness associated with foreign banks is nearly 30% higher than that of domestic banks, notably higher than the difference based on a simple comparison of mean values of *Z* across foreign and domestic banks.

Next, we also find some interesting results with regard to the risk impacts of other control variables. State ownership and bank size are persistently and negatively associated with the stability indicators, seemingly implying higher risk engaged in by state-owned and large banks, but the coefficients are only statistically significant in a limited number of cases. Banks with a greater holding of liquid assets, likely a reflection of managers' higher degree of risk aversion, are found associated with lower riskiness. Consistent with Berger and DeYoung (1997), we find that bank risk increases with the managerial inefficiency proxied by the overhead-cost-to-income ratio. However, we find only mixed evidence on the effect of income diversification on banks' stability, and weak evidence on any impact imposed by the funding diversification and the growth strategy of banks.

Financial stability tends to improve when the economy is booming, supported by the positive and statistically significant coefficient on the Hodrick-Prescott filtered real GDP growth rate. Nevertheless, in line with the growing literature on the "risk-taking channel of monetary policy," banks would undertake more risk when central banks adopt expansionary monetary policy, evidenced by the positive coefficient on our monetary policy indicator. This risk-increasing outcome could be probably driven by managers' distorted perception to risk and their incentive to "search for yield" amid relaxed monetary policy (Borio and Zhu, 2012; Buch et al., 2014). We also find that regulatory rules matter for financial soundness but in seemingly different directions. Banks in countries with stricter regulation on capital adequacy and stronger market discipline are less risky than their peers in other regions, whereas a more stringent limitation on banks' activity mix and more authority owned by supervisory officials

[24] Different from De Nicolò and Loukoianova (2007) and Levy Yeyati and Micco (2007), Boubakri et al. (2013) investigate the ownership-risk nexus in non-financial enterprises.

only create undesirably higher risk to banks. These findings are consistent with prior works by Martínez Pería and Schmukler (2001), Barth et al. (2004) and Laeven and Levine (2009).

Market structure, reflected by the Lerner index, is shown significantly related to bank risk. Our finding is consistent with the "competition-fragility" view, that financial instability tends to increase with the competition in banking markets, suggested by the positive coefficient on the Lerner index. In contrast to some works including Mannasoo and Mayes (2009) and Delis and Kouretas (2011), financial depth is positively associated with our stability indicators, implying an overall beneficial effect of the increasingly prominent financial sector in emerging economies.

4.2. The effect of foreign ownership on the components of *Z-scores*

In order to better understand how foreign ownership impacts the risk-taking of banks, we separate the *Z-score* into its three components, namely, return on assets (*ROA*), equity-to-asset ratio (*EA*) and the standard deviation of return on assets ($\sigma(ROA)$), and then substitute these elements as the dependent variable in equation (5). These variables denote banks' profit, leverage risk and asset portfolio risk, respectively. As reported in Table 4 Panel A, we find supportive evidence that the higher riskiness of foreign banks is attributed to their disadvantageous status on both the asset and the liability side. The dummy *foreign* is negatively associated with *ROA* but positively with $\sigma(ROA)$, indicating that foreign banks receive lower and more volatile return, probably owing to an allocation of assets in favor of more risky projects.[25] *EA* is also negatively associated with foreign banks, suggesting a higher demand for leverage by foreign banks, which may lower their equity-to-asset ratio consequently.

We next decompose our other two risk measures, *Z_n* and *Z_v*, into the above three components as well. We normalize *ROA*, *EA* and $\sigma(ROA)$ by using the similar approach as equation (2), and the outcomes are denoted as *ROA_n*, *EA_n* and $\sigma(ROA)\_n$, reflecting banks' relative riskiness on profitability, leverage and asset portfolio. For *Z_v*, we construct its three elements by replacing *Z* with *ROA*, *EA* and $\sigma(ROA)$ in equation (3) and use SFA to estimate their inefficiency item, respectively. The results, represented by *ROA_v*, *EA_v* and $\sigma(ROA)\_v$, are interpreted as the deviation of banks' profitability/capital sufficiency/return volatility from their optimal level.[26] As presented in Table 4 Panel B and C, the results of regressing these

[25] We compare our result with that of Claessens and Van Horen (2012), who investigate the impact of foreign ownership on bank profitability. Among their sample countries that overlap ours, they find that foreign banks earn higher profit than domestic banks in 10 countries (significantly or insignificantly), while the opposite holds in 14 countries.

[26] When replacing $\sigma(ROA)$ as the dependent variable in equation (3), we assume the error term $\varepsilon_{it} = u_{it}+v_{it}$ where the inefficiency term, v_{it}, follows half-normal distribution, $v_{it} \sim N^{+}(0, \sigma_v^2)$.

elements on our explanatory variables are, in the majority of estimations, consistent with our earlier finding that foreign banks' higher riskiness is driven by their inferior performance in all three aspects.

[Table 4]

4.3. Robustness tests

We conduct a variety of robustness tests in this section to examine if our result holds when using different measures of bank risk and alternative econometric methodologies.

We first replace our measures of bank risk, which are based on *Z-scores*, to alternative indicators that has also been adopted frequently in the literature, including the ratio of non-performing loans to outstanding loans (*NPL*), the charge-off of non-performing loans as a share of total loans (*charge-off*), the volatility of return on equity ($\sigma(ROE)$), and the Sharpe ratio (*Sharpe*).[27] $\sigma(ROE)$ is measured by using the standard deviation of return on equity, based on three-consecutive-year rolling over time window, and *Sharpe* is defined as the return on equity divided by the standard deviation of return on equity. The estimates are reported in Table 5 Panel A. We find consistent evidence that foreign banks are involved with higher riskiness and the results are either statistically significant or only marginally not significant in our regressions.

[Table 5]

Next, we re-estimate Z_v by using the "true fixed effects" specification introduced by Greene (2005a, b), which allows us to disentangle the time-varying inefficiency item from time-invariant unobservable factors and thus avoid probably biased results on the estimation of v_{it} in equation (4).[28] We allow for v_{it} to be either half normally distributed or truncated normally distributed, and use the re-estimated Z_v as the dependent variable for equation (5). As presented in Table 5 Panel B, our main results are still qualitatively held.

Finally, we estimate our model by employing alternative econometric methodologies and report the estimation results in Table 5 Panel C. We first use the random-effects estimator for our regression although the fixed-effects estimator is suggested by the Hausman test as a preferable estimator. The reason lies in that the fixed-effects estimator could generate imprecise estimates when the key regressors do not vary much over time (Wooldridge (2010), pp 326), which corresponds to the foreign ownership dummy in our case. We find the

[27] For example, for the measurement of bank riskiness, Laeven and Levine (2009) use $\sigma(ROE)$, Demirgüç-Kunt and Huizinga (2010) use *Sharpe*, and Delis and Kouretas (2011) use *NPL*.

[28] It is worth noting that, it can be argued that a portion of the time-invariant unobservable factors does belong to inefficiency or that these two components should not be distinguished at all. Thus, the approach of the earlier panel data SFA literature and that of Greene (2005a, b) are actually two extremes to deal with the potential presence of time-invariant unobservable factors, and both may have their own drawbacks.

coefficient on the dummy *foreign* is still negative and statistically significant, providing evidence in line with the result when the fixed-effects estimator is used. Next, we conduct the Fama-MacBeth two-step estimation (Fama and MacBeth, 1973), which first performs a cross-sectional regression for each single period, and then obtain final coefficient estimates as the average of the first step estimates. The results are still consistent with our benchmark findings and highly statistically significant.

We then revise our model to a dynamic version by adding the one-year lagged dependent variable as a covariate and then use the system GMM estimator to estimate this dynamic panel model. Bank characteristics are assumed endogenous even though we have used their one-year lagged value in our estimations. The coefficient on *foreign* is still negative and statistically significant, which confirms again our earlier benchmark results. Fourth, we conduct fixed-effects logit estimations by converting our dependent variable to a dummy variable for the severity of bank risk, which is equal to 1 if the original risk indicator falls in its lowest quartile in distribution, and 0 otherwise. A positive coefficient on *foreign*, as found in our estimation, is interpreted as that foreign banks are more likely to be associated with a higher riskiness.

