Why Have Bank Interest Margins Been so High in Indonesia since the 1997/1998 Financial Crisis?

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This draft: August 8, 2012

Abstract

We investigate the determinants of net interest margins of Indonesian banks after the 1997/1998 financial crisis. Using data for 93 Indonesian banks over the 2001-2009 period, we estimate an econometric model using a pooled regression as well as static and dynamic panel regressions. Our results confirm that the structure of loan portfolios matters in the determination of interest margins. Operating costs, market power, risk aversion and liquidity risk have positive impacts on interest margins, while credit risk and cost to income ratio are negatively associated with margins. Our results also corroborate the loss leader hypothesis on cross-subsidization between traditional interest activities and non-interest activities. State-owned banks set higher interest margins than other banks, while margins are lower for large banks and for foreign banks.

JEL Classification: G21, G28, G32

Keywords: Bank interest margins, Financial intermediation, Small scale loans, Indonesia

[1] The views expressed in this paper are the authors' only and do not necessarily reflect those of Bank Indonesia

1. Introduction

It is widely known that the average net interest margin, the difference between interest income and expenses divided by interest-earning assets, of Indonesian banks is relatively higher than those observed in other countries particularly in the East Asia region (Rosengard and Prasetyantoko, 2011). A number of cross country studies point out this fact. Demirgüç-Kunt and Huizinga (1998) show that the average margins of Indonesian banks for the 1988-1995 period was 3.6%, higher than those of neighboring countries such as Singapore (2.2%), and Malaysia (2.7%). Using data after the 1997/1998 financial crisis from 1999 to 2008, López-Espinosa *et al*. (2011) show that, in Indonesia, average bank interest margins (4.85%) were much higher than, for example, the average interest margins of Japanese banks (1.92%). Recently, Lin *et al.* (2012) have indicated that with a value of 6.36% the average bank margin of Indonesian banks over the 1997-2005 period, was the highest compared to other Asian countries in their sample[2]. Their work also shows that the interest margin of Indonesian banks is significantly higher after the 1997/1998 crisis than before[3].

The present paper extends the literature on the determinants of net interest margins by studying Indonesian banks which have experienced a problem of persistently high net interest margins since the 1997/1998 financial crisis. We hypothesize that the persistence of high interest margins in Indonesia is affected by a set of simultaneous factors which are the structure of loan portfolios, the degree of competition, the level of income diversification, cost efficiency, bank size as well as credit risk and liquidity risk. We also assume that net interest margins are influenced by bank ownership characteristics. To our knowledge, this paper is the first that comprehensively studies the determinants of net interest margins in Indonesia after the crisis. We incorporate two unique loan portfolio components, small scale loans and property loans, as factors explaining interest margins which contextually matter in Indonesia. Studying interest margins with regard to the ownership and governance characteristics of banks is also important. Using pooled regression techniques as well as static and dynamic panel regressions, we find evidence that the structure of loan portfolios do matter in the determination of interest margins. Specifically, small scale loans contribute to increase bank margins, whereas housing (property) loans tend to reduce interest margins. Also, operating costs, market power, risk aversion and liquidity risk significantly and

[2] We conduct our own computations using data from BankScope for banks in 9 East Asia countries from 2005 to 2009. The average margin of Indonesian banks is 5.7% far above the 3.03 % on average for the 8 other countries.

[3] López-Espinosa *et al*. (2011) also show that average interest margins of Indonesian banks have increased over their sample period.

positively affect margins, while credit risk and cost to income ratio are negatively associated with margins. Our results also corroborate the loss leader hypothesis on cross-subsidization of lending and non-interest activities. Furthermore, state-owned banks have higher margins than other banks, while foreign banks and large banks set lower margins.

The remainder of this paper is organized as follows. Section 2 reviews previous work on related issues. In section 3, we provide some background on Indonesian banking. In Section 4, we describe our data, variables, and empirical model. Section 5 reports the results and robustness checks. Section 6 concludes our findings and provides policy implications.

2. Literature Review

As financial intermediary institutions, banks collect deposits from surplus spending units with an interest cost and distribute it to deficit spending units by charging an interest rate. Although high interest margins are associated with inefficiency (Drakos, 2003; Beck and Hesse, 2009; López-Espinosa *et al*., 2011), some studies, however, use interest margins as a measure of bank profitability (*e.g.* Chen and Liao, 2011). The issue of how banks set their interest margin has been extensively studied in the literature. In a seminal paper, Ho and Saunders (1981) introduce the dealership model in which banks perform as a risk-averse intermediary between the demanders and suppliers of funds. Their model posits that positive interest margins will prevail as long as banks are risk-averse agents and face uncertainty even in a highly competitive market. They conclude that a bank's interest margin is determined by four factors: the degree of managerial risk aversion, the size of transactions, market structure, and the variance of the market interest rate. Many empirical studies have expanded and examined the dealership model using cross-country data or by focusing on a single country in the context of developed and developing countries (*e.g.* Angbazo, 1997; Saunders and Schumacher, 2000; Maudos and de Guevara, 2004; Carbó and Rodriguez, 2007; Hawtrey and Liang, 2008; Maudos and Solís, 2009; Poghosyan, 2010; Fungáčová and Poghosyan, 2011; Lin *et al*., 2012). The literature has also provided theoretical microeconomic approaches to optimal interest margin setting (Allen, 1988; Angbazo, 1997; Maudos and de Guevara, 2004; Maudos and Solís, 2009). Another comprehensive study on the determinants of interest margins is proposed by Beck and Hesse (2009) enlightening four major perspectives which determine interest margins and spread: i) risk-based view concerning the compensation for the riskiness of loans, ii) small financial system focuses on the fixed cost component of financial service provision and the resulting scale economies, iii) market structure matters for competitiveness and ownership structure of the banking market, iv) macroeconomic view

reveals that spreads and margins are affected by monetary and exchange rate policies as well as economic cycles.

From a risk-based perspective and in line with previous studies, Beck and Hesse (2009) argue that higher risk in bank lending contributes to positively affect margins. Under this view, banks will charge a higher risk premium for riskier loans. Subsequently, the level of risk compensation may depend on the structure of the loan portfolio. More specifically, in the case of a developing country such as Uganda, Beck and Hesse (2009) find that sectoral loan portfolio composition of banks influences the variation of margins[4]. In the present paper, we consider two types of lending which may significantly contribute to determine interest margins. Firstly, like in other developing countries, bank lending to small medium enterprises (SMEs) is prevalent in Indonesian banks especially in domestic banks. Loans to SMEs may require a higher risk premium because SMEs are more financially constrained than large firms and they are relatively opaque (de la Torre *et al*., 2010) due to weaker or non-existent accounting standards (Behr *et al*., 2011). Moreover, lending to these firms is typically costly in the context of Indonesia (Agung *et al*., 2001). Secondly, we consider that the proportion of housing (property) loans could affect the setting of interest margins. As a large market, Indonesia has been undergoing consumption-driven economic growth. One of the drivers is the growth of housing demand (Hoek-Smit, 2005) which subsequently leads to escalate the demand of housing loans. This type of lending is considered as less risky because for each loan banks hold the certificate of ownership as collateral with a value that will increase over time under normal conditions. Moreover, the policy of the Government of Indonesia to widen the access to housing finance for the poor imposes banks to charge a lower rate.

Ho and Saunders (1981) argue that banks facing relatively inelastic demand and supply functions can exercise their monopoly power to set a greater margin. A number of empirical studies have examined how market structure and banking competitive conditions impact on interest margins[5]. Maudos and de Guevara (2004) find a positive effect of bank market power estimated by the Lerner index on interest margins in the banking sectors of the European Union. Claeys and Vennet (2008) find that a higher interest margin is associated with a higher concentration of the banking industry in Central and Eastern European

[4] Using data of Ugandan banking, they include a number of sectors which are agriculture, mining, manufacturing, trade, transportation, construction, and other services.

