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The effects of ownership change on bank performance and risk exposure: Evidence from Indonesia

Abstract

This study investigates the effects of ownership change on the performance and exposure to risk of 60 Indonesian commercial banks over the period 2005-2012. We find that state-owned banks tend to be less profitable and more exposed to risk than private and foreign banks. Domestic investors tend to select the best performers for acquisition. Domestic acquisition is generally associated with a decrease in the efficiency of the acquired banks. Non-regional foreign acquisition is associated with a reduction in risk exposure. Acquisition by regional foreign investors is associated with performance gains.

Keywords. Bank; Efficiency; Ownership; Governance; M&A; Foreign acquisition; Privatization; Indonesia

JEL classification: G21; G28; G34; F36

1 Introduction

Emerging and developing economies continue to grow at higher rates compared to developed economies. Economic reforms, financial development, financial integration, privatization, liberalization and consolidation among other trends have characterized these economies since the late 1980s. Investors seeking higher rates of growth or diversification were encouraged to enter emerging markets to capitalize on the abundant opportunities available. Banking sectors in emerging economies often play a vital role in the success or failure of such initiatives. Thus, they attract ample attention, especially because of the rich and complex environment brought on by dynamic and rapid changes in bank ownership. Such changes often provide useful empirical evidence on the impact of many significant factors affecting banks and the wider economy such as *inter alia* privatization, liberalization, financial development, and governance.

An important strand of the literature examines performance discrepancies between the three major types of bank ownership (state-owned, private or foreign). These studies tend to focus primarily on the *static* (short-term) effects of ownership and often ignore the *dynamic* (long-term) effects of ownership change. More importantly, a lack of detailed and reliable data is a common obstacle for researchers trying to conduct in-depth analysis. Furthermore, despite the vast literature on the effects of foreign ownership and foreign banks' entry into emerging markets, many studies fail to distinguish between different types of foreign ownership, for instance whether foreign investors are regional or non-regional.

Indonesia is a major emerging market in the Asia-Pacific region with a diverse landscape and a rich mix of cultures and ethnicities. It is the sixth-largest economy in the region, with a nominal GDP of US\$888.5 billion in 2014, and it is the fourth most populous country in the world with a population estimated at 252.8 million, according to the World Bank (2014). The Indonesian financial sector is dominated by the banking sector,

which represents 77.9% of the total assets of the financial system (Bank Indonesia, 2013).¹ Similarly to other emerging economies, the Indonesian economy is characterized by weak institutions, weak law enforcement, corruption and politically directed lending (Hofman et al., 2004; Temple, 2003).

Over recent years, the country has experienced a surge in bank mergers and acquisitions (M&A) driven by structural, regulatory, and market forces. First, following the Asian financial crisis, M&A activity has been driven by government policy initiatives for restructuring and consolidating the banking industry. Second, bank ownership rules were introduced in 2006 to incentivize a bank shareholder with controlling stakes in more than one bank to merge the banks under its control. M&As are officially encouraged to prepare banks for greater competition brought on by regional financial integration and improved access to banking markets.² Last, the Indonesian banking sector's average profitability is one of the highest in the region, which makes investing in Indonesian banks particularly attractive to foreign investors (Trinugroho et al., 2014).

The implications of the recent wave of Indonesian banks' M&As on performance and risk are worth investigating. Not least because the empirical literature often provides ambiguous and country-specific evidence on whether a particular type of ownership generates superior performance compared to the others. This paper aims to contribute to this literature by investigating the effects of bank ownership on the performance and exposure to risk of Indonesian banks. We distinguish between *static*, *selection*, and *dynamic* ownership effects. In doing so, we aim to answer the following questions: What are the performance and risk characteristics of banks targeted for M&A? Do different types of ownership have different effects on the performance and risk exposure of target banks in the short- and long-term? Do regional foreign acquisitions differ from non-regional foreign

¹The sector comprises 120 commercial banks with the top 10 banks accounting for 63% of the country's total banking system assets (Bank Indonesia, 2013).

²Under the ASEAN Banking Integration Framework (ABIF), banks based in the Association of South-east Asian Nations (ASEAN) region - currently categorized as foreign banks in a neighboring country - will be re-classified as Qualified ASEAN Banks (QABs) and be given greater market access across the ten ASEAN countries. Initiated in 2007, ABIF is expected to be fully implemented by 2020.

acquisitions in terms of the characteristics of the banks acquired and the performance and risk exposure of the acquired banks post acquisition?

Our work directly relates to the studies by Berger et al. (2005) on Argentina and Lin and Zhang (2009) on China. It is our contention that the major types of bank ownership are also forms of governance in developing countries. The prevalence of weak legal infrastructures that often fail to provide adequate protection for investors causes ownership to play a *de facto* crucial role in reducing managerial agency costs. This is in contrast to conventional methods used by shareholders in developed nations to reduce agency costs, such as board composition, voting rules or stakes held by managers.³

We contribute to the literature in at least three ways. First, we extend the approach of Berger et al. (2005) and Lin and Zhang (2009), which jointly analyzes the *static*, *selection*, and *dynamic* effects of the different types of ownership on bank performance, by investigating how ownership also impacts on risk exposure. In our model, *static* effects refer to differences in performance or risk exposure among banks that have not observed any ownership change over the sample period. *Selection* effects refer to performance or risk exposure differences among banks that have experienced some ownership change over the sample period. In other words, selection effects measure the pre-ownership change differences in performance or risk exposure between the banks selected for acquisition and private banks that did not experience any change in ownership. *Dynamic* effects refer to performance or risk exposure effects associated with domestic and foreign acquisitions. Second, we distinguish between cross-border acquisitions carried out by regional foreign investors from the Southeast and East Asian regions and those conducted by non-regional foreign investors. A regional foreign acquisition is defined as an acquisition by an investor

³Berger et al. (2005) also argue that the objective of shareholder value maximization may not necessarily apply to foreign and state owners. Foreign owners may be concerned with the value of the whole international organization, rather than an individual bank in the foreign country, and state owners may have social or political objectives. Governance in this context includes the effects of the goals of different ownership types, as well as the ability of the owners to minimize managerial agency costs. Notwithstanding, the unavailability and/or unreliability of governance-related variables, which is a common feature for developing countries, is a limitation of our study. Therefore, we use ownership change as a proxy for governance change - an alternative commonly used in the literature - to overcome this constraint.

whose country of origin is a Southeast Asian or East Asian country. Thus, regional foreign acquisitions include but are not limited to acquisitions from investors originating from the ASEAN countries. This allows us to draw important policy implications regarding the potential impact on the Indonesian banking sector of the current trend in regional financial integration. Third, this study is, to the best of our knowledge, the first to specifically investigate the effects of changes in bank ownership in Indonesia following the country's recent intensive spell of banking consolidation. Our sample consists of 60 commercial banks over the period 2005 to 2012, representing approximately 75% of the Indonesian banking sector in terms of total assets.

Our main results are as follows. State-owned banks tend to be less profitable and more exposed to risk than private and foreign banks. Domestic investors tend to select the best performers for acquisition. Moreover, domestic acquisition is associated with a decrease in the efficiency of the acquired banks. Finally, regional foreign acquisition is associated with performance gains while non-regional foreign acquisition is associated with reduced exposure to risk.

The remainder of this paper is organized as follows. Section 2 presents a brief overview of the banking system in Indonesia. Section 3 reviews the literature on the impact of ownership on bank performance and risk with an emphasis on emerging markets. Section 4 describes our data and methodology. Empirical results are discussed in Section 5. Section 6 summarizes and concludes.

2 Review of the Indonesian banking sector

Prior to 1983 the Indonesian banking system was characterized by credit ceilings, interest rates rate controls, and restrictions on bank branching, all of which hindered deposit mobilization. State-owned banks (SOBs) were primarily used to channel loans to targeted borrowers at relatively low interest rates.⁴ The deregulation of the banking sector was

⁴Under the directed subsidized credit schemes known as liquidity credit schemes, such loans were subsequently eligible for refinancing from the central bank at subsidized rates.

triggered by the fall in oil revenues in 1982. A first package of reforms was introduced in June 1983 aimed at removing directed credit programs and lifting interest rate controls. The reforms, however, did not abolish entry barriers, either among banks or between banks and other financial institutions. In October 1988, an important policy package opened up the banking sector to limited foreign competition and eased the requirements for establishing new banks⁵. The 1992 banking law eventually allowed foreign investors to acquire shares in publicly listed domestic banks although foreign shares were not permitted to exceed 49% of total shareholding, and the government was required to retain majority shareholding in any SOB whose shares were offered to the public. Deregulation led to the rapid expansion of the banking sector with the total assets of commercial banks increasing 10-fold to IDR 715.2 trillion during the period 1988-1997, exceeding for the first time the size of the countrys GDP (Chou and Lin, 2011).

The subsequent increase in competition between banks that resulted from banking deregulation happened under a relatively weak regulatory and supervisory framework. This, in turn, magnified the impact of the 1997 Asian financial crisis on the banking sector. Restructuration involved closure, mergers, nationalization through the Indonesian Bank Restructuring Agency (IBRA), and recapitalization with government funds. Amendments to the 1992 banking law lifted the requirement that the government had to retain majority ownership of SOBs; abolished regulations discriminating between domestic and foreign joint-venture banks; and allowed foreign owners to acquire up to 100% of the shares in existing banks (including SOBs). Later in the restructuring process, the government started privatizing SOBs and divesting government shares of recapitalized private banks.

Since 2006, the government has focused on improving the competitiveness of the banking sector by reducing the number of banks through a process of consolidation. In 2006, the Single Presence Policy (SPP) was introduced based upon the premise that any controlling shareholder of a bank should be limited to owning only one banking operation in

⁵New domestic banks could be established, subject only to a small minimum capital requirement, and foreign banks were allowed to set up joint ventures with existing domestic banking partners.

Indonesia. A controlling shareholder of a bank is defined as either a party that holds 25% or more shares with voting rights in a bank, or a party with direct or indirect control of a bank even where it holds less than 25% of the shares. Under the policy, a shareholder is prevented from owning controlling stakes in multiple banks. Bank owners with multiple controlling stakes are required either to divest stakes, to establish a holding company, or to merge banks. In December 2012, the central bank loosened the SPP to support local banks being consolidated through M&As. Under the 2012 regulation, a controlling shareholder is allowed to have a controlling share in more than one bank subject to the proviso that one bank is a conventional bank and the other is a Sharia bank; or one of the banks is a joint-venture bank. However, if these exceptions do not apply, the central bank introduced incentives for banks contemplating a merger, including a temporary relaxation of the rules on minimum statutory reserve requirements. The central bank also set policies to raise the capital adequacy of banks by raising the minimum Tier 1 capital to IDR 100 billion for all commercial banks providing incentives for banks to merge as part of their consolidation strategy.

Currently, foreign banks can establish a branch or a representative office, establish a new bank in joint venture with local firms up to 99% foreign equity ownership, or acquire up to 99% of total equity in domestic banks. A bank is classified as foreign if the direct or total percentage of ownership from shareholders settled in foreign countries is at least 50.01% of the total shares of the bank. In August 2015, the assets of foreign and joint-venture banks stood at IDR 807 trillion, accounting for about 13.5% of the country's banking sector, according to the central bank data. In comparison, the assets of state-owned banks amounted to IDR 2,160 trillion while the assets of private banks amounted to IDR 2,510 trillion, accounting for 36% and 42% of the country's banking sector, respectively.