At last, by using 2SLS instrumental variable estimation, we address a potential endogeneity problem since it can be argued that foreign banks may choose to enter a market where the prevailing market riskiness is lower, thus causing the extent of foreign participation in a country not exogenous. We follow the method suggested by Wooldrige (2010, pp. 938-939) by using three instrumental variables for the dummy *foreign*, namely, the stringency on the limitation of foreign bank entry, the regulatory quality of host governments, and the stock of foreign direct investment in host countries in per capita terms.[29] Foreign banks may be less likely to build up their operation in countries where there are more prohibitions on foreign participation. However, foreign banks would more easily enter a market where the government can formulate and implement market-friendly policies, or follow their clients into countries where the clients of foreign banks have established business via foreign direct investment. Nevertheless, it is unlikely that these variables can affect the riskiness of banks directly, thus suggesting that these variables are proper instruments for the foreign ownership dummy. The result based on the 2SLS instrumental variable estimator is still consistent with our benchmark findings.[30]

[29] The data of these variables are from, respectively, Barth et al. (2004, 2008, 2013), Kaufmann et al. (2010) and the UNCTAD Statistics.

[30] Not reported for brevity, the sign on the estimated coefficient of the three instrumental variables in the first-stage regression is consistent with our expectation, and the estimates are statistically significant. However, the Hausman test on the endogeneity of the foreign ownership fails to reject the hypothesis that it may be treated as exogenous, providing no favorable evidence for a valid concern on

5. The factors that account for foreign banks' differentiated riskiness

In this section, we examine the factors that may account for the differentiated riskiness of foreign banks, by focusing on several aspects, namely, the informational disadvantage faced by foreign banks, agency problems within the multinational bank conglomerates, the contagious effect of parent banks' financial health, and the disparity between home and host markets in their macroeconomic environments and banking sector structure. Adding an interactive term of the dummy *foreign* with the potentially relevant factors *X*, i.e., $foreign_{it} \times X$, we revise our baseline model in most of the following examinations as equation (6):

$$Risk_{it} = c + \beta \cdot foreign_{it} + \rho \cdot foreign_{it} \times X + \mu \cdot others + f_i + \varepsilon_{it} \quad (6)$$

where *others* denotes all other regressors in equation (5). Since the impact of foreignness on bank risk is represented by $\partial Risk / \partial foreign = \beta + \rho \cdot X$, a statistically significant estimate on ρ is interpreted as supportive evidence for the relevance of the factors that contribute to foreign banks' differed riskiness from domestic banks.

5.1. The impact of foreign banks' informational disadvantages

Foreign banks may be characterized by a more risky profile because of proprietary information disadvantages in host markets, compared to their domestic competitors.[31] We choose a series of indicators to proxy the severity of informational disadvantages associated with foreign banks.

We first assess the impact of foreign banks' age in host countries on their risk-taking, since the informational disadvantage may diminish with the lending process of foreign banks. Banks' *age* is defined as the length of operational period since the registration of foreign banks, and is computed as the deduction between current year and the year of establishment. Interacting the dummy *foreign* with the logarithm of *age* and including this interaction in equation (6), we expect the coefficient on this interactive term to be positive.[32] The result is reported at Table 6 Panel A. In line with our expectation, we find that the estimated coefficient on the interactive term, *foreign* × ln*(age)*, is positive and highly statistically significant with all three risk indicators as the dependent variable. This is consistent with the argument that foreign banks can neutralize their informational disadvantage through "learning by lending". More experienced foreign banks may obtain richer information regarding host markets, which lead them to incur lower risk than their new entrant counterparts. The

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the potential endogeneity problem created by inverse causality.

[31] The higher overhead-cost-to-income ratio by foreign banks is interpreted by some research as a reflection that they have a higher cost to overcome informational disadvantage (Claessens et al., 2001).

[32] We add 1 to *age* and then take natural logarithm, i.e., ln(*age*+1), in order to avoid the truncation when *age* equals 0. For brevity, we denote ln(*age*+1) as ln(*age*).

coefficient on the dummy *foreign* is still negative and statistically significant, implying the existence of some other forces, other than bank's informational disadvantages, which also contribute to the riskiness of foreign banks.

[Table 6]

It has been well documented that foreign banks may choose to enter those markets which they are more familiar with, thus we should expect less informational disadvantages for the bankers who are doing business in a market that is culturally and/or institutionally closer to their home country (Chang et al., 1998; Mian, 2006). We construct two dummies, capturing, respectively, if the home country of foreign banks and their host market share the same official/spoken language, and if the legal systems in these two countries are developed upon the same origin. These two dummy variables, denoted as *Dummy (same language)* and *Dummy (same law origin)*, are interacted with *foreign* and included into our regression separately. As reported by Table 6 Panel B and C, we find that, although the sign on both dummies is positive as expected, the coefficient on *Dummy (same language)* is only statistically significant in one regression, whereas the coefficient on *Dummy (same law origin)* is significant in two estimations and only marginally not significant in the other. Our results seemingly suggest that being familiar with the legal institution of host countries can be more helpful in overcoming foreign banks' informational disadvantages than speaking the same language can.

Finally, we group foreign banks according to whether both the host and home countries are members of a regional free trade agreement, and if the home country of the foreign bank is the largest source of foreign direct investment in the host country. For the regrouping, we use two dummy variables, *Dummy (regional free trade agreement)* and *Dummy (largest FDI source)*. Including the two dummies interacted with *foreign*, we expect positive coefficients on these two interactions if foreign banks can lessen the informational disadvantage in the host market thanks to either trade or investment linkages between home and host countries. We report our results in Table 6 Panel D and E. Although positive as expected, the estimated coefficients are statistically insignificant, providing no clear supportive evidence for a lower informational barrier to foreign banks even when there is a stronger connection between home and host countries via free trade or investment or foreign direct investment linkages.[33]

Overall, we find some evidence that informational disadvantages of foreign banks can be a contributing factor that accounts for the differentiated riskiness of foreign banks, in particular for those new entrants that have only limited experiences on the host market, and those from home countries having the different origin of legal systems.

[33] Our finding is in line with Seth and Quijano (1991, 1993) who also find only a weak linkage between trade and FDI flows from Japan to the U.S. and the growth of Japanese banks in the U.S.

5.2. The impact of agency problems

The agency problems between the headquarters and their foreign affiliates could be another reason for the differentiated riskiness of foreign banks from their domestic counterparts. The subsidiary managers at a distant locale may have more leeway for mismanagement if their personal interests are deviated from those of the group, or if they are only overseen less attentively by their headquarters, thus likely resulting in higher risk in the foreign affiliates. As the extant literature suggests that it is always empirically difficult to measure the severity of agency problems, we experiment the following several proxies, although no indicator can be perfectly ideal.

We first measure the hierarchy of foreign banks within their conglomerates, as the absolute value of the net income of foreign affiliates as a share of the net income of the whole group, and use it as a gauge for the level of agency problems. There are two reasons underlying the construction of this proxy. First, a bank's net income is usually proportional to its size, thus this indicator can reflect the relative might of an affiliate within the conglomerate. The managers of large affiliates likely own more authority in the group and their interests can be more aligned with the interests of the group, thus having lower incentive to chase their personal benefits at the expense of the group. Second, headquarters may concentrate their attention on the affiliates that can affect the conglomerate profits more greatly, thus making the senior officers at the headquarters to keep a closer monitoring and supervision on the behavior of junior managers at those affiliates. Therefore, foreign banks that have a higher relative net income within the conglomerate are presumed to face less severe agency problems than their peers.[34] We interact the dummy *foreign* with the absolute value of the ratio of the net income of foreign banks to that of the conglomerates, denoted by *hierarchy*, and include this interactive term into equation (6).[35] As presented in Table 7 Panel A, the coefficient on *foreign* × *hierarchy*, is positive and either significant or only marginally not in our estimations. Consistent with our expectation, this result can be interpreted as that the affiliates that face less severe agency problems would be engaged in less risky activities.

[Table 7]

We alternatively use the geographic proximity between the headquarters and their affiliates as a measure of agency problems, assuming that more distant subsidiaries would be induced to take more risk because of the lax supervision and oversight by the parent banks

[34] Allen et al. (2013) suggest that, if a foreign subsidiary is not systemically important to the conglomerate, the latter may have insufficient incentives to exchange supervisory information with the host financial regulatory agency, which would obviously make the agency problems more conspicuous.

