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Market power, credit risk, revenue diversification and bank stability in selected ASEAN countries

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Abstract: **This paper investigates the effects of market power on credit risk, revenue diversification and bank stability in selected Association of Southeast Asian Nations (ASEAN) member countries (Indonesia, Malaysia, the Philippines, Thailand and Vietnam) using a sample of 153 commercial banks during 1998–2010. The authors find that bank market power is positively associated with credit risk and revenue diversification. Nevertheless, these associations diminished during the global financial crisis (GFC), implying that banks with greater market power have been better able to manage their non-performing loans during the crisis period. Bank stability, however, is not associated with market power. Instead, it is found to be a negative function of state ownership, asset composition and banking freedom. Overall, even though ASEAN banks with greater market power have higher credit risk, they are more diversified, thus leaving their overall bank risk unaffected.**

Keywords: **market power; credit risk; bank stability; revenue diversification; ASEAN**

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The Asian financial crisis (AFC), which originated in Thailand in July 1997, affected the regional economies and destabilized their financial service industries. In particular, banks faced increased foreign debt as currencies were devalued, lenders lost confidence in investing due to a sharp drop in savings, and fear of bankruptcy was widespread. The initial priorities in dealing with the crisis were to alleviate fears of financial system collapse and to restore confidence in economic management. Specific measures were taken by Association of Southeast Asian Nations (ASEAN) member countries to restrict banks' risk-taking behaviour and restructure their respective banking systems. At the country level, emergency measures such as the introduction of blanket guarantees and measures to deal with value-impaired assets were introduced. These were accompanied by comprehensive bank restructuring programmes supported by macroeconomic stabilization policies (Thoraneenitiyan and Avkiran, 2009).

Bank lending practice in ASEAN countries has traditionally relied on collateral rather than credit assessment and cash flow analysis. Thus, banks were especially

vulnerable to excessive risk taking and decline in asset values during the crisis (Carl-Johan *et al*, 1999). For example, as credit growth slowed, banks were exposed to high loan risk as their ability to be selective in lending was diminished. Moreover, new loan contracts were influenced by sharply increasing non-performing loans, loan-loss provisioning needs, declines in collateral values and eroding capital bases (Corsetti *et al*, 1999).

The regulatory and restructuring measures undertaken during and after the AFC focused primarily on discouraging banks from taking excessive credit risk, ensuring banks reduced their exposure levels by diversifying revenue sources and promoting the overall health of banks and their systems. Given this policy direction, this paper investigates, post-AFC, whether those ASEAN banks with greater market power (1) have a lower credit risk, (2) earn higher non-interest income from revenue diversification,[1] and (3) have lower overall bank risk (hence, greater stability). Investigating such impacts is important because market power should help banks to 'cherry-pick' low-risk customers, identify new fee-based and commission-based revenue growth opportunities and afford them greater bargaining capacity in contract creation.

The current literature lacks clear and robust evidence on bank market power in ASEAN countries and its impact on credit risk, revenue diversification and bank risk. Such regional focus should prove important as ASEAN countries advance intra-regional trade and economic agreements. Our sample, therefore, consists of 153 commercial banks operating in five ASEAN countries (Indonesia, Malaysia, the Philippines, Thailand and Vietnam). Based on initial data analysis and diagnostic testing, System Generalized Method of Moments (SGMM) estimators are obtained for 1998–2010 capturing both AFC- and GFC-affected periods.

This paper contributes to the literature by gauging, for the first time, the ability of ASEAN banks with greater market power to exploit the ex post AFC regulatory focus and emphasis (lower credit risk, revenue diversification and lower overall bank risk). This is achieved by utilizing annual bank-level market power proxies (as derived by Turk-Ariss, 2010) in place of widely used industry-level competition measures which are assumed to be common to all banks in an industry in a given period. Furthermore, multiple proxies are utilized in all models to ensure the robustness of our findings.

The research issues addressed here are worthy of investigation for a number of reasons. First, regulators can understand whether broader policy directives aimed at ensuring improved bank risk management and revenue diversification should accommodate bank-level market power differences in loan and deposit market segments. Second, our findings should inform bankers and regulators of the dichotomy between credit risk and overall bank risk, given bank revenue diversification strategies. Third, the regional focus of the analysis will help ASEAN in future policy formulation involving credit risk, revenue diversification and overall bank risk, given the varying market power at bank level in the region.

The following section provides a brief review of related literature and derives hypotheses from it.

[1] By revenue diversification, we mean directing resources from traditional sources of interest revenue (lending) and towards activities that generate fee income, commission income, trading revenue and other types of non-interest income (Perera *et al*, 2010).