[5] There are two widely used methods to measure market structure and its impact on bank margins in the literature which are the Herfindahl Hirschman Index (HHI) and the Lerner index. However, these two measures do not necessarily reflect the same dimension. HHI measures the concentration of the industry, while the Lerner index reflects the degree of competition as it measures the ability of a bank to influence the price of products and is therefore directly linked to competition (Weill, 2011).

countries. Using data of Mexican banks, Maudos and Solís (2009) find that banks with greater market power, measured by a Lerner index, have higher interest margins. Following the studies of Maudos and de Guevara (2004) and Maudos and Solís (2009), we use the Lerner index to represent the degree of competition. Banks having a greater market power are supposed to set higher interest margins[6].

All around the world banks have now become more diversified in their revenues' sources. Deregulation and technological changes have triggered the development of non-interest activities and reduced the importance of traditional intermediation activities (Lepetit *et al*., 2008; Elsas *et al*., 2010). Lepetit *et al*. (2008) test the loss leader hypothesis contending that the link between diversification in bank activities and interest margins could be negative as banks might be charging a lower lending rate to attract new customers and to build long-term relationship enabling the sales of services and higher gains from non-interest income activities. They empirically test this hypothesis in the context of European banks. Similarly, Maudos and Solís (2009) find that diversified banks, i.e. with a higher degree of non-interest income, have lower interest margins. Although income diversification is also widespread in Indonesian banks, the dependency on traditional banking activities is still prevalent as well[7].

We also take into account the efficiency in the production process, bank size, risk aversion, credit risk and liquidity risk to explain the persistence of high interest margins in Indonesia. We follow the studies of Maudos and de Guevara (2004); Beck and Hesse (2009); Maudos and Solís (2009); Fungáčová and Poghosyan (2011) to include operating (overhead) costs in the determination of interest margins. Maudos and de Guevara (2004) extend the dealership model by including operating costs to represent how efficient banks are in their production process. The higher the ratio of operating costs to total assets, the higher the interest margins banks set. The other proxy of efficiency is the cost to income ratio which also measures the quality of bank management as argued by Maudos and Solís (2009) as this ratio reflects a spent cost for a selected asset. They find that this ratio has a negative effect on interest margins. Bank size is also included. Some empirical studies find that large banks have lower margins because these banks may reach economies of scale enabling them to decrease their margins (Fungáčová and Poghosyan, 2011) and they tend to grow in loans markets with low margins (Lopez-Espinosa *et al*., 2011). Beck and Hesse (2009) also argue that smaller banks may encounter higher costs and therefore set higher margins. We

[6] We report in the robustness check's section the results obtained with HHI instead of the Lerner index.
[7] In this paper, we show that the average diversification index is only 0.16 indicating that as a whole, Indonesian banks are less diversified than in other countries.

incorporate the ratio of equity to total assets which is considered to represent the degree of bank risk aversion (Maudos and Solís, 2009; Poghosyan, 2010). In the dealership model, Ho and Saunders (1981) explain that higher managerial risk aversion will increase interest margins. We follow a number of previous studies which include credit risk as a determinant of interest margins. Regarding the effect of credit risk on bank margins, there are two competing arguments. On the one hand, banks facing higher credit risk will charge a higher risk premium on the loans they grant (Angbazo, 1997; Maudos and de Guevara, 2004; López-Espinosa *et al*., 2011). On the other hand, as argued by Fungáčová and Poghosyan (2011) risky banks could be punished by depositors in the form of a higher interest rate required on deposits implying that margins should be lower for these banks. Another factor that we consider to influence margins is liquidity risk. López-Espinosa *et al*. (2011) contend that the higher opportunity cost of holding reserves as a result of higher liquid assets would decrease net interest margins. Similar results are also found in other studies (Maudos and de Guevara, 2004; Chen and Liao, 2011).

We also question whether bank interest margins differ across ownership types. Firstly, we consider the interest margins of state-owned (government) banks. The role of state-owned banks in a banking system has been studied in several perspectives, particularly in the context of developing countries in which the behaviors of these banks matter more (Micco *et al*., 2007). According to social or development theory of public enterprises, these banks are often inefficient because they play a specific role as development agencies. Sometimes they are assigned to fund unprofitable government projects. Additionally, labor surplus could also be a form of policy burden that should be borne by these banks to help government reduce unemployment. Such development roles of these banks may lead them to be more costly and in turn set higher interest margins. Another possible difference between state-owned banks and private banks regarding margin setting could stem from implicit guarantees and too-big-to-fail considerations. Depositors may perceive state-owned banks as less risky because they believe that the government will rescue them if they face financial problems which mean that these banks are perceived to have a larger implicit guarantee (Mondschean and Opiela, 1999). Moreover, given that state-owned banks in Indonesia are mostly large banks, the too-big-to-fail dimension should also be considered. These two factors could lead such banks to charge a lower rate on deposits, which ultimately could spread their margins. Secondly, we examine whether the interest margins of foreign banks are different from those of other banks. It is generally argued that foreign banks in emerging countries have positive economic impacts on the host country in terms of resources allocation and higher efficiency (Claessens *et al*.,

2001). Having better hard information and technology may lead these banks to perform more efficiently than domestic banks.

Few studies examine the role of ownership in the determination of interest margins[8]. Contrary to the common expectation, Drakos (2003), using data of banks in Central and Eastern European Countries (CEECs) and the Former Soviet Union countries (FSU), finds that state-owned banks typically set lower margins. Martinez-Peria and Mody (2004) show that foreign banks in 5 Latin American Countries charge lower interest margins than domestic banks. Poghosyan (2010), by considering the dealership approach, finds that foreign bank participation does not affect interest margins in Central and Eastern European countries. Fungáčová and Poghosyan (2011) find that in Russia, the impact of some interest margins determinants differs across state banks, domestic private banks and foreign banks. Though the results of previous studies on this issue are inconclusive, the unique feature of the Indonesian banking structure is worth be considering in our investigation on the determinants of interest margins.

3. Indonesian Banking Post-Financial Crisis

The 1997/1998 financial crisis has led to severe consequences regarding the intermediation function of Indonesian banks. Early after the crisis, the Indonesian banking system experienced a credit crunch phenomenon banks being reluctant to grant new loans[9]. This credit crunch led to a sharp decrease in intermediation as shown by a lower ratio of loans to deposits. Banks then charged a strangling interest rate on loans to cover their intermediation costs. The credit crunch was considered as the factor causing the slower process of Indonesia's economic recovery compared to other Asian countries that have suffered from the crisis such as South Korea and Thailand (Agung *et al*., 2001). To accelerate the economic recovery, the Government of Indonesia then conducted several policies relying on banks as the locomotive given their importance in the financial system[10]. Thus, the

[8] Poghosyan (2010) argues that no theoretical paper has incorporated the role of ownership in the determination of interest margins. Moreover, he denotes that any potential impact of ownership, particularly foreign banks versus domestic banks, have already been accounted for in the dealership model and its extension.

[9] The banks' reluctance to grant loans was considered as the result of the excessive bank lending behavior during the banking deregulation regime which amplified the impact of the financial crisis. Therefore, banks then behaved very carefully in their lending activities. In the aftermath of the crisis, other affected countries in the region such as Malaysia, Thailand, South Korea, and Philippines also faced the credit crunch problem (Ding *et al*., 1998). Bank credit in Indonesia then continued to grow slowly due to banks being confronted with higher credit risk, capital crunch, and lack of information regarding the quality of borrowers (Agung *et al*., 2001). In 2001, the average loan to deposit ratio of banks included in our sample was only 54% (more details are provided in our descriptive statistics' tables 1 and 2).