[35] We use one-year lagged value of the absolute value of the subsidiary net income as a share of the group net income to reduce a possible endogeneity problem.

(Mian, 2006; Goetz et al., 2013; Albertazzi and Bottero, 2014).[36] This indicator, denoted by *distance*, is calculated as the logarithm of the Euclidean distance in thousands of kilometers. We add the interactive term of *foreign* and *distance* into regression and report the result at Table 7 Panel B. Although the coefficient on this interaction is negative as expected, in line with the presumption that more distant subsidiaries may take on more risk due to exacerbated agency problems, it is not statistically significant, implying that the distance-related agency problems might have been ameliorated, probably due to the benefits of modern technology on communication and supervision (Berger and DeYoung, 2006).

Next, we separate foreign banks according to their entry mode, i.e., de novo establishment or entry via mergers & acquisitions (M&A). The entry mode of foreign banks into host countries may be associated with agency problems due to a number of reasons. First, de novo subsidiaries are believed more closely integrated and overseen in the conglomerates than M&A subsidiaries (De Haas and Van Lelyveld, 2006; Havrylchyk and Jurzyk, 2011a), likely leaving the managers of the latter with more loopholes to pursue their own interests. Second, cross-border consolidation can create market power effect for M&A subsidiaries, which may cause increased profits and shareholder value, and meanwhile allow managers to proceed according to their own benefits without being easily detected (Berger et al., 2000; Mattoo et al., 2004; Claeys and Hainz, 2014). Third, it is suggested that cross-border mergers & acquisitions may be driven by managerial motives, such as their own compensation, perquisite, power and job security, rather than driven by the goal to maximize shareholder value, thus making the M&A subsidiaries more possibly subject to agency problems (Jensen, 1986; Berger et al., 2000; Gulamhussen et al., 2014). To test the impact of entry modes, we replace the dummy *foreign* by two alternative dummies, namely, *Dummy (de novo)* for de novo subsidiaries and *Dummy (M&A)* for M&A subsidiaries, and include both dummies in our estimation. As shown by Table 7 Panel C, we find no significant distinction between the stability of de novo foreign subsidiaries and domestic banks, while the coefficient on the M&A entry mode is negative and statistically significant, consistent with the hypothesis that foreign banks that entered via M&A may be characterized by more exacerbated agency problems and thus incur higher risk.

However, it can be argued that more fragile domestic banks may be more likely acquired by foreign banks, thus the underperformance of M&A subsidiaries only reflects the risk inherited by foreign acquirers from the consolidated domestic banks (Peek et al., 1999; Havrylchyk and Jurzyk, 2011b). In order to examine this possibility, we further divide the

[36] Distance has been also used in other works as a proxy to measure the difficulty for lenders to finance informationally opaque borrowers (see Petersen and Rajan (2002) and Brevoort and Wolken (2008), for example). However, in these works, distance is specified as the proximity between borrowers and lenders in the same market, instead of between the affiliates and the headquarters in different countries.

M&A subsidiaries according to the performance of acquired domestic banks *before* the acquisition. An M&A subsidiary is identified as having acquired a risky domestic bank if the average risk indicator of the target bank during the period of 3 years prior to the acquisition falls in the lowest 10th percentile of the distribution for all domestic banks. This group of M&A subsidiaries are distinguished by *Dummy (M&A_Bad)*, and the other M&A affiliates by *Dummy (M&A_Good)*. Replacing *Dummy (M&A)* by these two dummies in our estimation (Table 7 Panel D), we find the coefficient on *Dummy (M&A_Bad)* is negative, confirming the inherited risk effect after mergers & acquisitions. Nevertheless, the coefficient on *Dummy (M&A_Good)* is also negative and statistically significant in all regressions, suggesting foreign banks without a risky heritage from their domestic predecessors still experienced higher risk, probably owing to agency problems associated with their entry mode.

As a brief summary, we find some evidence in favor of the hypothesis that the agency problems between foreign subsidiaries and their headquarters can be a factor that accounts for the differentiated riskiness of foreign banks, in particular when proxying the existence of agency problems by using affiliates' hierarchy within the conglomerates and their entry mode.

5.3. The contagion effect of parent banks' financial conditions

Foreign affiliates' riskiness may be affected by their parent banks' financial conditions, either because the conglomerate as a whole changes its risk management policy, or as a result of the risk reallocation within the conglomerate. There has been a large body of literature that examines the linkage between foreign subsidiaries' credit growth and their parent banks' financial strength (De Haas and Van Lelyveld, 2006; Jeon et al., 2013), whereas only a few examine the nexus between foreign bank subsidiaries' riskiness and that of their parent banks (Anginer et al., 2014). In this section, we assess the effect of parent banks' financial conditions on subsidiaries' financial stability.

First, we examine the association between parent banks' risk and subsidiaries' risk, by including parent banks' risk indicator (*Z*, *Z_n* and *Z_v*, respectively, corresponding to the risk indicator that is used as the dependent variable) interacted with the dummy *foreign* in our regression.[37] The result is reported at Table 8 Panel A. As our most interested variable, this interactive term is found positive and statistically significant in all scenarios, suggesting a positive correlation between the financial stability of parent banks and that of their subsidiaries. Speaking alternatively, foreign affiliates' riskiness would increase when parent banks' risk exacerbates. This finding suggests an alternative contagious channel through the deterioration of foreign banks' credit quality, other than the variation of their credit quantity

[37] Parent banks' *Z_n* is calculated as the normalized *Z* within the specific home countries. When estimating parent banks' *Z_v*, we pool parent banks with our bank sample and use the stochastic frontier approach.

that has been examined in prior research, that adverse financial shocks on multinational banks may ripple to other countries where they have established affiliates.

[Table 8]

Second, we interact the foreign ownership dummy with the size of parent banks, measured by the logarithm of real assets in millions of US dollars, and add it in equation (6). Presented by Table 8 Panel B, the interaction term, *foreign* × *parent bank size*, is positive and statistically significant in all but one regression, lending some evidence for a higher riskiness of subsidiaries when their parent banks are small in the asset size.

Next, we use capitalization, defined as the ratio of equity to total assets, and the growth rate of real net income as two indicators for the financial strength of parent banks. It is expected that parent banks experience more severe financial distress with a decrease in capitalization and/or the growth of net income. As before, these two variables are interacted with the dummy *foreign* and included in our estimation separately. If the financial distress endured by parent banks would spill over to affect their subsidiaries' stability adversely, we should expect the coefficients on these two interactive terms to be positive. The results, presented by Table 8 Panel C and D, are qualitatively consistent with our expectation but only statistically significant in the case of the growth of net income. Our finding provides evidence for an increase of foreign banks' risk-taking as their parent banks experience a lower growth in net income or even a loss in their operation, which could, in turn, translate to a higher vulnerability of the host banking sector.

Our results provide some implications for international cooperation and coordination among the financial regulatory agencies in different countries to prevent the recurrence of contagious financial crises. The financial supervisors of host countries bear the obligation and responsibility to oversee the foreign banks that are operating within their boundary, but foreign banks are significantly influenced by parent banks that are beyond the reach of host governments' jurisdiction. International cooperations, such as the exchange of supervisory information across countries, collective surveillances, and the continuing elaboration on multilateral regulatory standards, codes and best practices, would be beneficial to ameliorate unfavorable effects of cross-border spillovers of bank riskiness from parent banks in home countries to their foreign affiliates in host countries.

5.4. The effect of the home-host market disparity

It has been documented in the literature that the impact of foreignness on the bank performance is conditional on home and host countries' characteristics (De Haas and Lelyveld, 2010; Claessens and Van Horen, 2012, for example), yet it is still sparse in the literature how the disparity between home and host markets may affect the riskiness of foreign banks. In this section, we examine how home-host market disparities in macroeconomic conditions and the

banking market structure affect foreign banks' risk-taking in the host country.

First, assuming that foreign banks have a more internationally diversified asset portfolio than their domestic peers, we examine the impact of home-host market disparity on the real GDP growth rate, presumably a proxy of the relatively higher/lower credit opportunities outside the host market. De Haas and Lelyveld (2010) find that GDP growth in the home country exerts a negative influence on subsidiaries' credit growth in host countries, seemingly implying a portfolio adjustment toward higher return opportunities. We use the deduction between the cyclical parts of the Hodrick-Prescott filtered home and host real GDP growth rates as the measure of disparity, i.e., a higher value in this measure suggests relatively better economic growth in the home country than the host country, and then interact the disparity with the foreign ownership dummy in our regression. Presented by Table 9 Panel A, the estimated coefficient on the interactive term, *foreign × (Home-Host) GDP growth rate difference*, is positive and statistically significant in all cases, suggesting a favorable effect on foreign banks' financial stability when their home countries provide better opportunities for higher return, but a detrimental impact when home countries fall in a slowdown or recession.