3 Related literature

Bank ownership change typically occurs as a consequence of privatization, nationalization, or M&As between private entities. In this paper we consider different types of ownership as different forms of governance (Shleifer and Vishny, 1997; Easterbrook and Fischel, 1996; Jensen, 1993; Berger et al., 2005; Lin and Zhang, 2009). Indeed, the effect of takeovers is widely perceived as a critical corporate governance mechanism. Hence, we aim to capture the effects of changes in governance (which are often difficult to observe due to the lack of reliable governance data at the bank-level in emerging markets) on banks through changes in ownership.

Calomiris and Karceski (2000) and Focarelli et al. (2002) are among early studies that emphasize the importance of distinguishing between the short-term and long-term effects of M&A on bank performance. Berger (1995) investigates the impact of M&A on SMEs lending and highlights the importance of including long lags in the analysis to capture the lagged effects of a M&A due to the time it often takes the acquirer to restructure and reorganize the acquired firm. We take this into account in this paper by considering not only the static effect of different types of ownership but also the dynamic (long-term) effects of ownership change. Our work relates directly to the work of Berger et al. (2005) on Argentina and Lin and Zhang (2009) on China. It differs from these two studies, however, in that we also investigate the impact of ownership change on the banks' exposure to risk. Moreover, we distinguish between the effects of regional and non-regional foreign ownership.

State-ownership is often regarded as a relatively inefficient form of ownership compared to other forms of ownership. Proponents of this view point to observed inefficiencies, overstaffing, and high levels of nonperforming loans in SOBs as well as major differences in objectives between state-owned and private banks (Sapienza, 2004; Claessens and Van Horen, 2012; Shleifer, 1998). Profit maximization may not be the prime objective of SOBs as is the case with private banks. Furthermore, under state-ownership

the agent may lack the incentives to exert effort towards profit maximization and/or it may be more difficult and costly for the principal to exercise monitoring. In contrast, private banks are typically less affected by political interference and better able to maximize profits, for instance by aligning the objectives of the principal and the agent using incentives schemes and superior governance systems (Shleifer and Vishny, 1997). Some studies, however, argue that externalities and monopoly power may distort the benefits of private ownership. For instance, the concentration of ownership in the hand of large private investors may lead to exploitation of other stakeholders' rights due to the primary focus on profit maximization (Sappington and Stiglitz, 1987; Laffont and Tirole, 1993).

The empirical evidence obtained from cross-country studies on the relative superiority of one form of ownership over another typically yields contrasting results. The country's level of financial development (Lee et al., 2012); political factors (Micco et al., 2007); and other country-specific factors (Angkinand and Wihlborg, 2010) appear to be important determinants of bank performance and risk. Mian (2003) investigates the strengths and weaknesses of the three main *organizational designs* (i.e. the different types of ownership) and finds that private banks outperform SOBs in emerging markets.⁶ In another cross-country study, Goddard et al. (2014) find that the cost efficiency of SOBs in Latin American countries deteriorated during the 1990s, before improving during the 2000s until the sub-prime crisis. In the same study, the profitability of SOBs is found to be inferior to other types of ownership. Fries and Taci (2005) investigate the performance of 289 banks from 15 East European transition countries. They find that private banks are more cost efficient than SOBs. Bonin et al. (2005a) analyze the effects of ownership on bank efficiency using data from 11 transition countries for the period 1996-2000. Their analysis reveals that SOBs are more efficient than *de novo* domestic private banks but inferior to banks already privatized (supporting the argument that better banks tend to be privatized first). Berger et al. (2005) and Delfino (2003) find similar evidence for Argentinian banks. Haber (2005) show that SOBs are the worst performers among Mexican banks.

⁶The three organizational designs are state-owned, private-owned and foreign banks.

Lin and Zhang (2009) and Berger et al. (2009) find that SOBs are the least profit efficient banks in China. Chen (1998) and Mercan et al. (2003) report similar findings for Taiwan and Turkey, respectively. In contrast, Sathye (2003) and Isik and Hassan (2003) find that SOBs are more efficient than private banks in India and Turkey, respectively. Fethi et al. (2011) find that SOBs in Egypt gained more from liberalization policies and, in general, tend to be more productive compared to other types of banks. Shen and Lin (2012) find that political interference tends to weaken the performance of SOBs in China compared to other banks. Dong et al. (2014) also unveil discrepancies in risk taking among different types of bank ownership in China. They find the Chinese banks that are controlled by the government tend to take more risks than those controlled by private investors. They attribute this finding to political intervention and a lack of incentives to follow prudent bank management practices.

Many studies explore the static effect of domestic versus foreign ownership on bank performance and find that foreign banks are the most profitable (Berger et al., 2004; Isik and Hassan, 2003). Naaborg and Lensink (2008), however, find evidence of a negative relationship between foreign ownership and bank profitability that suggests a *home-field* advantage for domestic banks. Claessens and Van Horen (2012) show that foreign banks perform better than domestic banks when (i) the foreign acquirer is from a high-income country; (ii) the regulation in the host country is relatively weak; (iii) the foreign acquirer's country of origin has the same language and similar regulation as the host country; (v) the acquirer is large and possesses a high market share. Jia (2009) finds that Chinese joint-equity banks behave more prudently with respect to their lending. Likewise, there is empirical evidence that foreign ownership is associated with lower overdue loans and higher regulatory capital in Taiwan (Chou and Lin, 2011). Iannotta et al. (2007) investigate 181 large banks from 15 European countries over the 1999-2004 period to evaluate the impact of ownership type and ownership concentration on performance. They find that mutual banks and SOBs have lower profitability compared to private banks. They also exhibit poorer loan quality and a higher risk of insolvency. Cornett et al. (2010) ex-

amine the performance and behavior towards risk of SOBs in 16 Far East countries over the period 1989-2004. SOBs are found to be less profitable and exposed to higher credit risk than private banks prior to the Asian financial crisis. The performance of SOBS is found to further deteriorate during the crisis and to converge towards the performance of private banks afterwards.

The dynamic effect of acquisition by domestic or foreign investors on bank performance and risk is central to our analysis. There is a general consensus in the literature that a change to private (domestic) or foreign ownership leads to performance improvement and/or a reduction in the risk exposure of banks. Megginson et al. (1994) and Megginson and Netter (2001) provide evidence of gains achieved through privatization. Boubakri et al. (2005) find that in developing countries privatization yields significant improvements in bank efficiency in the long run. Berger et al. (2005) find that the performance of SOBs in Argentina was particularly poor before privatization but improved dramatically afterwards. Privatization itself is not sufficient to ensure greater efficiency and both the method and timing of privatization are relevant to performance (Bonin et al., 2005*a,b*). Mohsni and Otchere (2014) find that privatized banks experience a significant decrease in risk after privatization but continue to exhibit higher risk than their rivals. Their results show that the risk-taking behavior of newly privatized banks is influenced by the country's level of development as well as its degree of political risk.

Foreign acquisition is often found to be associated with efficiency gains (see *inter alia* Dages et al., 2000; Claessens et al., 2001; Bonin et al., 2005*a*). Berger et al. (2009) show that minority foreign ownership is associated with significantly improved efficiency in Chinese banks. Ariff and Luc (2008) and Jiang et al. (2009) and Jiang et al. (2013) show that joint-equity ownership in China also tends to be associated with profitability and efficiency gains and offers long-term benefits. These findings are often attributed to foreign banks having greater access to capital, being better able to diversify risks, possessing technological superiority or being more innovative, for instance by introducing new managerial skills and production processes. Berger et al. (2003) and Buch and DeLong

(2004), however, find that foreign banks are at a disadvantage when it comes to accessing qualitative information regarding local conditions. Lensink et al. (2008) show that efficiency gains depend on the institutional quality of the host country and on institutional differences between the home and host country. Lee et al. (2012) find that a lower level of economic development of the host country enhances the positive effects of foreign ownership on the banks income, profit and cost. The mode of foreign entry appears to matter. Foreign Greenfield banks are characterized by superior cost efficiency, compared to foreign and domestic banks (Poghosyan and Poghosyan, 2010; Havrylchyk, 2006). Other studies explore the relationship between ownership and the selection of banks for acquisition. Poghosyan and Poghosyan (2010), for instance, find that foreign banks target relatively large and efficient banks when the country's institutions are weak.

The literature on the performance and risk of Indonesian banks reveals that SOBs tend to outperform foreign banks. Investigating Indonesian banks over the period 2003-2009, Hadad et al. (2011*a*) examine the relationship between bank efficiency and stock market performance. Their study uses a Data Envelopment Analysis (DEA)-based approach and finds that foreign banks tend to be less efficient compared to their domestic counterparts. Hadad et al. (2011*b*) investigate productivity changes and risk management in Indonesian banks over the same period. Their study employs the non-parametric DEA-based Malmquist index to estimate the productivity index and its components. They find that SOBs exhibit the highest degree of risk. However, listed Islamic banks outperform non-listed and conventional banks in terms of risk management. Hadad et al. (2012) find that SOBs are the most efficient banks in their sample but that regional SOBs are the least efficient ones. Regarding scale efficiency Hadad et al. (2013) confirms that SOBs have above average scale efficiency scores. They argue that M&As in this group of banks could result in cost saving (between US\$ 475 million to US\$ 1.8 billion).

4 Methodology and Data

4.1 Sample and observations

We obtain our data from three sources: financial data on individual banks from the Bankscope database (Bureau Van Dijk); data on M&A transactions from the Zephyr database (Bureau Van Dijk); data on industry aggregates from Bank Indonesia's annual reports. Our original sample obtained from Bankscope comprised 94 Indonesian banks categorized as commercial banks. We filtered out banks for which the data necessary to estimate cost and profit functions was not available for all years over the period 2005-2012. This reduced the sample to 60 banks. This final sample includes 64% of all the Indonesian banks classified as commercial banks in Bankscope, representing approximately 75% of the Indonesian banking sector in terms of total assets. We then matched the data obtained from Bankscope using the unique BvD ID of each bank with the data obtained from the Zephyr database to identify those banks involved in M&A transactions. Our second stage analysis involves an unbalanced panel because some banks have missing observations for the variables involved. Table 1 shows the distribution of the observations. We consider completed and confirmed-completed M&A transactions that occurred between 01/01/2004 and 31/12/2011. This enables us to analyze the dynamic effects of any transaction that occurred over the period 2005-2012. There were originally 39 M&A transactions that occurred during this period. However, we restrict our analysis to 20 transactions out of these 39 transactions based on the following criteria. We only consider a transaction if it leads to a majority-controlling stake in the acquired bank. We define a majority-controlling stake as a stake greater or equal to 50.01% of the target banks total shares. We exclude any transaction that occurred as a top-up of an original majority stake. We further exclude any multiple-tranche transactions involving the same banks occurring within a one-year period (where the acquirer buys multiple shareholding tranches of the target bank in a given year). Hence, we only consider the 20 transactions that brought the acquirers stakes to or above controlling stakes in the acquired banks. Table 2 provides

a summary of these transactions.