[10] The capital market and other financial intermediation institutions were still relatively underdeveloped.

government bolstered banks to improve their intermediation activities. Though several improvements in the banking sector have been implemented following the institutional reforms and economic recovery, the problem of high interest margins has been a serious problem in this country. Regulators have paid a greater attention on this issue by issuing a number of regulations to promote healthy competition, to improve market discipline, to boost good governance which expectedly could decrease interest margins and subsequently improve the efficiency of financial intermediation. Moreover, Bank Indonesia recently released a direct regulation on prime lending rate transparency for commercial banks. This regulation is intended to promote the transparency of banking products, including their benefits, costs and risks. At the primary stage, this regulation is addressed for those having assets more than 10 trillion Rupiah.

Like in other developing countries, the existence of micro, small, and medium enterprises (MSMEs) was an important issue in Indonesia[11] because of their significant contribution to the economy in forms work force and output, high priorities given by the government, and better response to the harmful 1997/1998 economic crisis (Hill, 2001; Hayashi, 2002) even though they faced several problems such as access to capital markets, and lack in technology that made them less competitive than others (Najib *et al*., 2011). As the importance of MSMEs in the economy, the government encouraged banks to increase the accessibility to financing for MSMEs[12]. In 2001, Bank Indonesia issued a regulation (PBI No: 3/2/PBI/2001) on small scale loans stating that banks were recommended to channel small scale loans in their lending portfolio[13]. Improving access of MSMEs to credit and financing was also highlighted in the implementation plan of the Indonesian Banking Architecture (IBA)[14].

Following the economic recovery, the Indonesian economy then consistently grew majorly driven by consumption. This fourth most populated country in the world faced an

[11] The Indonesia Statistics Bureau released data presenting that in 2007, 99.99 % of business units are micro, small, and medium enterprises and they account for 97.3 % of the total workforce in Indonesia (Statistics of Micro, Small and Medium Enterprises 2007-2008).

[12] Agung *et al*. (2001) reveal that lending to SMEs in Indonesia was relatively low risk, however, banks were still reluctant to release loans to SMEs due to the fact that loans to these firms were very costly and because banks lacked experience in dealing with SMEs. Wattanapruttipaisan (2003) explains the factors causing the unsuccessful small and medium enterprises (SMEs) financing in ASEAN countries, including Indonesia, after the financial crisis that come from demand and supply sides. In the supply side, banks were reluctant to channel loans to SMEs because they would be the major debtor that looks risky even though they could charge a high risk premium.

[13] This regulation defined small scale loan as a bank lending to borrowers for an investment and/or working capital (productive purposes) up to 500 million Rupiah.

[14] In 2004, the government introduced a concept of Indonesian Banking Architecture (IBA), a road map of the Indonesian banking sector which would be implemented gradually.

escalating housing demand in line with the growth of its population which was one of the main growth drivers. Hoek-Smit (2005) points out that the demand for new housing in Indonesia is more than 800,000 units per year (3.5 to 3.75 %) which lead the growth in housing (mortgage) loans to exceed growth in other types of credit. The government released policies to ease the access to housing loans for the poor to reduce the number of homeless people and as one of the poverty alleviation programs. The Ministry of Public Housing then issued a regulation on the subsidy of housing loans for the poor in form of a lower-fixed interest rate.

Indonesian banking is featured by a number of state-owned banks which are distinguished based on which government controls the banks. Regional development banks are owned by regional (provincial and district) governments, while state-owned banks are controlled by the central government[15]. As public enterprises, these banks are subject to government policies. However, they also benefit from funding under the form of deposits particularly from small depositors. Two aspects may arise regarding the intermediation cost, i) these banks could charge a lower rate for deposits, ii) the inefficiency of these banks could increase the overhead costs. Therefore the interest margins of state-owned banks could be higher than those of other banks. Another issue regarding bank ownership structure is the foreign banks' participation in this industry[16]. In principle, foreign banks' presence should benefit the domestic market since they have a better technology that could lead them to perform more efficiently and therefore contribute to lower the cost of intermediation.

4. Data, Variables, and Empirical Model

This study aims to investigate the factors behind the persistence of high interest margins in Indonesian banking after the 1997/1998 financial crisis. We hypothesize that several factors play a role in explaining the interest margins of Indonesian banks spreading from the structure of loan portfolios, the degree of competition, the level of income diversification, cost efficiency, bank size, risk aversion, credit risk, liquidity risk and ownership structure.

[15] Four state-owned banks in our sample are publicly traded banks. The government, however, maintains its majority ownership.

[16] Hamada (2003) shows that foreign banks' presence in Indonesia started in 1968. However, the number of foreign banks was stable until the deregulation of the Indonesian banking sector in 1988 which then doubled the number of foreign banks.

4.1. Data and Sample

We use yearly bank-level data for the 2001–2009 period. Annual banks' financial reports (balance sheets and income statements) come from Bank Indonesia and Ekofin Konsultindo. Data on the proportion of small scale loans and the proportion of property loans are reported by banks in the additional information of their financial reports. Our sample covers 93 commercial banks resulting in 617 bank-year observations. We end up with an unbalanced panel because we exclude banks exhibiting negative equity value, incomplete data for some variables and a number of outliers[17].

4.2. Variables

3.2.1 Dependent variable

- *Net interest margins*

The dependent variable of this study is the net interest margin (NIM) which is the difference between interest income and interest expenses divided by interest-earning assets.

3.2.2 Independent variables

- *Loan portfolio*

We use two kinds of lending shares which are the proportion of small scale loans to total loans (SMALL) and the proportion of property (housing) loans to total loans (PROPERTY). A positive sign is expected for the small scale loans because these loans may require a higher risk premium and these loans are costly. The coefficient of property loans is expected to be negative as these loans are less risky. Moreover government policy could reduce the interest rate on these loans.

- *Market Power (Degree of competition)*

We use a Lerner index (LERNER) to measure the degree of competition as banks with a higher spread between price and marginal cost could be considered to have a higher degree of monopoly power. Banks having a greater market power are supposed to set a higher interest margins (Maudos and de Guevara, 2004; Maudos and Solís, 2009). Referring to Koetter *et al*. (2012), Lerner index (LERNER) is the difference between average revenues

[17] We need to eliminate banks with a negative value of equity in the computation of the Lerner index. For some variables, especially the non-performing loans ratio, we have some missing data. Finally, we ignore extreme observations (outliers) for all the variables, particularly for our dependent variable (net interest margins), which in total corresponds to excluding around 5% bank-year observations.

(AR) and marginal costs (MC) divided by average revenues (AR) which can be written as follow:

LERNER = (AR – MC)/AR ……..... (1)

To calculate the marginal costs, we employ a translog total cost function which includes three input factors (interest on total borrowed funds, labor cost, and cost of fixed assets), four outputs (loans, other earnings assets, total securities, and off-balance sheet items), total equity, and time trend. The total cost function is estimated using a stochastic frontier analysis (SFA) following the work of Koetter *et al*. (2012).

A positive sign is expected as banks having a greater market power can set a higher interest margin. In addition, we report the results obtained by considering the Herfindahl Hirschman Index (HHI) instead of the Lerner index as a robustness check.

- *Diversification*

We follow the method of Elsas *et al*. (2010) to measure the degree of bank diversification (DIV). Basically, their diversification index is an adjusted Herfindahl-Hirschman index. The index ranges from 0 (fully specialized bank) to 0.75 (bank with fully balanced revenue).