[Table 9]

Second, we investigate if a monetary expansion in the home country, relative to the host country, can also create a risk-taking effect analogous to the common finding in the literature of the "risk-taking channel of monetary policy" which nevertheless only examines the impact of domestic monetary policy (Delis and Kouretas, 2011; Borio and Zhu, 2012; Jiménez et al., 2014). Constructing the monetary innovations in home countries by following the same methodology suggested by Bernanke and Mihov (1998), we interact the home-host difference of the monetary policy indicators with *foreign*, and include it into estimation. The result is reported at Table 9 Panel B. The coefficient on this interactive term is positive and statistically significant in all regressions, interpreted as that foreign subsidiaries would take on more risk when the central bank at their home country conducts more expansionary monetary policy than the host central bank does. At least two reasons underlie this result probably. First, owing to a more internationally diversified portfolio, an interest rate cut in the home country may reduce the overall return of foreign banks, thus motivating them to "search for yield" more aggressively if their return target is sticky. Second, a lower interest rate in home countries can reduce the cost of liability for foreign banks since they have easier access to international capital using internal capital markets in multinational banking, thus leading to higher indebtedness and lower capital adequacy.

Third, we focus on the home-host disparity on banking market competition. Home countries' competition is also measured by the Lerner index, similarly constructed as that for host countries. A negative/positive figure of the home-host disparity is interpreted as a

higher/lower competition in the home banking market relative to the host market, since a higher value of the Lerner indicator suggests higher market power. Following a similar approach as before, we include in our model the interactive term between *foreign* and the home-host difference of their Lerner index. We find that, as presented at Table 9 Panel C, the coefficient on this interaction term is negative and persistently significant, implying a higher financial stability for foreign banks when their home market is more competitive than the host market. This result seemingly suggests that, a more competitive home market can be a proving ground for more efficient and competent multinational banks, which are more likely able to gain advantageous positions in terms of financial stability in foreign markets.

Finally, we test the effect of home-host disparity on financial regulation, in particular the strength of market discipline. The strictness of home country regulatory rules can generate ambiguous outcomes on foreign banks' behavior in host markets: on one hand, amid more stringent regulations at home, foreign banks may undertake more risk abroad to compensate for their lower opportunistic return at home, while on the other hand, relatively tough supervision or regulation at home may give some institutions global advantages by certifying their quality or reducing the risks of their contractual counterparties (Berger et al., 2000). Ongena et al. (2013b) have studied the spillover effect of home regulation on banks' risk-taking abroad, specifically, the regulatory rules on activity mix, capitalization and supervisory power, but not the impact of the regulatory stringency on market discipline. As a complementary extension of prior works, we focus on the interactive effect of home-host differences of the regulatory strength on market discipline. Home countries' regulatory strictness on market discipline is analogously constructed as that of host countries, by using the data provided in Barth et al. (2004, 2008, 2013). As presented in Table 9 Panel D, the coefficient on the interactive term of *foreign* and home-host disparity on regulatory stringency of market discipline is positive and significant, providing favorable evidence for a regulatory spillover: stricter market discipline at home, possibly limiting subsidiaries' motivation to take excessive risk, seeming to translate into a higher financial soundness abroad.[38]

Overall, we find some evidence for a series of home-host market disparities that account for the differed riskiness of foreign banks, namely, the difference on economic growth, monetary stance, market competition and regulatory stringency. Different from the traditional contagious channel to transmit shocks through the quantitative variation of bank credit, our results suggest another potential route that host countries may be adversely affected by the qualitative deterioration of credit via the risk-taking behavior of foreign banks.

[38] Beqiri et al. (2014) find consistent evidence that stronger home country regulation on private monitoring will lower the net interest margins charged by foreign banks, which is interpreted as that stronger home supervision will limit foreign banks' risk-taking activities in host countries.

6. Conclusion

This paper addresses the differentiated riskiness of foreign banks in a group of 32 emerging economies using the bank-level data. Having controlled for many other risk determinants, we find that foreign ownership is negatively associated with the indicators of financial stability, suggesting a higher risk profile characterized by foreign banks than domestic banks. We next examine the potentially relevant factors that account for the differentiated riskiness of foreign banks, specifically, the information disadvantage faced by foreign banks, agency problems within conglomerates, the contagious impact of parent banks' financial health, and the disparity between home and host markets. We find supportive evidence that these factors play a significant role in explaining foreign banks' risk-taking.

Our paper contributes to two strands of research. First, it adds to the literature on the outcomes of foreign bank penetration in host markets. Compared to a rich body of works that concentrate on whether foreign banks outperform domestic banks in terms of credit growth, efficiency and profitability, whether foreign banks differ from domestic ones in terms of riskiness is only understudied so far. Our results present a potentially undesired impact of increased presence of foreign banks in emerging markets from the perspective of financial risk. Second, this paper adds to the literature of the determinants of bank risk by introducing foreign ownership as a significant factor to influence the fragility of financial institutions. As a complement for extant works, we also examine the factors that may account for the extra riskiness of foreign banks. Our findings suggest that regulatory agencies need to consider foreignness as an additional factor in bank supervision.

Our findings have some important policy implications. First, there are both bright and dark sides for the presence of foreign banks in emerging economies. Albeit bringing about many positive outcomes, as documented by a great number of prior research, foreign banks are found undertaking higher risk than their domestic counterparts in this paper, suggesting a likely trade-off between the stability of credit quantity and the vulnerability of credit quality. Thus, when designing optimal financial liberalization policy, decision makers need to keep vigilant to this possible detrimental impact of foreign prominence in their banking sector. Second, we find the heterogeneity of foreign banks' riskiness is conditional on a series of factors, such as informational disadvantages, entry modes and a variety of home-host disparities, thus the foreignness-related bank riskiness may be ameliorated by diversified origins and establishment methods of foreign entrants. Finally, the risk of foreign banks is found associated with that of parent banks, suggesting an alternative contagious channel that the external shocks may translate into domestic banking sector fragility via the behavior of multinational banks. Further elaborated international cooperation and policy coordination will be essential to prevent the recurrence of cross-border financial disorders.

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Table 1. Variable definitions

This table summarizes the definition of the main variables and presents data sources.

Variable	Description	Data source
Bank risk		
Z	Natural logarithm of Z-scores, i.e., $\ln[1+(ROA_{it}+EA_{it})/\sigma(ROA)_{it}]$. *ROA* represents return on assets, *EA* the equity-to-assets ratio, and $\sigma(ROA)$ the standard deviation of return on assets. A higher score suggests a lower probability of bank insolvency, or alternatively speaking, a higher degree of financial stability.	Bankscope and authors' own calculation
Z_n	Normalized Z-scores by using $[lZ_{ijt} - \min(Z_j)]/[\max(Z_j) - \min(Z_j)]$, where min and max present respectively the minimum and the maximum of Z-scores in each market across sample periods. A higher score denotes a higher stability/lower risk of the bank relative to its counterparts in the resident market.	Bankscope and authors' own calculation
Z_v	The X-efficiency of the natural logarithm of Z-scores. Following Fang et al. (2014), we adopt a stochastic frontier approach (SFA) to fit an upper envelop of Z-scores. The difference of the actual Z-score from the implicit optimal value represents the deviation of a bank's stability from its potential highest stability. A higher score suggests a closer distance between the actual Z-score to its potential highest value, that is, a higher stability/lower risk of the bank.	Bankscope and authors' own calculation
Bank ownership		
Foreign	A dummy that is equal to 1 if more than 50% of capital is owned by foreign banks, individuals, corporations or other organizations.	Author's own collection
State	A dummy that is equal to 1 if more than 50% of capital is owned by domestic governments.	Author's own collection
Bank characteristics		
Size	Natural logarithm of assets (in millions of constant US dollars).	Bankscope and authors' own calculation
Liquidity	The ratio of liquid assets to total assets (%).	Bankscope and authors' own calculation
Efficiency	The ratio of overhead cost over the sum of net interest revenue and non-interest income (%).	Bankscope and authors' own calculation
Income diversification	The ratio of non-interest income to total operating income (%).	Bankscope and authors' own calculation
Funding diversification	Non-deposit short-term funding as a share of the total short-term funding (%).	Bankscope and authors' own calculation
Growth rate of assets	The growth of real total assets (%).	Bankscope and authors' own calculation