4.2 Model

In order to jointly analyze static, selection and dynamic effects on bank performance and risk we use the model proposed by Berger et al. (2005) in Equation (1). We replace θ_{it} , the performance measure, by σ_{it} , the proxy for risk in equation 2 to also investigate ownership effects on bank risk.

$$\theta_{it} = \alpha + \mathbf{X}'_{it}\beta + \mathbf{Z}'_{it}\gamma + \mathbf{D}'_{it}\zeta + \mathbf{C}'_{it}\lambda + \varepsilon_{it} \quad (1)$$

$$\sigma_{it} = \alpha + \mathbf{X}'_{it}\beta + \mathbf{Z}'_{it}\gamma + \mathbf{D}'_{it}\zeta + \mathbf{C}'_{it}\lambda + \varepsilon_{it} \quad (2)$$

where

θ_{it} is a measure of performance

σ_{it} is a measure of exposure to risk

\mathbf{X}'_{it} is a vector of static ownership indicators

\mathbf{Z}'_{it} is a vector of selection ownership indicators

\mathbf{D}'_{it} is a vector of dynamic ownership indicators

\mathbf{C}'_{it} is a vector of control variables

and α , β , γ , ζ , and λ are parameters to be estimated by the models. See Table A.1 in Appendix A for a detailed description of the variables. In all the models we account for year fixed effects controlling for general macroeconomic conditions.

4.3 Endogenous variables

To obtain bank-specific relative performance measures we apply parametric frontier techniques to compute both cost and profit efficiency scores for our sample of commercial banks. A key advantage of parametric methods is that unlike deterministic methods (like DEA) they allow for the specification of a stochastic term thus making the estimates

less exposed to the influence of random events and measurement errors (Kumbhakar and Lovell, 2003). We use the approach suggested by Battese and Coelli (1995) to obtain the cost and profit efficiency scores. More specifically, the cost frontier is specified as:

$$\ln C_{it} = c(q_{it}, w_{it}, t : \beta) + (\ln v_{it} + \ln u_{it}) \quad (3)$$

$$i = 1, \dots, N \text{ and } t = 1, \dots, T$$

where $\ln C_{it}$ is the total cost of bank i at time t , q_{it} is a vector of outputs, w_{it} is a set of input prices, and t is a time trend that measures disembodied technical progress. β is a vector of unknown parameters to be estimated. The error term has two components: u_{it} and v_{it} . The term v_{it} is the independent and identically distributed random error, assumed to be distributed as a $N(0, \sigma_{vi}^2)$ and to be independent of u_{it} . The inefficiency component u_{it} is a non-negative random variable assumed to account for the banks cost inefficiency and to be independently distributed with truncation at zero. The translog cost function is presented in Equation (B.1) in Appendix B. The cost efficiency score of a bank is defined as the ratio between the actual level of costs and the minimum level of costs given the cost frontier (see Equation (B.2) in Appendix B). The definitions of the key variables in the cost frontier are standard and can be found in the literature on bank performance (see for example Berger et al., 2005; Bikker and Bos, 2008; Duygun et al., 2013; Shaban et al., 2014). Costs are the total operating costs i.e. the sum of interest expenses, salaries and employee benefits and other operating costs. Outputs in the vector q_{it} are loans (q_1) and securities investments (q_2). The loans variable is calculated as the difference between the gross loans and the reserves allocated for non-performing loans. We use three input prices in the vector w_{it} . These are: (a) the cost of capital (w_1) calculated by dividing interest expenses by total deposits, (b) the cost of physical capital (w_2) calculated by dividing overhead expenses other than personnel expenses by the book value of fixed assets and (c) the cost of labor (w_3) calculated by dividing the personnel expenses by the number of employees. We then proceed by normalizing the dependent

variable and all the input prices to ensure linear homogeneity. Finally, following Berger and Mester (1997), Duygun et al. (2013) and Shaban et al. (2014), we control for the level of equity as a quasi-fixed input to control for differences in risk preferences.

To obtain the bank's relative profit efficiency we estimate an alternative profit frontier proposed by Berger and Mester (1997). The alternative profit frontier assumes that banks take the output quantities and the input prices as given and maximize profits by adjusting output prices and input quantities. The alternative profit frontiers may be preferable to standard profit frontiers when there are differences in the quality of the banking outputs and output markets are not competitive.

$$\ln P_{it} = p(q_{it}, w_{it}, t : \beta) + (\ln v_{it} - \ln u_{it}) \quad (4)$$

$$i = 1, \dots, N \text{ and } t = 1, \dots, T$$

where $\ln P_{it}$ in Equation (4) is the profit before tax (PBT) for bank i at time t and q_{it} , w_{it} , t are the same as in Equation (3) above.⁷ β is a vector of unknown parameters to be estimated. The error term has two components: u_{it} and v_{it} . The term v_{it} is the independent and identically distributed random error, assumed to be distributed as a $N(0, \sigma_{vi}^2)$ and to be independent of u_{it} . The inefficiency component (u_{it}) is a non-negative random variable and enter the equation with negative sign, hence inefficiency reduces profit. The alternative profit frontier does not need to be homogenous of degree one, we do not divide the profits before tax by one of the inputs price. The specification of the translog profit function and the relative measure of profit efficiency is in Appendix B, Equations (B.3) and (B.4) respectively. Table 3 provides descriptive statistics on the basic variables used in both the profit and cost efficiency estimations.

Once we have generated cost efficiency score (*CE score*) and profit efficiency score (*PE score*) variables for each bank from the frontier models, we construct cost efficiency

⁷We overcome the presence of negative profits (losses) in some of the banks in our sample by transforming the dependent variable P_{it} using the following procedure $P_{it} = \mathbf{P}_{it} + |(\mathbf{P})_{\min}|$ where $(\mathbf{P})_{\min}$ is the minimum absolute value of PBT over all banks in the sample.

rank (*CE rank*) and profit efficiency rank (*PE rank*) variables by ranking efficiency scores across all the banks in our sample. This is because efficiency ranks may be more accurate indicators of the quality of the management of the institution than efficiency scores (Berger et al., 2005). We rank efficiency scores as follows. First, we rank banks according to their efficiency scores year-by-year. Second, for each year the bank that has the highest efficiency score is ranked 1 and the bank with the lowest efficiency score is ranked 60. Consequently, we obtain a total of four relative performance indicators to be used in our second stage analysis. We estimate censored Tobit regressions when our dependent variables are *CE rank* and *PE rank*; otherwise, we use Ordinary Least Squares (OLS). A negative (positive) coefficient associated to a given explanatory variable in the cost or profit efficiency rank regression implies that an increase in this variable is associated with a higher (lower) efficiency rank. In addition, we also consider standard financial ratios often used to measure profit and cost performance: net interest margin (NIM); return on average assets (ROA); return on average equity (ROE); total cost to total revenue (TCTR) and cost-income ratio (CIR). It can be argued that these ratios are less appealing than cost and profit efficiency scores and ranks (Berger et al., 2005). Importantly, we also analyze the impact of ownership change on the banks exposure to risk by considering the following measures: equity to total assets (ETA); core equity capital to total risk-weighted assets (TIER1); net charge offs to average loans (NCO); non-performing loans to total loans (NPL) and liquid assets to total assets (LATA).

4.4 Exogenous variables

The key exogenous variables in Equations (1) and (2) are the static, selection, and dynamic ownership indicators. For our static indicators we construct dummies indicating no change in ownership over the sample period: a dummy that equals 1 for a static foreign bank and 0 otherwise (FB); a dummy that equals 1 for a static private bank and 0 otherwise (PB); a dummy that equals 1 for a static state-owned bank and 0 otherwise (SOB). We use the ultimate ownership feature of the Bureau van Dijk Bankscope database to

construct the above dummies. This enables us to classify banks operating in Indonesia as foreign, private, or state-owned. The ultimate owner is a single shareholder or a group of shareholders with a direct or total percentage of ownership of at least 50.01% of the total shares of the bank. For example, if the Indonesian banks ultimate owner is a private Indonesian owner then the bank is classified as private. If the banks ultimate owner is the Indonesian government then the bank is classified as state-owned.

In order to construct selection and dynamic ownership indicators, we track changes in ultimate ownership following acquisitions using the Bureau van Dijk Zephyr database. For our selection indicators, we construct dummies indicating a change in ownership over the sample period: a dummy that equals 1 if the bank underwent a domestic acquisition and 0 otherwise (DA-S); a dummy that equals 1 if the bank underwent a non-regional/regional foreign acquisition and 0 otherwise (FA-S/RA-S). For our dynamic indicators we construct dummies for the years following a change in ownership ($t+1$): a dynamic domestic acquisition dummy (DA-D); a dynamic non-regional/regional foreign acquisition dummy (FA-D/RA-D).

We define a regional foreign acquisition as an acquisition by an investor whose country of origin is a Southeast Asian or East Asian country. For example, the ultimate owner of Bank ICBC Indonesia (established in 1989 as Bank Halim Indonesia) was Indonesian until 2007. In 2007, Industrial & Commercial Bank of China acquired the bank and the ultimate owner of Bank ICBC Indonesia became Chinese. Hence, this bank experienced a change in ownership from private to regional foreign in 2007.

We limit any potential endogeneity bias that may arise as a result of foreign banks selecting banks with inherently different characteristics by including bank specific control variables. These control variables comprise a dummy that equals 1 for a publicly traded bank and 0 otherwise (LISTED) and a dummy controlling for the activity of the acquiring investor, which equals 1 if the acquirers main business is banking and 0 otherwise (BUSINESS). Moreover, we include the natural logarithm of lagged total assets (SIZE) and the lagged market share in terms of total assets (SHARE) to help account for differences in

bank size and market power. Lastly, we include year fixed effects in the regressions to control for general macroeconomic conditions.

5 Empirical results

The aim of this paper is to provide empirical evidence on the effect of ownership on bank performance and risk exposure. As discussed in the previous section, in line with Berger et al. (2005) and Lin and Zhang (2009) we consider static, selection, and dynamic effects. We first generate robust relative performance indicators of cost and profit efficiency scores driven from the estimation of cost and alternative profit functions, respectively. In the second stage of our analysis we estimate two sets of models, where dependent variables are either performance or risk exposure indicators. We employ the Tobit censored regression model where we use *CE rank* or *PE rank* as the dependent variable, and OLS otherwise.

We first introduce a brief discussion on the descriptive statistics of the variables used in the regressions and then proceed in the following sub-section to discussing our findings. Table 4 provides descriptive statistics on the variables used in the estimations based on Equations (1) and (2). The table shows that the average cost efficiency score in our sample is 0.95 with a 0.04 standard deviation, implying limited disparities in terms of cost efficiency among our sample of Indonesian banks. The standard deviation of the profit efficiency score, however, is slightly higher (0.11) with an average profit efficiency score of 0.45. The accounting based profitability indicators show a healthy profitable banking sector with average NIM, ROA and ROE of 5.32%, 1.65%, and 11.56%, respectively. There is significant variation observed in the risk exposure indicators, with average ETA and Tier 1 ratios approaching 15% and 12%, respectively.