The diversification index is defined as:

$$DIV = [1 - [(INT/REV)^2 + (COM/REV)^2 + (TRAD/REV)^2 + (OTHER/REV)^2]] \times 100 \quad \text{…..(2)}$$

where INT is the gross interest income, COM is the commission income, TRAD represents the trading revenue, and OTHER is other revenue. The denominator is total revenues (REV).

As argued above, we expect a negative sign for the coefficient of this variable because more diversified banks tend to set a lower interest rate (cross subsidization strategy).

- *Efficiency*

First, following the studies of Maudos and de Guevara (2004), Beck and Hesse (2009) and Maudos and Solís (2009), we include the ratio of operating costs to total assets (OVERHEAD) to represent the efficiency of the production process. The higher the operating costs, the higher the interest margin banks will charge. Second, the ratio of cost to gross income (CIR) is also employed to measure the efficiency (quality) of management following

Maudos and Solís (2009). This ratio reflects how much management spends to obtain a unit of income; therefore, a negative sign is expected for this ratio.

- *Bank size*

Bank size is measured by the natural logarithm of total assets orthogonalized with equity (ORTHOLNTA) because of their strong correlation following the study of Barry *et al*. (2011). Large banks are expected to set a lower bank margin due to economies of scale enabling them to decrease their margins (Fungáčová and Poghosyan, 2011). Such banks have been found to grow in loan markets with low margins (López-Espinosa et al., 2011).

- *Risk aversion*

The ratio of equity to total assets (EQTA) measures the degree of risk aversion as proposed by Maudos and Solís (2009) and Poghosyan (2010). A higher degree of risk aversion is expected to be associated to a higher interest margin set by the bank.

- *Credit Risk*

We measure credit risk using the ratio of non-performing loans to total loans (NPL) following the study of Fungáčová and Poghosyan (2011). There are two competing arguments regarding the relationship between credit risk and margins. On the one hand, banks facing higher credit risk might charge a higher risk premium on their loans (Maudos and de Guevara, 2004) thereby increasing interest margins. On the other hand, as argued by Fungáčová and Poghosyan (2011) depositors might require higher interest rates on their deposits because they feel that the bank is more risky and therefore interest margins could be lower. Hence, the expected sign for credit risk is ambiguous.

- *Liquidity Risk*

The ratio of loans to deposits stands for bank liquidity risk (LDR). The higher this ratio, the higher the liquidity risk and the lower the bank holds reserves. As argued by López-Espinosa *et al*. (2011), a higher level of liquid assets would decrease net interest margins. We therefore expect a positive sign for the coefficient of LDR.

- *State-owned banks*

As explained above, state-owned banks in Indonesia consist of central government-owned banks and regional development banks. We use a dummy variable (SOB) to identify

the state-owned banks. These banks are expected to charge a lower rate for deposits because they are perceived as less risky by depositors. Moreover, the development roles of these banks may lead them to be more costly. Therefore a positive sign is expected.

- *Foreign banks*

Foreign banks (FOB) in Indonesia consist of branches of foreign banks, subsidiaries of foreign banks, and joint venture banks (Hadad *et al.*, 2011). We use a dummy variable (FOB) to categorize foreign banks. Benefiting from better hard information and technology may lead these banks to perform more efficiently than domestic banks. Accordingly, a negative sign is expected.

3.2.3 Control variables

- *Listed banks*

Publicly traded banks are supposed to have a better monitoring and efficiency. Therefore, we incorporate a dummy variable for listed banks (LISTED) as a control variable.

- *Year dummies*

We include year dummies (YEARS) in all of our regressions to capture time effects which could matter because of time-variant macroeconomic factors as argued by Beck and Hesse (2009).

4.3. Empirical Model

To deal with multicolinearity issues, we orthogonalize the proxy of size which is the natural log of total assets with equity. Moreover, because our bank diversification variable is highly correlated with the variable capturing small scale loans as well as bank size, we do not introduce the diversification variable concomitantly to these two variables. Likewise, we do not introduce bank size concurrently with operating costs and the cost to income ratio due to their high correlations.

The specifications of the determinants of interest margins to be estimated are formulated as follows:

$$NIM_{i,t} = \alpha_0 + \alpha_1 SMALL_{i,t} + \alpha_2 PROPERTY_{i,t} + \alpha_3 LERNER_{i,t} + \alpha_4 OVERHEAD_{i,t} + \alpha_5 CIR_{i,t} + \alpha_6 EQTA_{i,t} + \alpha_7 NPL_{i,t} + \alpha_8 LDR_{i,t} + \alpha_9 SOB_i + \alpha_{10} FOB_i + \alpha_{11} LISTED_{i,t} + YEARS + \varepsilon_{i,t} \quad \ldots\ldots (3)$$

$$NIM_{i,t} = \alpha_0 + \alpha_1 SMALL_{i,t} + \alpha_2 PROPERTY_{i,t} + \alpha_3 LERNER_{i,t} + \alpha_4 ORTHOLNTA_{i,t} + \alpha_5 EQTA_{i,t} + \alpha_6 NPL_{i,t} + \alpha_7 LDR_{i,t} + \alpha_8 SOB_i + \alpha_9 FOB_i + \alpha_{10} LISTED_{i,t} + YEARS + \varepsilon_{i,t} \quad \ldots\ldots (4)$$

$$NIM_{i,t} = \alpha_0 + \alpha_1 PROPERTY_{i,t} + \alpha_2 LERNER_{i,t} + \alpha_3 DIV_{i,t} + \alpha_4 OVERHEAD_{i,t} + \alpha_5 CIR_{i,t} + \alpha_6 EQTA_{i,t} + \alpha_7 NPL_{i,t} + \alpha_8 LDR_{i,t} + \alpha_9 SOB_i + \alpha_{10} FOB_i + \alpha_{11} LISTED_{i,t} + YEARS + \varepsilon_{i,t} \quad \ldots\ldots (5)$$

where i, t represent bank and time, respectively. NIM is the net interest margin. SMALL and PROPERTY are the proportion of small scale loans to total loans and the proportion of property (housing) loans to total loans, respectively. LERNER is the Lerner index. DIV is the bank diversification index. OVERHEAD is the ratio of operating costs to total assets, while CIR denotes the cost to income ratio. ORTHOLNTA is the natural logarithm of total assets orthogonalized with equity. EQTA is the ratio of equity to total assets. NPL is the ratio of non-performing loans to total loans. LDR stands for the loans to deposits ratio. SOB is a dummy taking value 1 for state-owned banks. FOB is a dummy taking value 1 for foreign-banks. LISTED is a dummy taking value 1 for publicly traded banks. YEARS represents a vector of year (time) dummies. We estimate the empirical model in equation 3 using pooled and static panel regressions.