Macroeconomic variables		
GDP growth rate	The cyclical part in Hodrick-Prescott filtered real GDP growth rate (%).	International Financial Statistics and authors' own calculation
Inflation	The cyclical part in Hodrick-Prescott filtered inflation rate (%).	International Financial Statistics and authors' own calculation
Monetary policy	The residuals of the interest rate equation in a VAR model inspired by Bernanke and Mihov (1998). A positive (negative) figure indicates an exogenous contractionary (expansionary) innovation of monetary policy.	International Financial Statistics and authors' own calculation
Crisis	A dummy equal to 1 for the banking crisis period in a country and the global financial crisis in 2008-09 for all countries, 0 for other periods.	Laeven and Valencia (2013)
Financial regulation		
Capital	Index of capital regulatory stringency. A higher score suggests more stringent regulations on banks' overall and initial capital.	Barth et al. (2004, 2008, 2013) and authors' own calculation
Activity	Index of activity regulatory stringency. A higher score suggests more stringent regulations on the scope of banks' business operation.	Barth et al. (2004, 2008, 2013) and authors' own calculation
Supervisory power	Index of supervisory power. The score in this index is higher when supervisory agencies are authorized more oversight power.	Barth et al. (2004, 2008, 2013) and authors' own calculation
Market discipline	Index of the private monitor strength. A higher value denotes a higher private monitoring force.	Barth et al. (2004, 2008, 2013) and authors' own calculation
Others		
Lerner	Lerner index. A higher score denotes a higher market power, i.e., lower competition level in the banking markets.	Bankscope and authors' own calculation
Financial depth	Domestic credit to private sector as a share of GDP.	International Financial Statistics and authors' own calculation
Deposit insurance	A composite index to reflect the strength of deposit insurance schemes. A higher value denotes a more generous and extensive coverage of the enacted deposit insurance systems.	Demirgüç-Kunt et al. (2013) and authors' own calculation
Rule of law	The Rule of Law sub-index in World Bank's Worldwide Governance Indicators (WGI). Higher values indicate stronger law and order.	World Bank's WGI

Table 2. Descriptive statistics

This table reports the summary statistics of the main variables and the results of the *t* test on the equality of the means between domestic and foreign banks. Panel A presents the mean, the standard deviation and the median of the key variables for all banks in our sample. Panel B divides the sample into domestic banks (D) and foreign banks (F) and reports the mean of the variables across these two groups. The *t* test is conducted by comparing if the mean of a variable in domestic banks is larger than/equal to/smaller than that in foreign banks. *p-values* of the test are reported.

	Panel A			Panel B				
	All banks			Domestic	Foreign			
	Mean	Std. dev.	Median	Mean	Mean	H_0: D > F	H_0: D = F	H_0: D < F
Bank risk								
Z	3.315	1.146	3.335	3.418	3.186	1.000	.000	.000
Z_n	.528	.156	.535	.537	.515	1.000	.000	.000
Z_v	.484	.167	.512	.495	.470	1.000	.000	.000
Bank Ownership								
Foreign	.441	.496	0					
State	.116	.320	0					
Bank characteristics								
Size	7.085	1.987	7.044	7.250	6.882	1.000	.000	.000
Liquidity	26.952	18.170	22.656	24.655	29.854	.000	.000	1.000
Efficiency	63.780	30.585	58.515	61.151	67.086	.000	.000	1.000
Income diversification	32.746	20.223	30.769	30.939	35.036	.000	.000	1.000
Funding diversification	11.931	14.292	6.741	10.732	13.440	.000	.000	1.000
Growth rate of assets	22.303	32.629	16.03	24.207	19.912	1.000	.000	.000
Macroeconomic conditions								
GDP growth rate	.107	3.384	.371	.209	-.021	1.000	.000	.000
Inflation	2.366	21.947	.901	2.868	1.731	.998	.003	.001
Monetary policy	-.187	4.261	-.195	-.188	-.186	.492	.984	.507
Crisis	.056	.231	0	.043	.072	.000	.000	1.000
Financial regulation								
Capital	5.756	1.781	5	5.799	5.700	.998	.002	.001
Activity	7.420	2.172	7	7.634	7.144	1.000	.000	.000
Supervisory power	11.681	1.733	12	11.628	11.749	.000	.000	.999
Market discipline	6.509	1.040	7	6.578	6.420	1.000	.000	.000
Others								
Lerner	.226	.093	.229	.233	.218	1.000	.000	.000
Financial depth	73.383	24.144	75.820	72.032	75.091	.000	.000	1.000
Deposit insurance	6.807	4.443	6.8	6.815	6.796	.593	.812	.406
Rule of law	-.076	.684	-.302	-.224	.109	.000	.000	1.000

Table 3. The impact of foreign ownership on bank risk-taking

This table reports the baseline results regarding the impact of foreign ownership on bank risk-taking. The dependent variables are *Z, Z_n* and *Z_v*, respectively, defined in Section 2.1. *Foreign* is the dummy variable that is equal to 1 for foreign-owned banks and 0 otherwise, and *State* the dummy for the domestically state-owned banks. *Size* is the natural logarithm of bank assets. *Liquidity* is the ratio of bank liquid assets to total assets. *Efficiency* denotes the overhead cost as a share of banks' operating income. *Income diversification* is the ratio of bank interest income to total operating income. *Funding diversification* is the ratio of non-deposit liability over total liability. *Growth rate of assets* is the growth rate of real bank assets. *GDP growth rate* is the cyclical components of Hodrick-Prescott filtered growth rate of real GDP. *Inflation* denotes the cyclical components of Hodrick-Prescott filtered inflation rate. *Monetary policy* is the proxy of monetary policy by using the residuals of the interest rate equation in the VAR model as suggested by Bernanke and Mihov (1998). *Crisis* is a dummy variable equal to 1 in the periods of crisis in sample countries, including the 2008-9 global financial turmoil for all countries, and 0 otherwise. Among the regulatory variables, *Capital* proxies the capital regulatory stringency, *Activity* is the restriction on the bank activity mix, *Supervisory power* reflects the official supervisory authority, and *Market discipline* measures the private monitor strength. *Lerner* is the proxy of banking market competition. *Financial depth* is domestic credit to private sector as a share of GDP. *Deposit insurance* is a composite index representing the strength of the deposit insurance coverage. *Rule of law* is the rule of law index from the World Bank's Worldwide Governance Indicators. Detailed definitions for each variable can be found in Section 2. We estimate all regressions by using the fixed-effects estimator with heteroskedasticity and within-panel serial correlation robust standard errors. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

Dependent variable	*Z*		*Z_n*		*Z_v*	
	(1)	(2)	(3)	(4)	(5)	(6)
Bank ownership						
Foreign	-.360***	-.297**	-.042***	-.036**	-.059***	-.038*
	(.008)	(.033)	(.000)	(.026)	(.004)	(.058)
State	-.546**	-.343	-.049	-.027	-.081*	-.043
	(.025)	(.278)	(.105)	(.486)	(.069)	(.338)
Bank characteristics						
Size	-.039	-.024	-.002	-.001	-.016**	-.016**
	(.324)	(.580)	(.652)	(.890)	(.017)	(.046)
Liquidity	.003**	.002**	.000**	.000*	.000**	.000
	(.012)	(.049)	(.027)	(.087)	(.047)	(.502)
Efficiency	-.006***	-.005***	-.001***	-.001***	-.001***	-.001***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Income diversification	-.003***	-.003**	-.000***	-.000**	.000**	.000**
	(.004)	(.011)	(.005)	(.014)	(.027)	(.026)
Funding diversification	.001	.001	.000	.000	.000	-.000
	(.483)	(.522)	(.559)	(.616)	(.939)	(.899)
Growth rate of assets	-.000	-.001*	-.000	-.000**	.000	-.000
	(.376)	(.080)	(.160)	(.030)	(.423)	(.805)
Macroeconomic condition						
GDP growth rate		.020***		.002***		.003***
		(.000)		(.000)		(.000)
Inflation		-.001		-.000		-.000
		(.220)		(.377)		(.350)
Monetary policy		.016***		.001***		.001*
		(.000)		(.000)		(.084)
Crisis		-.207*		-.014		-.019
		(.070)		(.316)		(.268)
Financial regulation						
Capital		.033**		.004**		.003
		(.018)		(.024)		(.120)
Activity		-.040***		-.005**		-.005**
		(.003)		(.017)		(.017)
Supervisory power		-.035**		-.003		-.003
		(.026)		(.103)		(.200)
Market discipline		.069**		.009**		.009**
		(.027)		(.036)		(.039)