5.1 Static effects

In this section we discuss our findings on the static effect of different types of ownership. Table 5 reports the results of the performance model using the efficiency scores and ranks

obtained from the frontier models. Furthermore, we report the results where profitability and efficiency ratios are dependent variables in Equation (1). The coefficients on the FB and SOB variables capture the static effects on the performance of banks of continuous foreign and state ownership relative to private ownership (i.e. no change in ownership over the entire sample period). In terms of the static effect of ownership on cost efficiency performance, the significant and positive sign of the coefficient on FB in the CE rank regression indicates that foreign ownership is associated with a lower cost efficiency rank than private (domestic) ownership, while the coefficient on FB in the CE score regression is not statistically significant. The coefficient on SOB in the CE rank regression is insignificant but the positive and statistically significant coefficient on SOB in the CE score regression suggests that state ownership may be somewhat associated with higher cost efficiency. This finding appears to be in line with Hadad et al. (2012). The results also indicate that foreign banks tend to underperform private banks but outperform SOBs, as shown by the sign and significance of the coefficients on FB and SOB in the PE rank regression as well as in the PE score regression. The finding that foreign banks trail private banks in terms of both cost and profit efficiency is broadly consistent with the results of Hadad et al. (2011a).

The results obtained with accounting indicators as performance measures show that foreign banks tend to be more successful in generating higher return on equity (ROE) and tend to have a lower cost-to-income ratio (CIR) in relation to private banks and SOBs.⁸ The negative and statistically significant coefficient in the CIR regression suggests that foreign banks tend to be more efficient in managing their overhead costs relative to income. In contrast, SOBs appear to be less efficient in managing their overhead costs as shown by the positive and statistically significant coefficient on SOB in the CIR regression. The coefficients on FB (SOB) in the total costs to total revenues (TCTR) regression are positive (negative) and statistically significant suggesting that foreign (state-owned) banks

⁸CIR shows the extent to which operating expenses (i.e. overheads) absorb operating revenues. The lower this ratio the more efficient the bank is in managing overhead costs relative to income.

are relatively inefficient (efficient) at managing their total costs to revenues compared to private banks.⁹ The positive and significant coefficient on SOB in the net interest margin (NIM) regression indicates that Indonesian SOBs enjoy a relatively healthy NIM compared to other banks in the sector. There are a number of possible explanations for this finding. SOBs in Indonesia could be charging higher interest rates to compensate for contracting relatively riskier loans than other banks. SOBs in Indonesia also have abundant access to deposits given their enormous branch network in the country and the implicit guarantees they provide of the safety of these deposits. The negative (positive) significant coefficient on SOB in the TCTR (CIR) regression suggest that that SOBs have higher overheads but lower interest expenses compared to their counterparts. Overall, our findings are for the most part consistent with the common finding of the empirical literature that SOBs are typically less efficient than private and foreign banks as they do not necessarily pursue profit maximization and their lending activity may be politically motivated (Sapienza, 2004; Shen and Lin, 2012). The CIR regression indicates that SOBs are burdened with higher levels of operating cost compared to private and foreign banks. One possible explanation is overstaffing, a common burden that is often borne by state-owned banks to help the government reduce unemployment.

One key contribution of this study is to further investigate the effect of ownership on the banks' attitude towards risk. Table 6 reports the results of the regression models that used risk indicators as dependent variables (Equation (2)). The equity to total assets (ETA) regression shows that SOBs tend to be less capitalized compared to private banks. The coefficient on FB in the net charge-offs to average loans (NCO) regression is positive and statistically significant.¹⁰ In the first instance, one may naively interpret this result as suggesting that foreign ownership is associated with a relatively greater amount of

⁹TCTR measures the bank's efficiency in managing total costs (i.e. overheads plus interest expenses and other expenses) relative to total revenues, which include interest and non-interest income.

¹⁰Banks regularly charge-off bad debt or poor credit quality loans and remove them from the books. This process may occur on a monthly or quarterly basis. If, at a later date, part of the debt is actually repaid, the net charge-offs can be calculated as the difference between the gross charge-offs and the repaid debt. Thus, a negative value for net charge-offs indicates that recoveries are greater than charge-offs during a particular accounting period.

poor credit quality loans. However, the non-performing loans (NPL) regression provides evidence that foreign and state-owned banks have a lower proportion of NPLs relative to private (domestic) banks. One possible explanation is that foreign banks are more active in charging-off bad loans compared to domestic banks. This is not inconsistent with the view that foreign banks typically possess relatively superior loan screening and monitoring technologies.

5.2 Selection effects

In this section we present our findings on the selection effect of ownership on bank performance and risk-exposure. Through each selection indicator we aim to capture the significant differences in the characteristics of the banks selected for acquisition.

As shown in Table 5 the CE rank and PE rank regressions yield negative and significant coefficients for DA-S of -11.57 and -12.18 respectively. In line with these results, the CE and PE score regressions yield positive and significant coefficients for DA-S. The DA-S coefficient in the NIM regression is negative and statistically significant implying that banks selected for M&A by domestic investors tend to have a lower NIM. The same coefficient is positive and statistically significant in the ROA and TCTR regressions, suggesting that domestic investors tend to prefer banks with a higher return on assets regardless of cost efficiency. It is worth noting that these findings are not directly comparable to those obtained using CE score or CE rank as the dependent variable since score and rank are frontier-based measures. Notwithstanding, the DA-S coefficient in the ROA regression is in line with the DA-S coefficient in the PE score and rank regressions. The FA-S variable has positive and significant coefficients in the CE and PE rank regressions as well as a negative and significant coefficient in the PE score regression. The FA-S coefficient is, however, insignificant in the CE score regression. This suggests that, compared to their peers, domestic investors are more careful in selecting targets characterized by relatively higher levels of profit and cost efficiency. Domestic investors are often banks that aim to benefit from the positive synergies generated through acquisitions. They are likely to be

more knowledgeable than foreign acquirers about the banks already operating domestically. Banks with lower TCTR also appear to be more attractive to non-regional foreign investors as shown by the negative and significant coefficient on FA-S in the TCTR regression. One possible explanation for these results is that the primary objective of non-regional foreign investors may be to penetrate the host country's market and increase market power as opposed to selecting banks that already exhibit superior performance in the industry.

Turning to the results on exposure to risk, Table 6 shows that domestic investors appear to select highly capitalized banks, with lower proportions of non-performing loans as shown by the significant positive and negative coefficients on DA-S in the ETA and NPL regressions, respectively. However, domestic investors do not appear to attach as much importance to the levels of NCO in the acquired banks as shown by the positive and significant coefficient on DA-S in the NCO regression. The DA-S coefficients in both the TIER1 and LATA regressions are negative and statistically significant implying that banks selected for M&A by domestic investors tend to have lower capital adequacy ratio and lower liquidity levels, respectively. In contrast, the FA-S coefficient in the LATA regression is positive and statistically significant. Overall, domestic investors in Indonesia seem to target highly capitalized banks with somewhat less problematic loan portfolios. As with the selection of banks in terms of performance, acquisition synergies may be a significant driver of acquisitions for domestic investors when assessing their targets risk exposure. In contrast, non-regional foreign investors seem to attach less importance to their targets' capitalization and more to their level of NCOs. These findings are intuitive. Non-regional foreign investors in Indonesia are typically large international banks with greater access to capital compared to domestic investors. As a consequence, they may be more concerned with the quality of the bank's loan portfolio than with its capitalization. In contrast, domestic investors may be keen to acquire well-capitalized banks, either because it allows them to improve the overall capitalization of the new entity (especially for leveraged pay-outs) or hedge against risky decisions taken in the future.

5.3 Dynamic effects

By dynamic effects we mean the post-acquisition long-term effects of ownership change on an acquired bank. As shown in Table 5, the CE score regression results yield negative and statistically significant coefficients on DA-D (-0.011) and FA-D (-0.016) implying that both domestic and foreign ownership change led to deterioration in cost efficiency. This decline, however, is marginally smaller with domestic acquisitions. The coefficients on DA-D and FA-D in the CE rank regressions provide further supporting evidence of these effects. Domestic acquisition is associated with higher CIR and non-regional foreign acquisition is associated with higher TCTR. The coefficient on FA-D in the PE score regression is positive and significant indicating that non-regional foreign acquisition is associated with profit efficiency gains. In contrast, the coefficients on DA-D in the PE score and PE rank regressions show deterioration in profit efficiency following domestic acquisition. Banks acquired by domestic investors also suffered a decline in ROA and ROE, and an increase in the cost-to-income ratio. The results show, however, some possible performance gains in terms of net interest margin and total costs to total revenues. Taken together, these results suggest at first that both domestic and non-regional foreign acquisition has a strong but mostly negative impact on cost efficiency.

Turning to our result on the dynamic effect of ownership change on risk exposure, Table 6 shows that non-regional foreign acquisition is associated with an increase in ETA. This suggests a reduction in the risk-exposure of banks acquired by non-regional foreign investors. Non-regional foreign acquisition is also associated with an increase in NCOs, as one would expect if bad loans are more actively charged-off. The results also show that non-regional foreign acquisition is associated with a decrease in the ratio of liquid assets to total assets. This finding can be explained by the fact that Indonesian subsidiaries of international banks can access liquidity in both Indonesia and abroad, which makes them less concerned about liquidity shocks, reducing in turn the volumes of liquid assets they hold compared to other banks in the sector.¹¹ The coefficients on DA-D in the

¹¹Subsidiaries of international banks, however, would increase their volumes of liquid assets in the

ETA and TIER 1 regressions shed light on the dynamic effect of domestic acquisition on capital. Domestic acquisition is simultaneously associated with a decrease in shareholder equity and an increase in the Tier 1 capital ratio. These two findings are not necessarily contradictory, especially if the increase in the Tier 1 capital ratio is mainly driven by growth in relatively safe assets, such as cash or government securities.

5.4 Selection and dynamic effects of regional foreign acquisitions

Our bank performance results controlling for regional foreign acquisitions are reported in Table 7. Starting with the selection effect of regional foreign acquisitions, the coefficient on RA-S is positive and statistically significant in the CE rank regression. Like non-regional foreign investors, regional investors tend to target the relatively less efficient banks. This finding is further supported by the negative and significant coefficient on RA-S in the CE and PE score regressions. This suggests that the selection behavior of regional investors could be driven by the same unobservable factors (e.g. increasing market power as the primary objective) that influence the selection behavior of non-regional foreign investors. The RA-S coefficients in both the ROE and CIR regressions are negative and statistically significant implying that banks selected for M&A by regional foreign investors tend to have a lower return on equity but are relatively more efficient at managing their overhead costs. Table 8 reports our bank risk exposure results controlling for acquisitions by regional foreign investors. Focussing on the selection effect of regional foreign acquisitions, regional foreign investors appear to select banks with relatively less risky portfolios. The coefficient on RA-S in the NPL regression is negative and statistically significant (-1.163).

Turning to the dynamic effect of foreign acquisition from regional foreign investors on bank performance, Table 7 shows that banks acquired by regional foreign investors experienced cost and profit efficiency gains as indicated by the significant coefficient on RA-D in the CE score, CE rank, PE score, and PE rank regressions. Banks acquired by regional

presence of an aggregate liquidity shortage in the host country (Freixas and Holthausen, 2005).

foreign investors also improved their net interest margin despite the fact that their cost-to-income ratios increased. The results suggest that foreign acquisitions by regional investors are generally associated with performance gains unlike non-regional foreign acquisitions, which yield mixed performance results (as shown in Table 6). Regional foreign investors, unlike non-regional foreign investors, may have superior knowledge of local conditions, which in turn enables them to turn low performers around. These results are also in sharp contrast with the finding that banks acquired by domestic investors tend to suffer a post-acquisition decline in performance as the coefficients on DA-D reported in Table 7 indicate. One possible explanation is that domestic investors in Indonesia are often private banks sharing many of the characteristics of the banks they acquire (e.g. limited access to capital, inferior technology, poor managerial skills).