Hypotheses

Previous work on bank market power and competition reflects two opposing views: (1) 'competition fragility' and (2) 'competition stability'. The former postulates that more competition corrodes market power, decreases profit margins and results in reduced franchise value for banks (Berger *et al*, 2008; Demsetz and Strahan, 1997; Keely, 1990). Banks are therefore encouraged to reduce capital and/or increase the average credit risk of their loan portfolios to maintain the expected asset values. These measures increase the banks' insolvency risk and threaten financial system stability (Berger *et al*, 2009; Jimenez *et al*, 2010; Keely, 1990; Schaeck *et al*, 2006). For example, Keely (1990) found that increased bank market power and deregulation in the USA in the 1980s eroded monopoly rents and resulted in a stream of bank failures. Similar results were observed in Spain where bank market power was associated with a higher-risk loan portfolio (Jimenez *et al*, 2010). Hellmann *et al* (2000) observe bank 'moral hazard' behaviour when interest ceilings on deposit are removed, while Agoraki *et al* (2011) show that non-performing loans decrease with a rise in the degree of bank market power in loan markets.

In contrast, the 'competition-stability' view argues that greater market power (resulting from less competitive markets) increases bank risk due to higher lending rates (Beck *et al*, 2006). These inflated loan prices make it harder for borrowers to repay, and instead encourage investing in riskier projects (Boyd and De Nicolo, 2006). Also, due to adverse selection, higher risks may result due to the select set of borrowers. Schaeck *et al* (2006) show that more competitive banking systems have a lower probability of failure, are more stable and have longer distances to default. They find that non-performing loans decrease with a rise of market power in the loan market, thus promoting financial stability.

Alternatively, Berger *et al* (2009) have investigated this research proposition using a sample of 8,255 banks from 23 developed nations, and suggest a U-shaped relationship between market power and bank stability. Accordingly, even if less market power results in a riskier set of loans, overall bank risk may not increase. Through application of risk mitigation techniques (such as increasing equity capital, sales of loans, sales of credit derivatives, etc), a bank can still choose a lower overall risk for itself while maintaining a riskier loan portfolio associated with higher lending rates. Liu *et al* (2012) provide European evidence that through sustainable risk mitigation tools, overall risk level can be managed.

We argue that Berger *et al*'s (2009) findings may not be applicable in developing ASEAN banking markets. For example, banks in ASEAN countries are subject to close supervision by respective central banks, and most of the larger, dominant banks are state-owned. These dominant banks are 'protected' from direct competition through discriminatory policies against foreign banks (Mohamed and Luc, 2009), and may therefore have the endemic ability to cherry-pick low-risk customers. Thus, given these competitive dynamics, to the extent that ASEAN banks with market power cherry-pick credit risk, we expect a negative association between bank market power and bank credit risk. The formal hypothesis is stated as follows:

H1: Bank market power is inversely associated with credit risk after controlling for other bank-specific and external characteristics.

Moreover, we argue that market power affords banks greater bargaining capacity in contract creation and helps identify new fee-based and commission-based revenue growth opportunities. Previous research (Deyoung and Roland, 2001; Lepetit *et al*, 2008a) has found that market power leads to changes in banks' income structure by reducing the importance of their traditional business lines. Authors assert that banks' emphasis on non-interest income is inevitable due to deregulation and the need to manage exposure levels. Other extant work focuses on the association between non-interest income and bank size (Deyoung and Roland, 2001; Rogers and Sinkey, 1999), net interest margins (Lepetit *et al*, 2008b), bank technology (Carbó and Fernández, 2007; Deyoung and Roland, 2001) and efficiency (Lozano and Pasiouras, 2010).

The existing works are, however, silent on the association between bank market power and revenue diversification in ASEAN countries. Arguably, revenue diversification prospects may be relatively restricted due to the lack of fee and commission-based products and the strict regulatory environment in ASEAN countries. Despite this, we anticipate a positive association between market power (in traditional loan and deposit markets) and revenue diversification, to the extent that the former helps banks to exploit new and existing non-interest income-generating opportunities (Baele *et al*, 2007; Nguyen *et al*, 2012b). Thus, the formal hypothesis is as follows:

> *H2:* Bank market power is positively associated with revenue diversification after controlling for other bank-specific and external characteristics.

Two previous studies by Molyneux and Nguyen-Linh (2008) and Soedarmono *et al* (2011) investigate the effect of market power on bank stability in selected Asian countries. Both find that bank market power does not erode bank stability. We reinvestigate the issue because the methods utilized in those studies did not consider possible endogeneity issues, and also their sample did not cover both AFC and GFC periods. Thus, to the extent that market power helps banks to cherry-pick low-risk loans (Liu *et al*, 2011) and exploit existing opportunities to diversify their revenue sources, then such dominant banks should be characterized by greater stability (Liu *et al*, 2012). Therefore, we expect a positive association between market power and bank stability. The formal hypothesis is as follows:

> *H3:* Market power is positively associated with bank stability after controlling for other bank-specific and external characteristics.