Others						
Lerner		1.733***		.221***		.276***
		(.000)		(.000)		(.000)
Financial depth		.006***		.001***		.001***
		(.000)		(.000)		(.010)
Deposit insurance		-.038		-.003		-.003
		(.309)		(.525)		(.403)
Rule of law		.043		.010		.026
		(.769)		(.583)		(.269)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.063	.102	.058	.092	.060	.094
Observations	8988	7777	8988	7777	6242	5678
(no. of banks)	(1191)	(1107)	(1191)	(1107)	(965)	(918)

Table 4. The impact of foreign ownership on the components of Z-scores

This table reports the effect of foreign ownership on the components of Z-scores, i.e., return on assets (*ROA*), the ratio of equity to assets (*EA*) and the standard deviation of return on assets ($\sigma(ROA)$). We follow the methods introduced in Section 2.1 to normalize the components of Z-scores, respectively, denoted as *ROA_n*, *EA_n*, and $\sigma(ROA)\_n$, and the X-efficiency of stability, namely, *ROA_v*, *EA_v*, and $\sigma(ROA)\_v$. We estimate all regressions by using the fixed-effects estimator with heteroskedasticity and serial correlation robust standard errors. In all regressions, we use a full set of independent variables that include bank characteristics, macroeconomic conditions, regulatory variables and others, as shown in Table 3. We only report the coefficients on foreign ownership for brevity. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

	Panel A		
Dependent variable	(1) *ROA*	(2) *EA*	(3) $\sigma(ROA)$
Foreign	-.583*** (.003)	-.655* (.056)	.231*** (.004)
	Panel B		
Dependent variable	(4) *ROA_n*	(5) *EA_n*	(6) $\sigma(ROA)\_n$
Foreign	-.020*** (.007)	-.005 (.236)	.016* (.053)
	Panel C		
Dependent variable	(7) *ROA_v*	(8) *EA_v*	(9) $\sigma(ROA)\_v$
Foreign	-.050*** (.008)	-.029*** (.008)	-.018 (.230)

Table 5. The impact of foreign ownership on bank risk-taking: Robustness tests

This table reports the results of various robustness tests. In Panel A, Column (1)-(4), the dependent variable is replaced, respectively, by the ratio of non-performing loans to total loans (*NPL*), the charge-off of non-performing loans to total loans (*charge-off*), the standard deviation of return on equity (σ*(ROE)*), and the Sharpe ratio (*Sharpe*). In Panel B, Column (5)-(6), *Z_v* is estimated by employing Greene's true fixed effects stochastic frontier approach, assuming that the stability inefficiency item follows a half-normal distribution/truncated normal distribution respectively. In Panel C, various alternative econometric methodologies are adopted for the dependent variables, i.e., *Z*, *Z_n* and *Z_v*, respectively. Column (7) reports the results when using random effects estimator. Column (8) reports the results by conducting the Fama and MacBeth (1973) two-step procedure. Column (9) uses the system GMM estimator after including one-year lag of the dependent variable into regressors. Column (10) is the results of fixed effects logit estimation by letting the dependent variable equal to 1 if *Z/Z_n/Z_v* falls in the lower quartile of its distribution. Column (11), by assuming endogenous presence of foreign banks in host banking markets, uses the 2SLS instrumental variable estimation suggested by Wooldrige (2010, pp. 938-939). In all regressions, we use a full set of independent variables that include bank-specific characteristics, regulatory variables, macroeconomic conditions and others, as shown in Table 3. We only report the coefficients on foreign ownership for brevity. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

Panel A: Alternative measures of bank risk

	(1) NPL	(2) Charge-off	(3) σ(ROE)	(4) Sharpe
Foreign	2.131	.506**	2.351**	-1.060
	(.114)	(.034)	(.041)	(.102)

Panel B: Greene's true fixed effects estimation for *Z_v*

		(5) Half-normal distribution	(6) Truncated normal distribution
Dependent variable			
Z_v	Foreign	-.056**	-.044*
		(.022)	(.072)

Panel C: Alternative econometric methodologies

		(7) Random effect	(8) Fama-MacBeth	(9) System GMM	(10) Panel logit	(11) 2SLS
Dependent variable						
Z	Foreign	-.175***	-.184***	-.156**	.508**	-.407*
		(.001)	(.003)	(.050)	(.020)	(.081)
Z_n	Foreign	-.020***	-.022***	-.025**	.549**	-.163***
		(.001)	(.005)	(.014)	(.028)	(.000)
Z_v	Foreign	-.031***	-.027***	-.030**	.238	-.079**
		(.000)	(.001)	(.015)	(.315)	(.018)

Table 6. The effect of informational disadvantages on foreign banks' risk

This table reports the results of the influence of the information disadvantage on foreign banks' riskiness. The dependent variable is *Z*, *Z_n* and *Z_v* respectively in column (1)–(3). In Panel A-E, the informational disadvantage faced by foreign banks is proxied respectively, by: (a) the logarithm of the length of time that a foreign bank is present in the host market; (b) a dummy if languages spoken in host and home countries are the same; (c) a dummy if the law origins in host and home countries are the same; (d) a dummy if both the host and home countries are members of a regional free trade agreement, and (e) a dummy of the home country is the largest source of foreign direct investment in the host country. These proxies are interacted with the foreign dummy and are included in regressions with other regressors, i.e., bank-specific characteristics, regulatory variables, macroeconomic conditions and others, as shown in Table 3. We only report the coefficients on foreign ownership and its interaction with the above proxies for brevity. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

Dependent variable	(1)	(2)	(3)
	Z	*Z_n*	*Z_v*
Panel A: The effect of foreign banks' establishment history			
Foreign	-.400***	-.053***	-.057***
	(.008)	(.003)	(.010)
Foreign × ln(age)	.141***	.021***	.031***
	(.005)	(.003)	(.000)
Panel B: The effect of same language			
Foreign	-.302**	-.037**	-.040**
	(.034)	(.025)	(.050)
Foreign × Dummy (same language)	.464**	.024	.005
	(.030)	(.315)	(.767)
Panel C: The effect of same law origin			
Foreign	-.390***	-.050***	-.057***
	(.007)	(.002)	(.003)
Foreign × Dummy (same law origin)	.218	.030*	.041*
	(.133)	(.098)	(.054)
Panel D: The effect of regional free trade agreement			
Foreign	-.376**	-.044***	-.049**
	(.015)	(.009)	(.011)
Foreign × Dummy (regional free trade agreement)	.181	.019	.023
	(.214)	(.300)	(.255)
Panel E: The effect of the largest source of FDI			
Foreign	-.344**	-.040**	-.041*
	(.019)	(.017)	(.052)
Foreign × Dummy (largest FDI source)	.562	.046	.030
	(.205)	(.384)	(.575)

Table 7. The effect of agency problems on foreign banks' risk

This table reports the results of the influence of agency problems on foreign banks' riskiness. The dependent variable is *Z*, *Z_n* and *Z_v* respectively in column (1)–(3). In Panel A-C, the agency problem faced by foreign bank subsidiaries is proxied respectively by: (a) the hierarchy of the foreign subsidiary in the conglomerate; (b) the geographic distance between the subsidiary and the parent bank headquarter, and (c) the entry mode of foreign subsidiaries. In Panel D, we further distinguish the foreign subsidiaries which are established through merger & acquisition into two types: the subsidiaries that acquired highly risky domestic banks, and those that acquired less risky banks. These proxies are interacted with the foreign dummy and are included in regressions with other regressors, i.e., bank-specific characteristics, regulatory variables, macroeconomic conditions and others, as shown in Table 3. We only report the coefficients on foreign ownership and its interaction with the above proxies for brevity. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