Controlling for regional foreign acquisitions yields noticeably different results on the dynamic effect of foreign acquisition on risk exposure, as shown in Table 8. The coefficient on the regional foreign acquisition dynamic indicator is insignificant across all the regressions, which suggests that regional foreign acquisition has no dynamic effect on the acquired banks' exposure to risk. This contrasts with our results for non-regional foreign acquisitions (as shown in Table 6). Hence, our findings suggest significant differences between the long-term impact on bank risk of regional and non-regional foreign acquisitions.

5.5 Other effects

With respect to our control variables, larger banks (captured by the dummy variable SIZE) are generally associated with greater cost and profit efficiency (statistically significant higher PE efficiency scores, higher cost efficiency ranks, higher ROE, lower TCTR and lower CIR). This suggests the existence of economies of scale when operating on a larger scale. These banks, however, display mixed risk-exposure results compared to smaller banks (statistically significant lower capitalization, higher NCOs and lower liquidity). Banks that are publicly listed (captured by the dummy variable LISTED) are

associated with lower profit efficiency (lower profit ranks, lower NIM, lower ROA, lower ROE) but generally greater cost efficiency (statistically significant higher cost efficiency scores, higher cost efficiency ranks, lower TCTR). These banks are not, by and large, different in terms of risk-exposure from other acquired banks, although they tend to have lower ratios of ETA and LATA. Banks with a high market share (captured by the dummy variable SHARE) tend to be more efficient and profitable (as shown in all the regressions where this coefficient is statistically significant) but have mixed risk-exposure results (they tend to be more capitalized and have higher liquidity levels but hold a greater proportion of NPLs). Banks acquired by investors whose main line of business is banking (captured by the dummy variable BUSINESS) are not generally different in terms of performance or risk-exposure from other acquired banks. The BUSINESS coefficient is only statistically significant in the CE score and NCO regressions, which suggests that these banks tend to be relatively more cost efficient and have lower net charge-offs.

6 Conclusion

In this study we investigate the effect of ownership change on performance and risk-exposure of Indonesian banks. We consider the static, selection and dynamic effects of the major types of ownership jointly in the same model. Since we investigate banks in a developing economy with relatively weak investor protection, we construe ownership change as a proxy for governance change. Importantly, we disentangle the selection and dynamic effects of acquisition by regional foreign investors from Southeast and East Asian countries from those of acquisition by non-regional foreign investors. Our main findings are as follows. Private banks in Indonesia are the best performers in terms of cost and profit efficiency. Foreign banks, however, appear to be relatively more prudent, to the extent that foreign ownership is significantly associated with a lower proportion of non-performing loans. Domestic investors tend to select the best performing banks. Domestic acquisition, however, is associated with a decline in performance of the acquired banks.

Non-regional foreign acquisition is associated with a reduction in the proportion of non-performing loans and improvements in the acquired bank's capitalization. Regional foreign acquisition is associated with significant performance gains.

Taken together, our results have important policy implications for the country's authorities. The ASEAN Banking Integration Framework, endorsed by ASEAN Central Bank Governors in December 2014, represents a critical milestone for ASEAN countries in achieving greater financial integration. The immediate objective of ABIF is to achieve a more highly integrated banking market by 2020. Allowing banks to operate across borders enables them to take advantage of economies of scale to increase profit and cost efficiency. As barriers to entry fall, however, stronger competition from ASEAN banks as well as other banks in the region also pushes Indonesian banks to merge as they look to strengthen their domestic position and better compete against their regional rivals. Thus, understanding the effects of M&As on the Indonesian banking market is key to assessing the potential gains from closer integration as well as the new risks it can give rise to. Heightened competition should spur Indonesia's policy makers to take more steps to improve the efficiency of SOBs, which presently trails that of other banks as suggested by this paper's findings. Our results also imply that the country should strengthen its regulatory and supervisory framework to prevent banks acquired by domestic investors from taking excessive risks. Regulators should encourage such banks to increase their capital and improve the monitoring of their loan portfolios. As our analysis demonstrates, domestic acquisition is generally associated with a decline in performance. Policy makers may therefore wish to prioritize domestic interests by protecting the country's domestic market until its banks can compete domestically with their rivals in Southeast and East Asia. Indonesia may risk losing its market to regional foreign banks should it support the acceleration of ABIF before its domestic banks have attained the requisite level of competitiveness.

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References

- Angkinand, A. and Wihlborg, C. (2010), 'Deposit insurance coverage, ownership, and banks' risk-taking in emerging markets', *Journal of International Money and Finance* **29**(2), 252–274.
- Ariff, M. and Luc, C. (2008), 'Cost and profit efficiency of Chinese banks: A non-parametric analysis', *China Economic Review* **19**(2), 260–273.
- Bank Indonesia (2013), 'Economic report on Indonesia'.
- Battese, G. E. and Coelli, T. J. (1995), 'A model for technical inefficiency effects in a stochastic frontier production function for panel data', *Empirical Economics* **20**(2), 325–332.
- Berger, A. N. (1995), 'The profit-structure relationship in banking: Tests of market-power and efficient-structure hypotheses', *Journal of Money, Credit and Banking* **27**(2), 404–431.
- Berger, A. N., Clarke, G. R., Cull, R., Klapper, L. and Udell, G. F. (2005), 'Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership', *Journal of Banking and Finance* **29**(8), 2179–2221.
- Berger, A. N., Dai, Q., Ongena, S. and Smith, D. C. (2003), 'To what extent will the banking industry be globalized? A study of bank nationality and reach in 20 European nations', *Journal of Banking and Finance* **27**(3), 383–415.
- Berger, A. N., Demirgüç-Kunt, A., Levine, R. and Haubrich, J. G. (2004), 'Bank concentration and competition: An evolution in the making', *Journal of Money, Credit and Banking* pp. 433–451.

- Berger, A. N., Hasan, I. and Zhou, M. (2009), ‘Bank ownership and efficiency in china: What will happen in the world’s largest nation?’, *Journal of Banking and Finance* **33**(1), 113–130.
- Berger, A. N. and Mester, L. J. (1997), ‘Inside the black box: What explains differences in the efficiencies of financial institutions?’, *Journal of Banking and Finance* **21**(7), 895–947.
- Bikker, J. and Bos, J. W. (2008), *Bank Performance: A theoretical and empirical framework for the analysis of profitability, competition and efficiency*, Routledge.
- Bonin, J. P., Hasan, I. and Wachtel, P. (2005a), ‘Bank performance, efficiency and ownership in transition countries’, *Journal of Banking and Finance* **29**(1), 31–53.
- Bonin, J. P., Hasan, I. and Wachtel, P. (2005b), ‘Privatization matters: Bank efficiency in transition countries’, *Journal of Banking and Finance* **29**(8), 2155–2178.
- Boubakri, N., Cosset, J.-C., Fischer, K. and Guedhami, O. (2005), ‘Privatization and bank performance in developing countries’, *Journal of Banking and Finance* **29**(8), 2015–2041.
- Buch, C. M. and DeLong, G. (2004), ‘Cross-border bank mergers: What lures the rare animal?’, *Journal of Banking and Finance* **28**(9), 2077–2102.
- Calomiris, C. and Karceski, J. (2000), Is the bank merger wave of the 1990s efficient? Lessons from nine case studies, in ‘Mergers and productivity’, University of Chicago Press, pp. 93–178.
- Chen, T.-Y. (1998), ‘A study of bank efficiency and ownership in Taiwan’, *Applied Economics Letters* **5**(10), 613–616.
- Chou, S. and Lin, F. (2011), ‘Bank’s risk-taking and ownership structure: Evidence for economies in transition stage’, *Applied Economics* **43**(12), 1551–1564.
- Claessens, S., Demirgüç-Kunt, A. and Huizinga, H. (2001), ‘How does foreign entry affect domestic banking markets?’, *Journal of Banking and Finance* **25**(5), 891–911.
- Claessens, S. and Van Horen, N. (2012), ‘Being a foreigner among domestic banks: Asset or liability?’, *Journal of Banking and Finance* **36**(5), 1276–1290.
- Cornett, M. M., Guo, L., Khaksari, S. and Tehranian, H. (2010), ‘The impact of state ownership on performance differences in privately-owned versus state-owned banks: An international comparison’, *Journal of Financial Intermediation* **19**(1), 74–94.
- Dages, B. G., Goldberg, L. and Kinney, D. (2000), ‘Foreign and domestic bank participation in emerging markets: Lessons from Mexico and Argentina’, *Economic Policy Review* **6**(3), 17–36.

- Delfino, M. (2003), Bank ownership, privatisation and efficiency: Empirical evidence from Argentina.
- Dong, Y., Meng, C., Firth, M. and Hou, W. (2014), ‘Ownership structure and risk-taking: Comparative evidence from private and state-controlled banks in China’, *International Review of Financial Analysis* **36**, 120–130.
- Duygun, M., Sena, V. and Shaban, M. (2013), ‘Schumpeterian competition and efficiency among commercial banks’, *Journal of Banking and Finance* **37**(12), 5176–5185.
- Easterbrook, F. H. and Fischel, D. R. (1996), *The economic structure of corporate law*, Harvard University Press.
- Fethi, M. D., Shaban, M. and Weyman-Jones, T. (2011), ‘Liberalisation, privatisation and the productivity of Egyptian banks: A non-parametric approach’, *The Service Industries Journal* **31**(7), 1143–1163.
- Focarelli, D., Panetta, F. and Salleo, C. (2002), ‘Why do banks merge?’, *Journal of Money, Credit and Banking* **34**(4), 1047–1066.
- Freixas, X. and Holthausen, C. (2005), ‘Interbank market integration under asymmetric information’, *Review of Financial Studies* **18**(2), 459–490.
- Fries, S. and Taci, A. (2005), ‘Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries’, *Journal of Banking and Finance* **29**(1), 55–81.
- Goddard, J., Molyneux, P. and Williams, J. (2014), ‘Dealing with cross-firm heterogeneity in bank efficiency estimates: Some evidence from Latin America’, *Journal of Banking and Finance* **40**, 130–142.
- Haber, S. (2005), ‘Mexico’s experiments with bank privatization and liberalization, 1991–2003’, *Journal of Banking and Finance* **29**(8), 2325–2353.
- Hadad, M. D., Hall, M. J., Kenjegalieva, K. A., Santoso, W. and Simper, R. (2011a), ‘Banking efficiency and stock market performance: An analysis of listed Indonesian banks’, *Review of Quantitative Finance and Accounting* **37**(1), 1–20.
- Hadad, M. D., Hall, M. J., Kenjegalieva, K. A., Santoso, W. and Simper, R. (2011b), ‘Productivity changes and risk management in Indonesian banking: a Malmquist analysis’, *Applied Financial Economics* **21**(12), 847–861.
- Hadad, M. D., Hall, M. J., Kenjegalieva, K. A., Santoso, W. and Simper, R. (2012), ‘A new approach to dealing with negative numbers in efficiency analysis: An application to the Indonesian banking sector’, *Expert Systems with Applications* **39**(9), 8212–8219.
- Hadad, M. D., Hall, M. J., Santoso, W. and Simper, R. (2013), ‘Economies of scale and a process for identifying hypothetical merger potential in Indonesian commercial banks’, *Journal of Asian Economics* **26**, 42–51.