Carbó and Rodriguez (2007), and Maudos and Solís (2009) consider that bank interest margins is influenced by their previous values given the fact that banks have to match across periods the deposits and lending which are randomly determined as well as non-interest activities. Therefore, they argue that the determination of interest margins should also be tested using a dynamic panel method. Hence, we also estimate a dynamic panel data model employing a two-step Generalized Method of Moments/ GMM estimator[18]. The equations can be written as follows:

$$NIM_{i,t} = \alpha_0 + \alpha_1 NIM_{i,t-1} + \alpha_2 SMALL_{i,t} + \alpha_3 PROPERTY_{i,t} + \alpha_4 LERNER_{i,t} + \alpha_5 OVERHEAD_{i,t} + \alpha_6 CIR_{i,t} + \alpha_7 EQTA_{i,t} + \alpha_8 NPL_{i,t} + \alpha_9 LDR_{i,t} + \alpha_{10} SOB_i + \alpha_{11} FOB_i + \alpha_{12} LISTED_{i,t} + YEARS + \varepsilon_{i,t} \quad \ldots\ldots (6)$$

$$NIM_{i,t} = \alpha_0 + \alpha_1 NIM_{i,t-1} + \alpha_2 SMALL_{i,t} + \alpha_3 PROPERTY_{i,t} + \alpha_4 LERNER_{i,t} + \alpha_5 ORTHOLNTA_{i,t} + \alpha_6 EQTA_{i,t} + \alpha_7 NPL_{i,t} + \alpha_8 LDR_{i,t} + \alpha_9 SOB_i + \alpha_{10} FOB_i + \alpha_{11} LISTED_{i,t} + YEARS + \varepsilon_{i,t} \quad \ldots\ldots (7)$$

[18] We use a two-step GMM estimator, particularly the System GMM proposed by Arellano and Bover (1995) and Blundell and Bond (1998) which extends the standard GMM of Arellano and Bond (1991). The System GMM estimator uses both first-differences and levels.

$$NIM_{i,t} = \alpha_0 + \alpha_1 NIM_{i,t-1} + \alpha_2 PROPERTY_{i,t} + \alpha_3 LERNER_{i,t} + \alpha_4 DIV_{i,t} + \alpha_5 OVERHEAD_{i,t} + \alpha_6 CIR_{i,t} + \alpha_7 EQTA_{i,t} + \alpha_8 NPL_{i,t} + \alpha_9 LDR_{i,t} + \alpha_{10} SOB_i + \alpha_{11} FOB_i + \alpha_{12} LISTED_{i,t} + YEARS + \varepsilon_{i,t} \quad (8)$$

5. Results

5.1. Descriptive Statistics

Table 1 presents the descriptive statistics for the variables of our full sample and the sub-samples by ownership type (state-owned banks, foreign banks, and private-domestic banks), while table 2 reports the statistics year by year. The dependent variable (NIM) has a mean (median) of 6.61% (5.91%). As shown in table 2, the yearly average interest margins of Indonesian banks are persistently high during the period we study. The means (medians) of the proportion of small scale loans and the proportion of property loans are 16.33% (7.78%) and 4.98% (0.77%) respectively. The mean (median) of Lerner index is 0.393 (0.369), while the average (median) of the diversification index is 16.61% (11.51%). The ratio of overhead costs to total assets has an average (median) of 3.73% (3.61%), whereas the cost to income ratio has a mean (median) of 79.48% (80.25%). The average size (total assets) is 20,593.86 billion Rupiah. The smallest bank has assets of 52.65 billion Rupiah, while 370,000 billion Rupiah is the total assets of the largest bank. 11.76% (9.73%) is the average (median) of the ratio of equity to total assets. The mean (median) of the ratio of non-performing loans to total loans is 4% (2.8%). The average (median) of the loans to deposits ratio in our sample is 74.18% (69.78%).

Insert Table 1 here

Insert Table 2 here

5.2. Correlation Matrix

Table 3 reports the correlation matrix between variables of this study. The correlations between the dependent variable (interest margin) and the explanatory variables are shown in the first column of the table. As expected, net interest margins (NIM) is found to be positively correlated with small scale loans, the Lerner index, the ratio of overhead costs to total assets, and the ratio of equity to total assets. We observe, as expected, negative

correlations between NIM and property loans, diversification, the cost to income ratio, as well as between NIM and size. The ratio of non-performing loans to total loans and the loans to deposits ratio are found to be negatively correlated with NIM.

Insert Table 3 here

5.3. Regressions

We analyze the determinants of interest margins of Indonesian banks by employing pooled regression and static panel regression techniques, as well as a two-step GMM estimator. Table 4 presents the regression results of pooled regression (column 1, 2 and 3), random effect panel data (column 4, 5 and 6), and two-step GMM estimation (column 7, 8 and 9). The Wald test, the Sargan test, and the Arellano-Bond test (autocorrelation) of the GMM estimation meet the requirements. The Wald test in the random effect model is found to satisfy the requirement as well.

Insert Table 4 here

As expected, we find a positive and significant impact of small scale loans (SMALL) on interest margins (NIM) in all models. Banks with a greater proportion of small scale loans in their loan portfolio set a higher interest margin. In the pooled regression, the ratio of property loans to total loans (PROPERTY), as expected, has a negative effect on interest margins. However, the coefficient of this variable is not significant in the random effect panel data and GMM estimations. In line with Beck and Hesse (2009), the results suggest that the structure of bank loan portfolios matters in the determination of interest margins. Banks set a higher interest margin if they are more exposed to riskier loans.

As shown in all models, we confirm the findings of Maudos and de Guevara (2004), and Maudos and Solís (2009) that market power, measured by Lerner index (LERNER), is positively associated with interest margins. Banks set a higher interest margins when they face relatively inelastic demand and supply functions in the markets enabling them to exercise their monopoly power (Ho and Saunders, 1981).

Our results is consistent with the loss leader hypothesis on the cross-subsidization strategy of income diversification (Lepetit *et al*., 2008; Maudos and Solís, 2009), as shown by the negative coefficients of the diversification index (DIV) in all regression models. More

diversified banks charge a lower interest rate as they are able to gain a higher income from non-interest activities because the lower rate might attract new clients to the banks. Such clients are expected to buy fee generating services from the bank. Subsequently, more diversified banks have a lower interest margin.

We find that the ratio of overhead costs to total assets (OVERHEAD) is positively and significantly associated with interest margins using all methods. These results confirm the findings of Beck and Hesse (2009) and Maudos and Solís (2009) as well as the extension of the dealership model proposed by Maudos and de Guevara (2004) which includes operating costs to represent how efficient banks are in their production process. As expected, the second proxy of efficiency which is the cost to income ratio (CIR) has a negative impact on interest margins using all methods. This result confirms the finding of Maudos and de Guevara (2004), Maudos and Solís (2009) and Lopez-Espinosa et al. (2011).

Strong evidence is also found regarding the negative effect of bank size, measured by the natural logarithm of total assets orthogonalized with equity (ORTHOLNTA) on interest margins. This negative impact confirms the hypothesis that large banks achieve economies of scale that can decrease their margins (Beck and Hesse, 2009; Fungáčová and Poghosyan, 2011). The ratio of equity to total assets (EQTA) which is a proxy of risk aversion has a positive and significant coefficient in all the regressions. In line with the dealership model (Ho and Saunders, 1981) higher managerial risk aversion will increase interest margins. This result is similar to those of previous studies such as Maudos and Solís (2009), Poghosyan (2010).

Our results show that credit risk, measured by the ratio of non-performing loans to total loans (NPL), has a negative and significant effect on interest margins in the pooled and random effect regression models which confirm the finding of Fungáčová and Poghosyan (2011). The results are also in line with the findings of Hadad *et al*., (2011) that in Indonesia market discipline by depositors is pronounced in the price of deposits. Depositors require a higher interest rate on deposits for riskier banks. The loans to deposits ratio (LDR) as the proxy of liquidity risk has a positive impact on bank margins using all regression methods. The results are consistent with the findings of Maudos and de Guevara (2004), López-Espinosa *et al*. (2011), Chen and Liao (2011). More liquid banks (banks with lower liquidity risk) with higher opportunity cost have lower interest margins.

Regarding the influence of bank ownership, in all our models, the coefficient of the dummy for state-owned banks (SOB) exhibits a positive and significant sign. The results show that state-owned banks set a higher interest margin than other banks. There are a

number of possible explanations for such a result. First, as they are perceived less risky by depositors because of implicit guarantee and too-big-to-fail considerations, specifically by a large number of small depositors, they can easily obtain resources under the form deposits with a lower cost than other funds. Second, as explained by Rosengard and Prasetyantoko (2011), the higher interest margins of Indonesian state-owned banks (both provincial and central) are mainly driven inefficiency considerations. Third, labor surplus in these banks may contribute to increase the operating costs which subsequently lead them to increase their margins.