Dependent variable	(1)	(2)	(3)
	Z	*Z_n*	*Z_v*
Panel A: The effect of foreign banks' hierarchy			
Foreign	-.252*	-.033*	-.043**
	(.081)	(.053)	(.042)
Foreign × hierarchy	.015	.002*	.003**
	(.106)	(.095)	(.012)
Panel B: The effect of geographic distance			
Foreign	-.264*	-.034*	-.027
	(.091)	(.077)	(.255)
Foreign × distance	-.036	-.002	-.011
	(.684)	(.835)	(.369)
Panel C: The effect of entry mode			
Dummy (de novo)	-.033	-.004	.029
	(.887)	(.879)	(.445)
Dummy (M&A)	-.315**	-.038**	-.043**
	(.021)	(.016)	(.028)
Panel D: The effect of entry mode after a further division of M&A foreign banks			
Dummy (de novo)	.142	.017	.034
	(.489)	(.520)	(.347)
Dummy (M&A_Bad)	-1.963***	-.197***	-.238***
	(.000)	(.000)	(.001)
Dummy (M&A_Good)	-.232*	-.031**	-.034*
	(.076)	(.045)	(.075)

Table 8. The effect of parent bank financial conditions on foreign subsidiaries' risk

This table reports the results of the impact of parent banks' financial conditions on their foreign subsidiaries' riskiness. The dependent variable is *Z*, *Z_n* and *Z_v* respectively in column (1)–(3). In Panel A-D, the selected parent banks' financial conditions include: (a) the risk of parent banks. When we use *Z/Z_n/Z_v* as the risk proxy of subsidiaries, parent banks' riskiness is correspondingly gauged by the same indicators; (b) the size of parent banks; (c) the capitalization of parent banks; and (d) the growth rate of real net income of parent banks. These proxies are interacted with the dummy *foreign* and are included in regressions with other regressors, i.e., bank-specific characteristics, regulatory variables, macroeconomic conditions and others, as shown in Table 3. We only report the coefficients on foreign ownership and its interaction with the above parent bank financial conditions for brevity. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

Dependent variable	(1)	(2)	(3)
	Z	*Z_n*	*Z_v*
Panel A: The effect of parent banks' risk			
Foreign	-.465**	-.061***	-.054*
	(.013)	(.009)	(.081)
Foreign × parent banks' Z-score	.051**	.007**	.085**
	(.035)	(.048)	(.039)
Panel B: The effect of parent bank size			
Foreign	-1.328**	-.207***	-.149
	(.027)	(.009)	(.135)
Foreign × parent banks' size	.087*	.013**	.009
	(.078)	(.030)	(.213)
Panel C: The effect of parent banks' capitalization			
Foreign	-.353*	-.046**	-.060**
	(.055)	(.049)	(.038)
Foreign × parent banks' capitalization	.005	.001	.002
	(.714)	(.732)	(.301)
Panel D: The effect of parent banks' growth rate of net income			
Foreign	-.259*	-.034*	-.035
	(.080)	(.051)	(.110)
Foreign × parent banks' growth rate of net income	.064***	.009***	.012***
	(.008)	(.009)	(.003)

Table 9. The effect of home-host country disparity on foreign subsidiaries' risk

This table reports the results of the impact of the differences between home and host countries. The dependent variable is *Z*, *Z_n* and *Z_v* respectively in column (1)–(3). In Panel A-D, the examined home-host disparities include: (a) the difference of the real GDP growth rate between home and host markets; (b) the difference of the monetary policy conducted in home and host markets; (c) the difference in the competition levels in home and host banking markets; and (d) the difference of the regulatory stringency on the market disciplines in home and host financial regulations. These proxies are interacted with the foreign dummy and are included in regressions with other regressors, i.e., bank-specific characteristics, regulatory variables, macroeconomic conditions and others, as shown in Table 3. We only report the coefficients on foreign ownership and its interaction with the above home-host differences for brevity. *p-values* are in parentheses. *** indicates the 1% significance level; ** 5% significance level; * 10% significance level.

Dependent variable	(1)	(2)	(3)
	Z	*Z_n*	*Z_v*
Panel A: The effect of home and host GDP growth rate			
Foreign	-.296**	-.037**	-.040*
	(.037)	(.026)	(.051)
Foreign × (Home-Host) GDP growth rate difference	.016**	.002**	.002**
	(.044)	(.034)	(.049)
Panel B: The effect of home and host monetary policy difference			
Foreign	-.283**	-.034**	-.035*
	(.041)	(.034)	(.077)
Foreign × (Home-Host) MP difference	.030**	.003**	.005***
	(.023)	(.036)	(.009)
Panel C: The effect of home and host different market competition			
Foreign	-.257*	-.032**	-.036*
	(.067)	(.050)	(.072)
Foreign × (Home-Host) Lerner difference	-.146***	-.021***	-.018***
	(.000)	(.000)	(.000)
Panel D: The effect of home and host market discipline			
Foreign	-.922***	-.123***	-.149***
	(.002)	(.003)	(.004)
Foreign × (Home-Host) market discipline difference	.093**	.013**	.016**
	(.021)	(.021)	(.016)

Appendix A. The number of domestic and foreign banks in countries

This table presents the number of domestic and foreign banks in our sample. The first figure denotes the number of domestic banks, while the latter the number of foreign banks. Only commercial banks are included.

	2000	2002	2004	2006	2008	2010	2012
Bulgaria	9/13	8/16	8/16	6/18	6/13	6/13	7/12
Croatia	26/10	21/13	22/8	19/12	18/13	17/13	15/13
Czech	5/18	4/17	4/17	3/17	2/15	2/14	2/14
Estonia	2/3	3/3	3/3	3/4	2/4	2/4	2/5
Hungary	2/20	1/22	1/23	2/24	3/22	6/17	6/15
Lithuania	7/2	4/5	4/5	4/6	4/6	5/7	3/6
Macedonia	7/4	9/3	8/5	9/5	4/10	4/8	4/8
Moldova	9/0	9/2	12/3	11/5	11/5	9/6	9/5
Poland	11/30	7/34	9/35	8/33	9/34	9/32	11/27
Romania	11/13	7/16	5/19	3/19	2/21	3/21	2/18
Slovakia	3/10	2/11	0/13	0/13	0/13	0/11	0/10
Slovenia	15/2	9/5	9/5	9/6	9/6	9/6	9/5
Ukraine	22/4	22/8	29/10	30/16	22/27	24/30	28/26
Argentina	41/34	41/25	41/22	43/20	39/19	37/18	33/16
Bolivia	6/5	6/5	6/5	6/4	6/5	6/4	6/4
Brazil	72/58	75/55	69/43	72/44	65/43	55/35	50/34
Chile	12/17	12/14	13/12	12/12	10/13	10/12	10/11
Colombia	16/10	19/9	20/8	11/5	11/7	12/7	14/7
Mexico	15/18	11/19	13/16	16/17	20/17	21/16	22/16
Paraguay	7/14	6/11	5/8	5/8	7/7	8/6	7/6
Peru	7/9	4/9	5/9	5/8	5/9	5/10	4/10
Uruguay	8/26	6/30	4/23	2/24	2/20	2/19	2/16
Venezuela	28/14	25/10	25/8	25/7	22/6	18/5	19/4
China	41/3	47/5	68/5	97/10	102/25	106/31	96/29
Hong Kong	10/31	8/31	8/28	7/26	6/23	6/23	5/23
India	59/4	55/5	55/6	52/6	49/7	47/7	47/6
Indonesia	39/20	36/16	36/20	38/21	31/26	32/26	31/27
Korea	17/1	15/1	12/5	11/5	11/4	11/4	12/3
Malaysia	14/13	15/13	12/13	12/13	12/14	12/15	10/13
Philippines	20/6	23/5	24/4	21/4	19/8	19/4	19/3
Singapore	8/8	5/7	5/5	5/8	5/8	6/5	5/4
Thailand	14/4	14/4	14/3	16/3	16/4	14/8	13/8

Appendix B. The assets of foreign banks in host countries

This table presents the assets of foreign bank subsidiaries as a share of the total banking sector assets in host countries. Only commercial banks are included.