- Havrylchyk, O. (2006), 'Efficiency of the Polish banking industry: Foreign versus domestic banks', *Journal of Banking and Finance* **30**(7), 1975–1996.
- Hofman, B., Rodrick-Jones, E. and Thee, K. W. (2004), Indonesia: Rapid growth, weak institutions, in 'Proceedings of the World Bank Shanghai Conference'.
- Iannotta, G., Nocera, G. and Sironi, A. (2007), 'Ownership structure, risk and performance in the European banking industry', *Journal of Banking and Finance* **31**(7), 2127–2149.
- Isik, I. and Hassan, M. K. (2003), 'Financial deregulation and total factor productivity change: An empirical study of Turkish commercial banks', *Journal of Banking and Finance* **27**(8), 1455–1485.
- Jensen, M. C. (1993), 'The modern industrial revolution, exit, and the failure of internal control systems', *Journal of Finance* **48**(3), 831–880.
- Jia, C. (2009), 'The effect of ownership on the prudential behavior of banks: The case of China', *Journal of Banking and Finance* **33**(1), 77–87.
- Jiang, C., Yao, S. and Feng, G. (2013), 'Bank ownership, privatization, and performance: Evidence from a transition country', *Journal of Banking and Finance* **37**(9), 3364–3372.
- Jiang, C., Yao, S. and Zhang, Z. (2009), 'The effects of governance changes on bank efficiency in China: A stochastic distance function approach', *China Economic Review* **20**(4), 717–731.
- Kumbhakar, S. C. and Lovell, C. K. (2003), *Stochastic frontier analysis*, Cambridge University Press.
- Laffont, J.-J. and Tirole, J. (1993), *A theory of incentives in procurement and regulation*, MIT press.
- Lee, C.-C., Hsieh, M.-F. and Dai, H.-W. (2012), 'How does foreign bank ownership in the banking sector affect domestic bank behaviour? A dynamic panel data analysis', *Bulletin of Economic Research* **64**(s1), s86–s108.
- Lensink, R., Meesters, A. and Naaborg, I. (2008), 'Bank efficiency and foreign ownership: Do good institutions matter?', *Journal of Banking and Finance* **32**(5), 834–844.
- Lin, X. and Zhang, Y. (2009), 'Bank ownership reform and bank performance in China', *Journal of Banking and Finance* **33**(1), 20–29.
- Meggison, W. L., Nash, R. C. and Randenborgh, M. (1994), 'The financial and operating performance of newly privatized firms: An international empirical analysis', *Journal of Finance* **49**(2), 403–452.
- Meggison, W. L. and Netter, J. M. (2001), 'From state to market: A survey of empirical studies on privatization', *Journal of Economic Literature* **39**(2), 321–389.

- Mercan, M., Reisman, A., Yolalan, R. and Emel, A. B. (2003), 'The effect of scale and mode of ownership on the financial performance of the Turkish banking sector: results of a DEA-based analysis', *Socio-Economic Planning Sciences* **37**(3), 185–202.
- Mian, A. (2003), 'Foreign, private domestic, and government banks: New evidence from emerging markets', *Journal of Banking and Finance* **27**(7), 1219–1410.
- Micco, A., Panizza, U. and Yanez, M. (2007), 'Bank ownership and performance. Does politics matter?', *Journal of Banking and Finance* **31**(1), 219–241.
- Mohsni, S. and Otchere, I. (2014), 'Risk taking behavior of privatized banks', *Journal of Corporate Finance* **29**, 122–142.
- Naaborg, I. and Lensink, R. (2008), 'Banking in transition economies: Does foreign ownership enhance profitability?', *European Journal of Finance* **14**(7), 545–562.
- Poghosyan, T. and Poghosyan, A. (2010), 'Foreign bank entry, bank efficiency and market power in Central and Eastern European countries', *Economics of Transition* **18**(3), 571–598.
- Sapienza, P. (2004), 'The effects of government ownership on bank lending', *Journal of Financial Economics* **72**(2), 357–384.
- Sappington, D. E. and Stiglitz, J. E. (1987), 'Privatization, information and incentives', *Journal of Policy Analysis and Management* **6**(4), 567–585.
- Sathye, M. (2003), 'Efficiency of banks in a developing economy: The case of India', *European Journal of Operational Research* **148**(3), 662–671.
- Shaban, M., Duygun, M., Anwar, M. and Akbar, B. (2014), 'Diversification and banks' willingness to lend to small businesses: Evidence from Islamic and conventional banks in Indonesia', *Journal of Economic Behavior and Organization* **103**, S39–S55.
- Shen, C.-H. and Lin, C.-Y. (2012), 'Why government banks underperform: A political interference view', *Journal of Financial Intermediation* **21**(2), 181–202.
- Shleifer, A. (1998), 'State versus private ownership', *Journal of Economic Perspectives* **12**(4), 133–150.
- Shleifer, A. and Vishny, R. W. (1997), 'A survey of corporate governance', *Journal of Finance* **52**(2), 737–783.
- Temple, J. (2003), *Growing into Trouble*, Princeton University Press.
- Trinugroho, I., Agusman, A. and Tarazi, A. (2014), 'Why have bank interest margins been so high in Indonesia since the 1997/1998 financial crisis?', *Research in International Business and Finance* **32**, 139–158.
- World Bank (2014), *World Development Indicators*, World Bank Group.

APPENDIX A

Table A.1: Variable definitions

Variable name	Definition
Endogenous variables	
CE SCORE	Cost efficiency score
CE RANK	Cost efficiency rank
PE SCORE	Profit efficiency score
PE RANK	Profit efficiency rank
NIM	Net interest margin
ROA	Return on average asset
ROE	Return on average equity
TCTR	Total costs to total revenues
CIR	Cost income ratio
ETA	Equity to total assets
TIER1	Tier 1 capital ratio (ratio of core equity capital to total risk-weighted assets)
NCO	Net charge offs to average loans
NPL	Non-performing loans to total loans
LATA	Liquid assets to total assets
<i>Static Ownership Indicators</i>	
PB	Dummy indicating a private bank that underwent no changes in ownership over the entire 2005-2012 interval. Equals 1 or 0 for all years for a bank. Excluded from regressions as the base case when all the other static and selection ownership indicators are included.
FB	Dummy indicating a foreign bank that underwent no changes in ownership over the entire 2005-2012 interval. Equals 1 or 0 for all years for a bank.
SOB	Dummy indicating a state-owned bank that underwent no changes in ownership over the entire 2005-2012 interval. Equals 1 or 0 for all years for a bank.
<i>Selection Ownership Indicators</i>	
DA-S	Dummy indicating a bank that underwent a domestic acquisition over the entire 2005-2012 interval. Equals 1 or 0 for all years for a bank. If the bank went through a foreign acquisition, the variable is set to 0, as a foreign acquisition is considered to be the dominating event.
FA-S/RA-S	Dummy indicating a bank that underwent at least one foreign/regional acquisition over the entire 2005-2012 interval. Equals 1 or 0 for all years for a bank.
<i>Dynamic Ownership Indicators</i>	
DA-D	Dummy indicating the years following a bank's domestic acquisition. Equals 0 prior to the bank's acquisition and 1 starting in the year following the domestic acquisition (t+1). It also equals 0 for all years for banks that did not undergo a domestic acquisition.
FA-D/RA-D	Dummy indicating the years following a bank's foreign/regional acquisition. Equals 0 prior to the bank's acquisition and 1 starting in the year following the foreign/regional acquisition (t+1). It also equals 0 for all years for banks that did not undergo a foreign/regional acquisition.
Control variables	
LISTED	Dummy indicating a publicly traded bank.
BUSINESS	Dummy indicating the business of the acquiring investor. Equals 1 if the acquirer's main business is banking.
SIZE	Log of total assets in t-1 for each bank.
SHARE	Market share in t-1 for each bank.

APPENDIX B

1. The multi-output translog functional form for the cost frontier (3) is as follows:

$$\begin{aligned}
 \ln \left(\frac{C}{w_3} \right) &= \beta_0 + \sum_{i=1}^2 \beta_i \ln Q_{it} + \sum_{i=1}^2 \beta_i \ln \left(\frac{w_i}{w_3} \right) + \frac{1}{2} \sum_{i=1}^2 \sum_{j=1}^2 \beta_{ij} \ln Q_{ijt} \ln Q_{ijt} \\
 &+ \frac{1}{2} \sum_{i=1}^2 \sum_{j=1}^2 \beta_{ij} \ln \left(\frac{w_i}{w_3} \right) \ln \left(\frac{w_j}{w_3} \right) + \sum_{i=1}^2 \sum_{j=1}^2 \beta_{ij} \ln Q_{ijt} \ln \left(\frac{w_i}{w_3} \right) \\
 &+ \ln Equity + T + T^2 + (v_{it} + u_{it}) \\
 &i = 1, \dots, N \text{ and } t = 1, \dots, T
 \end{aligned} \tag{B.1}$$

2. We use the parameter estimates from the cost function in equation (??) to obtain a bank-specific measure of relative cost efficiency as follows:

$$\text{Cost Eff}^f = \frac{\hat{C}^{\min}}{\hat{C}^f} = \frac{\exp \left[\hat{c}(q^f, w^f) \right] \times \exp \left(\ln \hat{u}_c^{\min} \right)}{\exp \left[\hat{c}(q^f, w^f) \right] \times \exp \left(\ln \hat{u}_c^f \right)} = \frac{\hat{u}_c^{\min}}{\hat{u}_c^f} \tag{B.2}$$

3. The translog profit function takes the following form:

$$\begin{aligned}
 \ln P &= \beta_0 + \sum_{i=1}^2 \beta_i \ln Q_{it} + \sum_{i=1}^3 \beta_i \ln w_i + \frac{1}{2} \sum_{i=1}^2 \sum_{j=1}^2 \beta_{ij} \ln Q_{ijt} \ln Q_{ijt} \\
 &+ \frac{1}{2} \sum_{i=1}^3 \sum_{j=1}^3 \beta_{ij} \ln w_{ijt} \ln w_{ijt} + \sum_{i=1}^2 \sum_{j=1}^3 \beta_{ij} \ln Q_{ijt} \ln w_{ijt} \\
 &+ \ln Equity + T + T^2 + (v_{it} - u_{it}) \\
 &i = 1, \dots, N \text{ and } t = 1, \dots, T
 \end{aligned} \tag{B.3}$$

4. We use the parameter estimates from the profit function in equation (??) to obtain a bank-specific measure of relative profit efficiency as follows:

$$\mathbf{Profit\ Eff}^f = \frac{\hat{P}^f}{\hat{P}^{\max}} = \frac{\exp[\hat{p}(q^f, w^f)] \times \exp(\ln \hat{u}_p^f)}{\exp[\hat{p}(q^f, w^f)] \times \exp(\ln \hat{u}_p^{\max})} = \frac{\hat{u}_p^f}{\hat{u}_p^{\max}} \quad (\text{B.4})$$

Table 1: Distribution of observations by ownership type

Year	Private banks	State-owned banks	Foreign banks	Regional foreign banks	Non-regional foreign banks	Total
2005	19	4	21	15	6	44
2006	20	4	22	17	5	46
2007	22	4	24	19	5	50
2008	24	4	24	18	6	52
2009	30	4	22	15	7	56
2010	34	4	22	15	7	60
2011	33	4	23	16	7	60
2012	32	4	23	16	7	59
Total	214	32	181	131	50	427