The coefficient of the dummy for foreign banks (FOB) is found to be negative and significant in all models. The results are consistent with those of previous studies such as Martinez-Peria and Mody (2004) in which foreign banks are found to charge a lower interest margin than domestic banks. This evidence may result from the better hard information and technology from which foreign banks benefit which in turn enables them to perform more efficiently than domestic banks.

Finally, we find little evidence on the difference regarding interest margins between listed (LISTED) and non-listed banks in all models.

5.4. Robustness Checks

We conduct several robustness checks. Firstly, we follow the method of Maudos and de Guevarra (2004) by replacing the Lerner index by the Herfindahl Hirschman Index (HHI), calculated on the basis of total assets, as a measure of banking market structure. As expected, the coefficient of HHI is positive and significant in some models, while the results for the other variables are stable (the results are presented in table 5).

Insert Table 5 here

Secondly, we exclude the dummy for state-owned banks (SOB), the dummy for foreign banks (FOB), and the dummy for listed banks (LISTED) to enable us to test the empirical model using fixed-effect panel data techniques. For all the remaining variables, except for the Lerner index, the results are similar to those of the random effect regressions presented in column 4 - 6 of table 4 although the effect of the Lerner index is slightly weaker but still significant.

6. Conclusion and Policy Implications

We analyze the determinants of net interest margins in Indonesia after the 1997/1998 financial crisis. We use data of 93 commercial banks over the 2001-2009 period. We estimate the empirical model using pooled regression techniques as well as static and dynamic panel methods.

We confirm that the structure of loan portfolio matters in the determination of interest margins. In the context of Indonesian banking, small scale loans contribute to increase bank margins, whereas housing (property) loans reduce interest margins. Our results also show that Indonesian banks with a greater market power set higher interest margins. Furthermore, we also corroborate the loss leader hypothesis on cross-subsidization of lending and non-interest activities. The results also validate that higher margins are driven by higher operating costs, higher risk aversion and higher liquidity risk. Consistent with previous literature the cost to income ratio is also found to negatively affect intermediation margins. We also find that credit risk has a negative impact on bank margins. Strong evidence is found that large banks set lower interest margins.

We then turn our analysis to the role of ownership as a determinant of interest margins. Considering whether there is a difference in interest margins between state-owned (government) banks and private banks, we find that the latter have lower margins. Our findings also confirm that foreign banks are beneficial to the banking sector and the economy as a whole as they charge lower margins.

These empirical results have several noteworthy policy implications. Firstly, we show that banks with a higher market power "enjoy" higher interest margins. Therefore, promoting a more healthy banking competition should be pursued by regulators to specifically improve transparency and disclosure on banking products. Secondly, the regulation on the transparency of the prime lending rate has been released by the Bank Indonesia in March 2011 but only for corporate, retail, housing and consumption loans. Extending the regulation on prime lending rates to include loans to MSMEs should be strongly recommended. Thirdly, the positive impact of small scale loans on interest margins may come from the fact that loans to micro, small and medium enterprises require a higher risk premium. Imposing on banks that they charge a lower rate on these loans may not be a proper answer as these loans are costly and riskier. Regulators should therefore direct banks to appropriately estimate risk

premia on loans to MSMEs, for instance by using credit scoring systems. Lastly, Regulators need to bring banks to perform more efficiently.

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Table 1: Descriptive Statistics – based on ownership type

This table presents the descriptive statistics of our variables. NIM is the net interest margins (%). SMALL is the proportion of small scale loans to total loans (%). PROPERTY is the proportion of property loans to total loans (%). LERNER is the Lerner index. DIV is the diversification index (%). OVERHEAD is the ratio of operating costs to total assets (%). CIR is the cost to income ratio (%). ASSET denotes total assets in billion Rupiah. EQTA is the ratio of equity to total assets (%). NPL is the ratio of non-performing loans to total loans (%). LDR represents the loans to deposits ratio (%).

Sample	Banks	Statistics	NIM	SMALL	PROPERTY	LERNER	DIV	OVERHEAD	CIR	ASSETS (billion Rupiah)	EQTA	NPL	LDR
Full Sample	617	Mean	6.693	16.697	5.037	0.391	16.068	3.700	79.205	21003.25	11.760	3.999	74.181
		Median	5.980	8.030	0.786	0.366	11.301	3.616	80.144	4070.27	9.729	2.800	69.781
		Maximum	16.640	100.000	53.610	2.208	57.349	16.729	219.940	370000	51.069	44.000	313.446
		Minimum	-0.650	0.000	0.000	-7.930	0.864	0.195	21.850	52.65	0.466	0.010	5.104
		Std. Dev.	3.046	22.039	8.722	0.507	12.609	1.668	18.846	49010.14	7.348	4.519	38.775
		Skewness	0.828	1.971	2.771	-7.020	1.324	1.319	1.710	4.08189	1.940	3.443	2.133
State-owned Banks	207	Mean	9.109	31.901	4.568	0.535	10.299	4.265	76.575	32029.3	9.077	3.165	60.772
		Median	9.230	21.370	0.328	0.547	8.392	4.403	76.570	4566.6	8.656	2.010	56.458
		Maximum	16.640	100.000	53.610	0.995	31.043	7.589	108.290	370000	19.274	26.660	129.593
		Minimum	0.900	0.000	0.000	-0.075	2.573	0.958	38.920	208.62	3.133	0.090	10.037
		Std. Dev.	3.097	27.435	10.700	0.260	5.973	1.456	9.561	71330.99	3.137	3.433	25.996
		Skewness	0.095	1.091	3.302	-0.140	1.347	-0.091	-0.370	2.836817	0.833	3.189	0.341
Foreign Banks	127	Mean	4.741	0.302	1.129	0.484	33.237	2.711	65.700	10907.23	15.216	5.948	111.844
		Median	4.390	0.000	0.000	0.507	35.386	2.509	63.620	5509.92	14.520	4.090	98.983
		Maximum	10.000	13.000	19.765	1.991	57.349	8.537	219.000	52329.46	40.872	44.000	313.446
		Minimum	1.470	0.000	0.000	-0.997	6.865	0.195	21.850	410.01	0.466	0.100	22.466
		Std. Dev.	1.653	1.462	3.046	0.468	13.682	1.507	24.910	11548.69	9.013	6.132	57.073
		Skewness	0.824	6.582	4.058	-0.435	-0.250	0.862	2.318	1.546831	0.211	2.766	1.365
Private Domestic Banks	283	Mean	5.802	12.933	7.134	0.243	12.583	3.730	87.190	17468.99	12.170	3.735	67.087
		Median	5.570	7.310	4.869	0.187	10.124	3.529	86.930	2403.2	9.866	2.750	68.753
		Maximum	15.100	81.130	41.081	2.208	43.298	16.729	219.940	281000	51.069	29.020	152.650
		Minimum	-0.650	0.010	0.000	-7.930	0.864	1.012	34.450	52.65	1.301	0.010	5.104
		Std. Dev.	2.291	14.328	8.181	0.611	8.259	1.683	16.752	36370.19	7.976	4.113	22.667
		Skewness	0.957	2.167	1.422	-8.159	1.118	2.662	3.180	3.953469	2.350	3.597	-0.128

Table 2: Descriptive statistics year by year

This table presents the descriptive statistics of our variables. NIM is the net interest margins (%). SMALL is the proportion of small scale loans to total loans (%). PROPERTY is the proportion of property loans to total loans (%). LERNER is the Lerner index. DIV is the diversification index (%). OVERHEAD is the ratio of operating costs to total assets (%). CIR is the cost to income ratio (%). ASSET denotes total assets in billion Rupiah. EQTA is the ratio of equity to total assets (%). NPL is the ratio of non-performing loans to total loans (%). LDR represents the loans to deposits ratio (%).