	2000	2002	2004	2006	2008	2010	2012
Bulgaria	.814	.821	.781	.819	.825	.807	.718
Croatia	.423	.848	.859	.885	.877	.902	.898
Czech	.759	.947	.969	.974	.965	.968	.952
Estonia	.979	.981	.984	.992	.986	.987	.969
Hungary	.743	.987	.987	.979	.978	.968	.955
Lithuania	.473	.846	.833	.838	.842	.782	.934
Macedonia	.543	.457	.488	.401	.687	.668	.658
Moldova	0	.089	.108	.222	.268	.230	.230
Poland	.909	.974	.945	.933	.912	.873	.793
Romania	.419	.504	.545	.918	.926	.910	.873
Slovakia	.465	.958	1	1	1	1	1
Slovenia	.039	.232	.249	.277	.289	.275	.292
Ukraine	.074	.142	.130	.379	.597	.564	.466
Argentina	.582	.410	.314	.291	.316	.303	.297
Bolivia	.398	.318	.307	.187	.201	.210	.210
Brazil	.257	.281	.245	.252	.230	.208	.188
Chile	.339	.454	.401	.386	.423	.387	.354
Colombia	.246	.196	.178	.212	.198	.175	.180
Mexico	.223	.806	.816	.812	.752	.736	.695
Paraguay	.773	.767	.721	.656	.588	.459	.420
Peru	.544	.558	.534	.525	.524	.511	.506
Uruguay	.475	.459	.501	.556	.562	.572	.540
Venezuela	.477	.396	.323	.296	.258	.164	.152
China	.001	.001	.001	.005	.019	.018	.016
Hong Kong	.907	.912	.922	.917	.930	.930	.927
India	.027	.036	.052	.062	.073	.057	.049
Indonesia	.052	.064	.200	.237	.267	.257	.261
Korea	.044	.045	.182	.196	.199	.187	.108
Malaysia	.241	.207	.225	.211	.232	.215	.179
Philippines	.026	.020	.017	.017	.011	.018	.012
Singapore	.046	.055	.032	.047	.056	.085	.068
Thailand	.062	.060	.039	.047	.068	.106	.107

Appendix C. The comparison of the risk of foreign and domestic banks over years

This table presents the mean values of the risk measures, i.e., *Z*, *Z_n* and *Z_v*, across domestic and foreign banks in 2000-2013. We also report the *p-values* of the *t* test for the hypothesis that the mean value of risk for domestic banks (D) is larger than/equal to/smaller than that of foreign banks (F).

Variable: *Z*

	Mean				
Year	Domestic banks	Foreign banks	H_0: D>F	H_0: D=F	H_0: D<F
2000	3.072	2.808	.998	.003	.001
2001	3.152	2.882	.998	.002	.001
2002	3.161	2.938	.996	.007	.003
2003	3.370	3.005	1.000	.000	.000
2004	3.351	3.121	.997	.005	.002
2005	3.346	3.252	.885	.229	.114
2006	3.459	3.380	.851	.297	.148
2007	3.541	3.382	.987	.025	.013
2008	3.366	3.216	.985	.028	.014
2009	3.361	2.970	1.000	.000	.000
2010	3.467	3.175	.999	.000	.000
2011	3.627	3.369	.999	.001	.000
2012	3.722	3.489	.998	.003	.001
2013	3.828	3.639	.976	.046	.023

Variable: *Z_n*

	Mean				
Year	Domestic banks	Foreign banks	H_0: D>F	H_0: D=F	H_0: D<F
2000	.512	.463	1.000	.000	.000
2001	.521	.472	1.000	.000	.000
2002	.516	.486	.997	.006	.003
2003	.544	.497	1.000	.000	.000
2004	.536	.510	.991	.016	.008
2005	.532	.530	.589	.820	.410
2006	.541	.546	.315	.631	.684
2007	.546	.544	.554	.891	.445
2008	.522	.522	.492	.984	.507
2009	.520	.484	.999	.001	.000
2010	.534	.510	.984	.030	.015
2011	.552	.536	.923	.152	.076
2012	.566	.548	.950	.099	.049
2013	.585	.569	.920	.160	.080

Variable: *Z_v*

	Mean				
Year	Domestic banks	Foreign banks	H_0: D>F	H_0: D=F	H_0: D<F
2000	.457	.427	.968	.062	.031
2001	.475	.444	.972	.054	.027
2002	.488	.479	.711	.577	.288
2003	.526	.478	.998	.002	.001
2004	.505	.475	.978	.043	.021
2005	.492	.495	.419	.839	.580
2006	.503	.504	.449	.898	.551
2007	.520	.501	.927	.144	.072
2008	.497	.466	.989	.020	.010
2009	.478	.429	.999	.001	.000
2010	.486	.448	.997	.005	.002
2011	.493	.462	.981	.036	.018
2012	.505	.480	.965	.069	.034
2013	.512	.515	.420	.840	.579

Appendix D. Pairwise correlation

This table reports the pairwise correlation coefficients of main variables. The figures in bold form denote the correlation coefficients with the significance level lower than 10%.

	Z	Foreign	State	Size	Liquidity	Efficiency	Income diversification	Funding diversification	Growth rate of assets	GDP growth rate	Inflation	Monetary policy	Crisis	Capital	Activity	Supervisory power	Market discipline	Lerner	Financial depth	Deposit insurance	Rule of law
Z	1																				
Foreign	**-.100**	1																			
State	.012	**-.322**	1																		
Size	**.194**	**-.092**	**.219**	1																	
Liquidity	**-.047**	**.142**	**-.079**	**-.240**	1																
Efficiency	**-.293**	**.096**	**-.043**	**-.330**	**.122**	1															
Income diversification	**-.140**	**.100**	**-.054**	**-.146**	**.137**	**.183**	1														
Funding diversification	**-.059**	**.094**	-.004	.002	.009	-.009	-.004	1													
Growth rate of assets	**-.075**	**-.065**	**-.033**	**-.066**	**.061**	-.008	-.011	-.008	1												
GDP growth rate	**.045**	**-.033**	-.003	-.014	**.052**	.004	**.030**	-.011	**.055**	1											
Inflation	-.013	**-.025**	-.008	**-.099**	**.052**	**.024**	**.038**	**.082**	.015	**-.041**	1										
Monetary policy	.009	.000	**.019**	**-.037**	.004	.015	.003	**-.024**	**-.036**	**-.160**	**.102**	1									
Crisis	**-.139**	**.062**	**-.018**	**-.060**	.001	**.039**	**.041**	**-.042**	.014	**-.090**	**.021**	**.094**	1								
Capital	**.031**	**-.027**	**.126**	.015	**-.168**	-.013	**-.059**	**-.045**	**-.040**	**-.126**	**-.044**	**.018**	**.034**	1							
Activity	**.043**	**-.111**	**.126**	**.108**	**-.061**	**-.099**	**-.047**	**-.156**	**.037**	**.079**	**-.078**	.006	**-.134**	**.105**	1						
Supervisory power	**-.037**	**.034**	**-.052**	**-.125**	**.105**	**.024**	**-.080**	**.105**	**.031**	**.108**	**-.055**	**-.034**	**-.043**	.013	**-.075**	1					
Market discipline	**.119**	**-.075**	.011	**.193**	.010	**-.120**	**-.146**	**.031**	**-.032**	**.053**	**-.061**	**.054**	**-.071**	**-.065**	**.176**	**.073**	1				
Lerner	**.261**	**-.084**	.008	**.284**	.006	**-.286**	**-.176**	**-.068**	-.014	**.076**	-.011	-.002	**-.222**	**-.091**	**.187**	**-.056**	**.347**	1			
Financial depth	**.188**	**.062**	**-.062**	**.108**	.004	**-.110**	**-.047**	**-.179**	**.029**	**.047**	**.025**	**-.054**	**-.111**	**-.097**	.000	-.010	-.014	**.339**	1		
Deposit insurance	-.007	-.002	**.035**	.014	**-.032**	**.068**	**.045**	**.121**	-.013	.011	**-.021**	.007	**-.022**	**.055**	**-.055**	-.000	**-.072**	**-.149**	**-.210**	1	
Rule of law	**.099**	**.242**	**-.052**	**.188**	-.005	**-.059**	**.051**	.009	**-.166**	**-.040**	**-.072**	.005	-.004	**-.036**	**-.167**	**-.043**	**.032**	**.113**	**.247**	**-.155**	1