Table 2: Summary of mergers and acquisitions transactions

No	Acquirer	Country	Ownership type	Target name	Ownership type	Deal type	Year
1	KOOKMIN BANK*	KOREA	REGIONAL	BANK INTERNASIONAL INDONESIA TBK, PT	PRIVATE	Acquisition 71%	2004
2	OVERSEA-CHINESE BANKING CORPORATION LTD**	SINGAPORE	REGIONAL	BANK NISP TBK, PT	PRIVATE	Acquisition increased from 22.5% to 51%	2005
3	BANK INTER PACIFIC TBK, PT	INDONESIA	PRIVATE	BANK ARTHA GRAHA, PT	PRIVATE	Acquisition 100%	2005
4	UNITED OVERSEAS BANK LTD	SINGAPORE	REGIONAL	BANK BUANA INDONESIA, PT	PRIVATE	Acquisition increased from 23% to 53%	2005
5	ICB FINANCIAL GROUP HOLDINGS AG	CHINA	REGIONAL	BANK BUMIPUTERA INDONESIA TBK, PT	PRIVATE	Acquisition 58.41%	2006
6	BANK NEGARA INDONESIA (PERSERO) TBK, PT	INDONESIA	STATE-OWNED	BANK TABUNGAN NEGARA (PERSERO) TBK, PT	PRIVATE	Acquisition 100%	2007
7	PT DIAN INTAN PERKASA	INDONESIA	PRIVATE	PT BANK FINCONESA	PRIVATE	Acquisition 51%	2007
8	BANK VICTORIA INTERNATIONAL TBK, PT	INDONESIA	PRIVATE	BANK SWAGUNA, PT	PRIVATE	Acquisition 99.8%	2007
9	INDUSTRIAL AND COMMERCIAL BANK OF CHINA LTD	CHINA	REGIONAL	BANK HALIM INDONESIA, PT	PRIVATE	Acquisition 90%	2007
10	ACOM CO., LTD	JAPAN	REGIONAL	BANK NUSANTARA PARAHYANGAN TBK, PT	PRIVATE	Acquisition 55.4%	2007
11	BANK BUKOPIN TBK, PT	INDONESIA	PRIVATE	BANK PERSYARIKATAN INDONESIA, PT	PRIVATE	Acquisition increased from 24.73% to 65.44%	2008
12	BANK NIAGA TBK, PT***	INDONESIA	PRIVATE	BANK LIPPO TBK, PT	PRIVATE	Acquisition unknown remaining stake %	2008
13	BANK OF INDIA LTD	INDIA	FOREIGN	BANK SWADESI TBK, PT	PRIVATE	Acquisition 76%	2008
14	HSBC ASIA PACIFIC HOLDINGS (UK) LTD	GREAT BRITAIN	FOREIGN	BANK EKONOMI RAHARJA TBK, PT	PRIVATE	Acquisition 88.89%	2009
15	BANK MULTICOR TBK, PT	INDONESIA	PRIVATE	BANK WINDU KENTJANA INTERNASIONAL TBK, PT	PRIVATE	Acquisition 100%	2009
16	BANK RAKYAT INDONESIA (PERSERO) TBK, PT	INDONESIA	STATE-OWNED	BANK JASA ARTA, PT	PRIVATE	Acquisition 100%	2009
17	BANK CENTRAL ASIA TBK, PT	INDONESIA	PRIVATE	PT BANK UIB	PRIVATE	Acquisition 100%	2010
18	PT BANK UOB BUANA TBK	INDONESIA	PRIVATE	BANK UOB INDONESIA, PT	PRIVATE	Acquisition 100%	2010
19	BANK OCBC NISP	SINGAPORE	REGIONAL	BANK OCBC INDONESIA, PT	PRIVATE	Acquisition increased from 1% to 100%	2011
20	BANK RAKYAT INDONESIA (PERSERO) TBK, PT	INDONESIA	STATE-OWNED	BANK AGRONIAGA TBK, PT	PRIVATE	Acquisition 88.649%	2011

Notes: All target banks are Indonesian. *The acquisition of KOOKMIN BANK by BANK INTERNASIONAL INDONESIA occurred in December 2003 and is the first transaction included in the sample. **Following the acquisition of BANK NISP by OCBC in 2005, BANK NISP was renamed BANK OCBC NISP. ***LIPPO BANK officially merged with BANK CIMB NIAGA in 2008 to form the new entity BANK CIMB NIAGA, which is the Indonesian subsidiary of CIMB Group. A regional foreign acquisition is defined as an acquisition by an investor whose country of origin is a Southeast Asian or East Asian country. Thus, regional foreign acquisitions include but are not limited to acquisitions from investors originating from the ASEAN countries.

Table 3: Variables used in profit and cost efficiency estimations

Variable	Mean	SD	Min	Max
<i>Profit (cost) (in million US \$)</i>				
Total profits	144.86	386.39	-655.58	2885.01
Total costs	341.74	596.59	0.53	3506.23
<i>Input prices</i>				
Cost of capital (w_1)	0.22	2.69	0.01	55.04
Cost of physical capital (w_2)	2.08	2.16	0.06	11.73
Cost of labor (w_3)	29.19	115.42	0.46	1404.11
<i>Output quantities (in million US \$)</i>				
Loans (q_1)	2596.81	5114.45	1.07	38700
Securities investments (q_2)	1488.96	3284.35	3.05	21800

Notes: This table shows the descriptive statistics of basic variables used in the profit and cost efficiency estimations. In our translog-based estimations of profit (cost) efficiency scores, total profits are profits before tax and total costs are total operating costs, defined as the sum of interest expenses, salaries and employee benefits and other operating costs. Output variables considered are: loans, defined as the difference between the gross loans and the reserves allocated for non-performing loans, and securities investments. The input variables are: cost of capital, defined as interest expenses divided by total deposits, cost of physical capital, defined as overhead expenses other than personnel expenses divided by the book value of fixed assets, and cost of labor, defined as personnel expenses divided by the number of employees.

Table 4: Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
<i>Performance measures</i>					
PE SCORE	424	0.45	0.11	0.28	0.99
CE SCORE	424	0.95	0.04	0.71	0.99
PE RANK	424	27.34	15.89	1	60
CE RANK	424	27.34	15.89	1	60
NIM	427	5.32	3.06	-12.51	23.45
ROA	427	1.65	4.33	-72.45	16.85
ROE	427	11.56	43.45	-650.26	216.16
TCTR	427	21.5	17.89	-22.29	146.85
CIR	427	62.19	49.53	12.17	873.58
<i>Risk exposure measures</i>					
ETA	427	14.84	11.77	-27.49	68.8
TIER1	427	11.91	15.03	-39.62	136.3
NCO	427	0.5	1.21	-3.22	13.85
NPL	427	3.01	2.70	0	7.83
LATA	427	25.75	14.02	5.02	84.33
<i>Control variables</i>					
SIZE	427	4720.5	9291.64	5.81	65700
SHARE	427	1.73	3.21	0.003	17.92

Notes: **CE SCORE** is the cost efficiency score. **CE RANK** is the cost efficiency rank. **PE SCORE** is the profit efficiency score. **PE RANK** is the profit efficiency rank. **NIM** is the net interest margin. **ROA** is the return on average assets. **ROE** is the return on average equity. **TCTR** is the total cost to total revenue ratio. **CIR** is the cost to income ratio. **ETA** is equity to total assets. **TIER1** is the tier 1 capital ratio. **NCO** is net charge offs to average loans. **NPL** is non-performing loans to total loans. **LATA** is liquid assets to total assets. **SIZE** is the natural logarithm of lagged total assets (in million US\$). **SHARE** is lagged market share.

Table 5: Bank performance results

	CE SCORE	CE RANK	PE SCORE	PE RANK	NIM	ROA	ROE	TCTR	CIR
FB	0.001 (0.005)	3.045* (1.819)	-0.011** (0.004)	2.957** (1.422)	-0.404 (0.303)	0.428 (0.353)	7.446** (3.538)	3.104* (1.72)	-7.629*** (2.466)
SOB	0.008** (0.004)	-0.399 (3.333)	-0.086*** (0.028)	19.52*** (4.491)	1.115* (0.618)	-1.683* (0.958)	-2.743 (5.899)	-5.407* (3.068)	11.82*** (3.111)
DA-S	0.02*** (0.004)	-11.57*** (2.758)	0.093*** (0.021)	-12.18*** (2.922)	-2.755*** (0.756)	2.348*** (0.786)	4.959 (4.543)	5.688* (3.325)	-2.27 (3.128)
FA-S	0.004 (0.003)	4.958** (2.483)	-0.026*** (0.008)	12.50*** (1.914)	-0.189 (0.313)	0.195 (0.941)	8.463 (7.439)	-5.354** (2.652)	-5.583 (3.758)
DA-D	-0.011** (0.005)	8.856** (3.741)	-0.117*** (0.027)	16.05*** (5.155)	3.327*** (0.781)	-2.792*** (0.768)	-6.792* (3.891)	-8.907** (4.138)	10.97*** (4.075)
FA-D	-0.016*** (0.003)	10.73*** (2.722)	0.025** (0.011)	-4.083 (2.618)	-0.749 (0.456)	-0.188 (0.786)	-1.209 (8.463)	15.28** (6.791)	6.718 (7.054)
LISTED	0.032*** (0.005)	-14.56*** (1.858)	0.003 (0.006)	9.723*** (1.646)	-1.26*** (0.334)	-0.948* (0.512)	-13.34*** (4.323)	-6.041*** (1.703)	18.71*** (2.581)
BUSINESS	0.01** (0.004)	-1.834 (2.794)	-0.004 (0.012)	-0.448 (4.862)	0.512 (0.336)	-0.013 (0.338)	-3.387 (4.702)	-0.641 (2.571)	4.182 (3.561)
SIZE	-0.0003 (0.001)	-2.885*** (0.833)	0.011** (0.005)	0.894 (0.890)	-0.207 (0.135)	0.379 (0.309)	6.872* (3.551)	-4.436*** (1.27)	-6.847*** (2.621)
SHARE	-0.001*** (0.000)	1.864*** (0.52)	0.007*** (0.001)	-2.632*** (0.384)	0.223*** (0.074)	0.055 (0.093)	-0.148 (0.937)	1.354*** (0.44)	-0.654 (0.721)
Constant	0.925*** (0.017)	78.77*** (11.72)	0.379*** (0.071)	12.86 (12.64)	8.522*** (1.809)	-3.194 (3.966)	-74.20 (45.97)	86.50*** (16.63)	-1.281 (1.442)
Sigma		13.74*** (0.411)		13.59*** (0.411)					
Observations	360	360	360	360	360	360	360	360	360
R^2	0.226		0.618		0.178	0.079	0.082	0.196	0.269

Notes: All specifications include year fixed effects (not shown).

Standard errors used in computing t statistics are corrected for both heteroskedasticity and correlation across multiple observations of the same bank using a robust cluster method. * $p < 0.1$, ** $p < 0.05$ and *** $p < 0.001$.