Year	Banks	Statistics	NIM	SMALL	PROPERTY	LERNER	DIV	OVERHEAD	CIR	ASSETS (billion Rupiah)	EQTA	NPL	LDR
2001	59	Mean	6.617	28.156	2.308	0.322	12.699	3.178	82.269	14721.88	9.432	6.749	54.147
		Std. Dev.	3.500	31.972	4.669	1.160	11.133	1.365	26.150	40384.47	7.061	8.110	31.037
2002	62	Mean	6.626	21.776	2.993	0.488	14.619	3.675	82.543	14935.41	11.186	5.475	64.823
		Std. Dev.	3.461	25.206	5.846	0.375	12.450	1.700	26.432	38919.5	7.076	6.136	38.392
2003	67	Mean	6.600	21.824	3.823	0.394	16.328	3.633	78.626	15064.21	11.647	4.375	67.826
		Std. Dev.	3.127	25.373	7.322	0.428	14.029	1.737	19.116	38450.43	6.892	4.720	37.177
2004	70	Mean	7.040	17.664	4.954	0.476	19.945	3.826	75.402	16146.19	11.253	4.095	73.471
		Std. Dev.	3.541	20.592	8.916	0.353	15.554	2.247	22.221	38578.98	5.738	4.181	40.784
2005	76	Mean	6.931	14.949	4.983	0.392	15.929	3.889	78.967	17700.96	11.485	3.977	77.036
		Std. Dev.	3.217	19.566	8.979	0.445	11.980	1.543	16.369	39669.33	7.210	3.782	39.823
2006	73	Mean	6.801	13.384	5.993	0.386	14.341	3.805	79.703	20858.44	11.187	3.577	72.277
		Std. Dev.	3.017	16.527	9.762	0.346	10.974	1.963	15.301	44155.58	6.173	2.940	41.036
2007	75	Mean	6.299	12.127	5.289	0.381	16.757	3.547	78.751	23850.96	13.842	2.794	81.201
		Std. Dev.	2.545	17.074	9.066	0.359	11.710	1.425	14.082	52646.65	10.008	2.169	42.054
2008	67	Mean	6.792	12.143	7.118	0.344	16.713	3.845	78.874	30890.52	12.369	2.565	86.478
		Std. Dev.	2.683	18.442	10.231	0.356	12.706	1.412	13.608	62775.35	7.376	2.215	29.757
2009	68	Mean	6.510	11.112	7.257	0.330	16.680	3.813	78.550	33800.89	12.959	3.018	86.085
		Std. Dev.	2.287	17.161	10.289	0.339	11.721	1.329	13.449	71343.04	7.146	2.756	36.378

Table 3: Correlation Matrix

This table presents the pairwise correlation between the variables used in this study. NIM is the net interest margins (%). SMALL is the proportion of small scale loans to total loans (%). PROPERTY is the proportion of property loans to total loans (%). LERNER is the Lerner index. DIV is the diversification index (%). OVERHEAD is the ratio of operating costs to total assets (%). CIR is the cost to income ratio (%). ORTHOLNTA denotes the natural logarithm of total assets orthogonalized with equity. EQTA is the ratio of equity to total assets (%). NPL is the ratio of non-performing loans to total loans (%). LDR represents the loans to deposits ratio (%).

	NIM	SMALL	PROPERTY	LERNER	DIV	OVERHEAD	CIR	ORTHOLNTA	EQTA	NPL	LDR
NIM	1										
SMALL	0.384	1									
PROPERTY	-0.165	-0.025	1								
LERNER	0.192	0.069	-0.082	1							
DIV	-0.400	-0.378	-0.059	0.122	1						
OVERHEAD	0.339	0.178	-0.053	-0.032	-0.081	1					
CIR	-0.158	0.108	0.055	-0.207	-0.116	0.176	1				
ORTHOLNTA	-0.182	-0.276	0.200	0.137	0.359	-0.331	-0.318	1			
EQTA	0.124	-0.081	-0.086	-0.014	-0.085	0.005	-0.196	0.000	1		
NPL	-0.251	-0.082	-0.044	0.044	0.274	-0.023	0.226	-0.003	0.007	1	
LDR	-0.035	-0.222	-0.071	-0.034	0.138	-0.011	-0.057	0.100	0.302	0.068	1

Table 4: Regressions results

This table presents the results of pooled regression (column 1, 2 and 3), random effect panel data (column 4, 5 and 6), and two-step GMM estimation (column 7, 8 and 9). The dependent variable is net interest margins (NIM, presenting in percentage). SMALL is the proportion of small scale loans to total loans (%). PROPERTY is the proportion of property loans to total loans (%). LERNER is the Lerner index. DIV is the diversification index (%). OVERHEAD is the ratio of operating costs to total assets (%). CIR is the cost to income ratio (%). ORTHOLNTA denotes the natural logarithm of total assets orthogonalized with equity. EQTA is the ratio of equity to total assets (%). NPL is the ratio of non-performing loans to total loans (%). LDR represents the loans to deposits ratio (%). SOB is the dummy variable for state-owned banks. FOB represents the dummy variable for foreign banks. LISTED is the dummy variable for publicly traded banks. The values in parentheses are standard errors. *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Net Interest Margin (NIM)								
	Pooled			Random Effect			GMM		
	1	2	3	4	5	6	7	8	9
NIM (t-1)							0.378***	0.419***	0.387***
							(0.030)	(0.042)	(0.030)
SMALL	0.010**	0.008*		0.013***	0.010**		0.009**	0.007	
	(0.004)	(0.005)		(0.004)	(0.005)		(0.004)	(0.005)	
PROPERTY	-0.038***	-0.041***	-0.035***	-0.014	0.003	-0.013	-0.002	0.013	-0.001
	(0.009)	(0.011)	(0.009)	(0.012)	(0.014)	(0.012)	(0.014)	(0.015)	(0.013)
LERNER	0.555***	0.858***	0.611***	0.284**	0.260**	0.298**	0.401**	0.549***	0.445**
	(0.149)	(0.182)	(0.146)	(0.124)	(0.131)	(0.123)	(0.168)	(0.202)	(0.174)
DIV			-0.050***			-0.047***			-0.017**
			(0.009)			(0.010)			(0.008)
OVERHEAD	0.839***		0.861***	0.554***		0.580***	0.379***		0.378***
	(0.048)		(0.047)	(0.051)		(0.050)	(0.070)		(0.072)
CIR	-0.049***		-0.054***	-0.035***		-0.038***	-0.026***		-0.027***
	(0.005)		(0.005)	(0.005)		(0.005)	(0.004)		(0.004)
ORTHOLNTA		-0.268***			-0.485***			-0.412**	
		(0.075)			(0.120)			(0.204)	
EQTA	0.059***	0.095***	0.050***	0.069***	0.112***	0.068***	0.060***	0.090***	0.062***
	(0.012)	(0.013)	(0.011)	(0.013)	(0.015)	(0.013)	(0.009)	(0.014)	(0.009)
NPL	-0.053***	-0.113***	-0.030	-0.042**	-0.078***	-0.027	-0.027**	-0.059***	-0.021
	(0.019)	(0.021)	(0.019)	(0.017)	(0.016)	(0.017)	(0.012)	(0.018)	(0.013)
LDR	0.004*	0.006**	0.002	0.005**	0.006**	0.004*	0.009***	0.011***	0.008***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
SOB	2.004***	3.167***	2.065***	2.631***	3.865***	2.754***	0.883***	1.677***	0.999***
	(0.205)	(0.259)	(0.191)	(0.361)	(0.473)	(0.335)	(0.309)	(0.342)	(0.294)