CE SCORE is the cost efficiency score. **CE RANK** is the cost efficiency rank. **PE SCORE** is the profit efficiency score. **PE RANK** is the profit efficiency rank. **NIM** is the net interest margin. **ROA** is the return on average assets. **ROE** is the return on average equity. **TCTR** is the total cost to total revenue ratio. **CIR** is the cost to income ratio. **FB** is a dummy variable for foreign banks that underwent no changes in ownership over the sample period. **SOB** is a dummy variable for state-owned banks that underwent no changes in ownership over the sample period. **DA-S** is a dummy variable for banks that underwent at least one domestic acquisition over the sample period. **FA-S** is a dummy variable for banks that underwent at least one foreign acquisition over the sample period. **DA-D** is a dummy variable for the years following domestic acquisition. **FA-D** is a dummy variable for the years following foreign acquisition. **LISTED** is a dummy variable for publicly traded banks. **BUSINESS** is a dummy variable for acquisition by an investor whose main business is banking. **LATA** is liquid assets to total assets. **SIZE** is the natural logarithm of lagged total assets (in million US\$). **SHARE** is lagged market share.

Table 6: Bank risk exposure results

	ETA	TIER1	NCO	NPL	LATA
FB	0.55 (1.148)	-2.611 (1.684)	0.348** (0.147)	-1.407* (0.771)	-0.008 (0.017)
SOB	-7.811*** (2.333)	2.587 (2.205)	0.133 (0.291)	-9.075* (5.382)	-0.033 (0.025)
DA-S	9.594*** (3.251)	-5.029*** (1.314)	0.592** (0.287)	-2.786** (1.29)	-0.04** (0.018)
FA-S	-5.229*** (1.429)	3.629 (3.473)	-0.616*** (0.153)	-0.711 (0.998)	0.165** (0.064)
DA-D	-12.24*** (3.492)	7.392*** (2.564)	0.098 (0.393)	1.687 (1.445)	0.006 (0.027)
FA-D	8.443*** (2.686)	-2.046 (8.869)	0.606*** (0.202)	-1.824 (1.282)	-0.152** (0.068)
LISTED	-2.159* (1.29)	-2.497 (1.62)	-0.091 (0.126)	0.396 (0.528)	-0.056*** (0.017)
BUSINESS	-0.117 (1.273)	1.182 (2.556)	-1.058*** (0.289)	1.052 (0.816)	0.0266 (0.023)
SIZE	-1.055 (0.667)	-3.872*** (1.295)	0.216*** (0.069)	-0.656 (0.433)	-0.019*** (0.007)
SHARE	0.259 (0.297)	1.316*** (0.377)	-0.006 (0.025)	1.41** (0.671)	0.009*** (0.002)
Constant	29.34*** (8.813)	63.38*** (16.88)	-2.648*** (0.961)	12.01** (5.651)	0.624*** (0.096)
Observations	360	360	360	360	360
R^2	0.141	0.126	0.155	0.165	0.189

Notes: All specifications include year fixed effects (not shown).

Standard errors used in computing t statistics are corrected for both heteroskedasticity and correlation across multiple observations of the same bank using a robust cluster method. * $p < 0.1$, ** $p < 0.05$ and *** $p < 0.001$.

ETA is equity to total assets. **TIER1** is the tier 1 capital ratio. **NCO** is net charge offs to average loans. **NPL** is non-performing loans to total loans. **FB** is a dummy variable for foreign banks that underwent no changes in ownership over the sample period. **SOB** is a dummy variable for state-owned banks that underwent no changes in ownership over the sample period. **DA-S** is a dummy variable for banks that underwent at least one domestic acquisition over the sample period. **FA-S** is a dummy variable for banks that underwent at least one foreign acquisition over the sample period. **DA-D** is a dummy variable for the years following domestic acquisition. **FA-D** is a dummy variable for the years following foreign acquisition. **LISTED** is a dummy variable for publicly traded banks. **BUSINESS** is a dummy variable for acquisition by an investor whose main business is banking. **LATA** is liquid assets to total assets. **SIZE** is the natural logarithm of lagged total assets. **SHARE** is lagged market share.

Table 7: Bank performance results controlling for acquisitions by regional foreign investors

	CE SCORE	CE RANK	PE SCORE	PE RANK	NIM	ROA	ROE	TCTR	CIR
FB	0.004 (0.006)	2.52 (2.637)	-0.013*** (0.004)	7.848*** (1.689)	-1.443*** (0.333)	0.344 (0.583)	20.29*** (7.658)	4.691 (3.787)	1.179 (3.752)
SOB	0.005 (0.004)	2.138 (3.358)	-0.094*** (0.03)	23.23*** (5.059)	0.633 (0.608)	-1.575 (1.054)	0.951 (6.254)	-4.368 (3.217)	9.817*** (3.06)
DA-S	0.02*** (0.004)	-11.85*** (2.848)	0.091*** (0.021)	-11.32*** (2.962)	-2.963*** (0.766)	2.353*** (0.805)	7.092 (4.538)	5.903* (3.387)	-1.329 (3.336)
RA-S	-0.01* (0.005)	6.802** (3.015)	-0.01* (0.006)	-0.813 (1.599)	0.963** (0.390)	0.322 (0.372)	-15.01** (6.441)	-0.635 (4.065)	-18.47*** (3.74)
DA-D	-0.018*** (0.004)	14.60*** (4.802)	-0.15*** (0.003)	29.12*** (6.185)	1.645** (0.807)	-2.375** (1.01)	6.933 (5.495)	-7.751* (4.172)	3.274 (4.175)
RA-D	0.015** (0.006)	-14.56*** (4.156)	0.046*** (0.011)	-18.36*** (3.792)	1.879*** (0.612)	-0.667 (0.71)	-12.20* (6.289)	-3.672 (2.665)	17.77*** (3.719)
LISTED	0.031*** (0.005)	-12.94*** (1.755)	0.002 (0.006)	10.84*** (1.526)	-1.322*** (0.314)	-0.932** (0.461)	-12.79*** (3.804)	-5.430*** (1.735)	18.16*** (2.341)
BUSINESS	0.008** (0.003)	0.237 (2.683)	0.003 (0.01)	-2.863 (5.196)	0.937*** (0.323)	-0.093 (0.278)	-7.901* (4.641)	0.857 (2.014)	4.385 (3.019)
SIZE	0.0001 (0.001)	-3.377*** (0.828)	0.011** (0.005)	0.789 (0.858)	-0.188 (0.13)	0.377 (0.304)	6.890** (3.402)	-4.789*** (1.259)	-6.756*** (2.493)
SHARE	-0.001*** (0.0003)	1.752*** (0.36)	0.008*** (0.001)	-2.965*** (0.441)	0.265*** (0.07)	0.047 (0.083)	-0.551 (0.942)	1.337*** (0.424)	-0.557 (0.703)
Constant	0.92*** (0.017)	84.76*** (11.67)	0.383*** (0.069)	13.00 (12.13)	8.462*** (1.75)	-3.216 (3.863)	-75.75* (44.48)	90.21*** (16.39)	140.5*** (32.60)
Sigma		13.76*** (0.404)		13.35*** (0.415)					
Observations	360	360	360	360	360	360	360	360	360
R ²	0.23		0.623		0.197	0.08	0.092	0.185	0.304

Notes: All specifications include year fixed effects (not shown).

Standard errors used in computing t statistics are corrected for both heteroskedasticity and correlation across multiple observations of the same bank using a robust cluster method. * $p < 0.1$, ** $p < 0.05$ and *** $p < 0.001$.

CE SCORE is the cost efficiency score. **CE RANK** is the cost efficiency rank. **PE SCORE** is the profit efficiency score. **PE RANK** is the profit efficiency rank. **NIM** is the net interest margin. **ROA** is the return on average assets. **ROE** is the return on average equity. **TCTR** is the total cost to total revenue ratio. **CIR** is the cost to income ratio. **FB** is a dummy variable for foreign banks that underwent no changes in ownership over the sample period. **SOB** is a dummy variable for state-owned banks that underwent no changes in ownership over the sample period. **DA-S** is a dummy variable for banks that underwent at least one domestic acquisition over the sample period. **RA-S** is a dummy variable for banks that underwent at least one regional acquisition over the sample period. **DA-D** is a dummy variable for the years following domestic acquisition. **RA-D** is a dummy variable for the years following regional acquisition. **LISTED** is a dummy variable for publicly traded banks. **BUSINESS** is a dummy variable for acquisition by an investor whose main business is banking. **LATA** is liquid assets to total assets. **SIZE** is the natural logarithm of lagged total assets. **SHARE** is lagged market share.

Table 8: Bank risk exposure results controlling for acquisitions by regional foreign investors

	ETA	TIER1	NCO	NPL	LATA
FB	-0.762 (2.117)	-3.046 (3.293)	0.264 (0.349)	-0.101 (0.699)	0.019 (0.029)
SOB	-8.077*** (2.49)	1.771 (2.233)	0.140 (0.291)	-8.061* (4.809)	-0.035 (0.026)
DA-S	9.359*** (3.284)	-5.376*** (1.395)	0.595** (0.279)	-2.306** (1.088)	-0.04** (0.018)
RA-S	1.696 (2.322)	0.146 (3.303)	0.0866 (0.402)	-1.163* (0.638)	-0.032 (0.033)
DA-D	-14.54*** (3.653)	4.121* (2.385)	-0.077 (0.356)	6.225 (4.316)	0.01 (0.032)
RA-D	1.337 (1.753)	3.351 (2.653)	0.012 (0.278)	-4.278 (3.781)	0.0001 (0.031)
LISTED	-2.043 (1.268)	-2.234 (1.613)	-0.113 (0.132)	0.136 (0.477)	-0.05*** (0.017)
BUSINESS	1.408 (1.05)	2.371 (2.034)	-1.034*** (0.308)	-0.837 (0.545)	-0.021 (0.023)
SIZE	-1.227* (0.658)	-3.865*** (1.322)	0.207*** (0.071)	-0.591 (0.414)	-0.017** (0.007)
SHARE	0.333 (0.295)	1.375*** (0.374)	-0.003 (0.027)	1.309** (0.611)	0.008*** (0.002)
Constant	31.48*** (8.707)	63.38*** (17.12)	-2.533*** (0.932)	11.05** (5.37)	0.595*** (0.094)
Observations	360	360	360	360	360
R^2	0.139	0.127	0.153	0.174	0.176

Notes: All specifications include year fixed effects (not shown).

Standard errors used in computing t statistics are corrected for both heteroskedasticity and correlation across multiple observations of the same bank using a robust cluster method. * $p < 0.1$, ** $p < 0.05$ and *** $p < 0.001$.

ETA is equity to total assets. **TIER1** is the tier 1 capital ratio. **NCO** is net charge offs to average loans. **NPL** is non-performing loans to total loans. **FB** is a dummy variable for foreign banks that underwent no changes in ownership over the sample period. **SOB** is a dummy variable for state-owned banks that underwent no changes in ownership over the sample period. **DA-S** is a dummy variable for banks that underwent at least one domestic acquisition over the sample period. **RA-S** is a dummy variable for banks that underwent at least one regional acquisition over the sample period. **DA-D** is a dummy variable for the years following domestic acquisition. **RA-D** is a dummy variable for the years following regional acquisition. **LISTED** is a dummy variable for publicly traded banks. **BUSINESS** is a dummy variable for acquisition by an investor whose main business is banking. **LATA** is liquid assets to total assets. **SIZE** is the natural logarithm of lagged total assets. **SHARE** is lagged market share.