Table 4. (Continued)

	1	2	3	4	5	6	7	8	9
FOB	-1.799***	-1.547***	-0.808**	-1.596***	-0.901*	-0.762*	-1.517***	-0.200	-1.112**
	(0.269)	(0.334)	(0.323)	(0.416)	(0.334)	(0.443)	(0.486)	(0.670)	(0.529)
LISTED	-0.178	-0.058	0.086	-0.038	0.361	0.088	-0.436**	0.008	-0.341
	(0.207)	(0.306)	(0.209)	(0.284)	(0.344)	(0.279)	(0.215)	(0.258)	(0.218)
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	Included	Included	Included	Included	Included	Included	Included	Included	Included
Method	Pooled	Pooled	Pooled	Panel (Random effect/GLS)	Panel (Random effect/GLS)	Panel (Random effect/GLS)	GMM	GMM	GMM
Observations	617	617	617	617	617	617	554	554	554
Overall R-squared	0.678	0.510	0.692	0.647	0.478	0.663			
R-Squared between				0.728	0.560	0.752			
R-Squared within				0.271	0.171	0.281			
Wald Test				chi2(19)= 462.59 (0.000)***	chi2(18)= 227.40 (0.000)***	chi2(19)= 513.87 (0.000)***	chi2(19)= 881.34 (0.000)***	chi2(18)= 842.04 (0.000)***	chi2(19)= 953.44 (0.000)***
Sargan Test							chi2(32)= 38.45 (0.201)	chi2(32)= 38.45 (0.201)	chi2(32)= 39.08 (0.181)
Arellano–Bond test for AR(1)							N(0, 1)= -3.341 (0.001)***	N(0, 1)= -3.495 (0.000)***	N(0, 1)= -3.376 (0.001)***
Arellano–Bond test for AR(2)							N(0, 1)= -0.029 (0.977)	N(0, 1)= -0.902 (0.367)	N(0, 1)= -0.030 (0.976)

Table 5: Robustness Check – alternative measure of market structure

This table presents the results of pooled regression (column 1, 2 and 3), random effect panel data (column 4, 5 and 6), and two-step GMM estimation (column 7, 8 and 9). The dependent variable is net interest margins (NIM, presenting in percentage). SMALL is the proportion of small scale loans to total loans (%). PROPERTY is the proportion of property loans to total loans (%). HHI is the Herfindahl Hirschman Index. DIV is the diversification index (%). OVERHEAD is the ratio of operating costs to total assets (%). CIR is the cost to income ratio (%). ORTHOLNTA denotes the natural logarithm of total assets orthogonalized with equity. EQTA is the ratio of equity to total assets (%). NPL is the ratio of non-performing loans to total loans (%). LDR represents the loans to deposits ratio (%). SOB is the dummy variable for state-owned banks. FOB represents the dummy variable for foreign banks. LISTED is the dummy variable for publicly traded banks. The values in parentheses are standard errors. *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Net Interest Margin (NIM)								
	Pooled			Random Effect			GMM		
	1	2	3	4	5	6	7	8	9
NIM (t-1)							0.407***	0.449***	0.419***
							(0.030)	(0.040)	(0.031)
SMALL	0.010**	0.009*		0.013***	0.010**		0.008*	0.007	
	(0.004)	(0.005)		(0.004)	(0.005)		(0.004)	(0.005)	
PROPERTY	-0.039***	-0.044***	-0.037***	-0.015	0.004	-0.013	-0.001	0.016	-0.001
	(0.009)	(0.011)	(0.009)	(0.012)	(0.014)	(0.012)	(0.014)	(0.015)	(0.014)
HHI	0.114	-0.021	0.097	0.172**	-0.012	0.181**	0.092*	-0.021	0.114**
	(0.078)	(0.097)	(0.076)	(0.070)	(0.082)	(0.068)	(0.049)	(0.066)	(0.049)
DIV			-0.048***			-0.047***			-0.014*
			(0.009)			(0.010)			(0.008)
OVERHEAD	0.844***		0.866***	0.549***		0.571***	0.367***		0.358***
	(0.049)		(0.048)	(0.051)		(0.051)	(0.068)		(0.070)
CIR	-0.053***		-0.058***	-0.035***		-0.039***	-0.028***		-0.029***
	(0.005)		(0.005)	(0.005)		(0.005)	(0.004)		(0.004)
ORTHOLNTA		-0.222***			-0.501***			-0.338*	
		(0.076)			(0.125)			(0.200)	
EQTA	0.056***	0.094***	0.047***	0.070***	0.114***	0.069***	0.061***	0.092***	0.065***
	(0.012)	(0.014)	(0.012)	(0.013)	(0.015)	(0.013)	(0.010)	(0.014)	(0.009)
NPL	-0.045**	-0.109***	-0.022	-0.038**	-0.075***	-0.023	-0.028**	-0.064***	-0.023*
	(0.019)	(0.022)	(0.019)	(0.017)	(0.016)	(0.017)	(0.012)	(0.019)	(0.013)
LDR	0.004*	0.007**	0.002	0.004*	0.005*	0.003	0.009***	0.012***	0.008***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
SOB	2.118***	3.355***	2.203***	2.705***	3.963***	2.844***	1.037***	1.893***	1.177***
	(0.205)	(0.261)	(0.191)	(0.361)	(0.500)	(0.341)	(0.297)	(0.343)	(0.283)

Table 5. (Continued)

	1	2	3	4	5	6	7	8	9
FOB	-1.738***	-1.435***	-0.791**	-1.557***	-0.817	-0.723*	-1.327***	-0.193	-1.028*
	(0.271)	(0.339)	(0.328)	(0.418)	(0.558)	(0.450)	(0.500)	(0.631)	(0.542)
LISTED	-0.154	-0.119	0.095	-0.040	0.373	0.089	-0.336	0.089	-0.256
	(0.210)	(0.311)	(0.212)	(0.286)	(0.346)	(0.282)	(0.209)	(0.245)	(0.213)
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	Included	Included	Included	Included	Included	Included	Included	Included	Included
Method	Pooled	Pooled	Pooled	Panel (Random effect/GLS)	Panel (Random effect/GLS)	Panel (Random effect/GLS)	GMM	GMM	GMM
Observations	617	617	617	617	617	617	554	554	554
Overall R-squared	0.670	0.491	0.683	0.639	0.466	0.663			
R-Squared between				0.73	0.546	0.752			
R-Squared within				0.266	0.170	0.281			
Wald Test				chi2(18)= 452.75 (0.000)***	chi2(17)= 210.67 (0.000)***	chi2(18)= 493.07 (0.000)***	chi2(18)= 897.39 (0.000)***	chi2(17)= 734.27 (0.000)***	chi2(18)= 950.37 (0.000)***
Sargan Test							chi2(32)= 40.10 (0.154)	chi2(32)= 40.51 (0.144)	chi2(32)= 41.23 (0.127)
Arellano–Bond test for AR(1)							N(0, 1)= -3.327 (0.001)***	N(0, 1)= -3.497 (0.000)***	N(0, 1)= -3.392 (0.001)***
Arellano–Bond test for AR(2)							N(0, 1)= -0.067 (0.947)	N(0, 1)= - 1.006 (0.314)	N(0, 1)= -0.071 (0.943)