The following section details sample selection and empirical methods utilized to test the three hypotheses mentioned above.

Sample

The sample consists of 153 commercial banks operating in five ASEAN countries (Indonesia, Malaysia, the Philippines, Thailand and Vietnam) over the period 1998–2010.[2] We exclude investment banks, savings banks, cooperative banks and other non-bank financial intermediaries (insurance companies, mortgage houses, etc),

[2] The other five ASEAN members are excluded: Singapore due to accounting report date mismatch; Cambodia due to prohibitions on non-interest income activities (Barth *et al*, 2009) and Brunei, Laos and Myanmar due to lack of bank-specific data.

since they are subject to different regulatory requirements from those applied to commercial banks (Perera *et al*, 2007). In the case of mergers and acquisitions, we treat targets and acquirers separately as long as data are reported separately. If a non-bank acquirer is involved and unconsolidated data are not available after a merger, then the target firm is excluded from the sample (Nguyen *et al*, 2012a). To avoid survivorship bias, unbalanced bank-specific panel data are used to cover as many banks as possible within the sample period.

The sample is constructed using several data sources. Unconsolidated bank-level data are taken from the BankScope database published by Fitch Ratings and Bureau van Dijk. The Index of Economic Freedom (IEF) is collected from the Heritage Foundation and the *Wall Street Journal*.

There were 272 licensed commercial banks listed in central bank annual reports of the selected countries as of December 2010. BankScope, however, only covers 253 commercial banks. The sample is also filtered by excluding 68 banks with fewer than three consecutive yearly observations (Nguyen *et al*, 2012b) or when data on major variables (such as non-performing loans, share of non-interest income and off-balance-sheet activities) are not available. Among these 68 banks, 54 are foreign bank branches operating in ASEAN countries. These banks do not produce separate detailed financial statements, and only consolidate their results with parent companies. A further 32 banks whose reporting dates were different from the majority in the sample were deleted. Thus, our final sample consists of 153 commercial banks.

Table 1 summarizes the composition of the sample by country and ownership form. Of the 153 banks included in the final sample, Indonesia has the largest number, accounting for 43.79% of the total, followed by Vietnam (17.64%), Malaysia (16.99%), Thailand (13.72%) and the Philippines (7.84%). In terms of ownership forms, the majority of sample banks in all five countries are domestically

Table 1. Sample selection and breakdown by country and ownership form.

Panel A: Sample selection

	Number
Total number of licensed commercial banks in selected ASEAN countries	272
Exclude: banks without unconsolidated data in BankScope	19
Exclude: banks without data for three consecutive years	68
Exclude: banks with mismatched reporting dates	32
Final sample of banks	*153*
Total bank-year observations	*1,877*

Panel B: Breakdown of banks by country and ownership form

Country	**Indonesia**	**Malaysia**	**The Philippines**	**Thailand**	**Vietnam**
Number of banks	67	26	12	21	27
State-owned	3	0	1	2	3
Privately owned	64	26	11	19	24
Foreign-owned	16	13	6	6	0
Domestically owned	51	13	6	15	27
Listed	22	5	8	10	2
Not listed	45	21	4	11	25

Source: Compiled by the authors.

and privately owned. Overall, the sample consists of 1,877 bank-year observations.

Empirical model

To estimate the effects of market power on credit risk, revenue diversification and bank stability, we employ Generalized Method of Moments (GMM) estimators consistent with Berger *et al* (2009) and Schaeck *et al* (2006). The Breusch-Pagan/Cook-Weisberg tests show that variables are heteroskedastic since their variances are not constant over time. Thus, we employed White diagonal standard errors adjustment (White, 1980) to correct the *p*-values obtained from GMM regressions. Our approach is more efficient than two-stage least squares (2SLS), since it accounts for heteroskedasticity and does not require distributional assumptions on the error terms (Hall, 2005).

While constructing our model, we consider the possible effects among three dependent variables (credit risk, revenue diversification and overall bank risk), and hence, use them in a system of equations. To illustrate, overall bank risk is a partial function of credit risk (along with various other types of risks including liquidity risk, funding risk, portfolio risk, etc). Likewise, fee and commission income can bring diversification benefits, thereby impacting on bank stability. Thus, to account for the intra-effects among these three dependent variables, we employ system GMM following Ataullah and Le (2006). The specific model is given below, while Table 2 defines its variables:

$$\sum_{q=1}^{Q} Y_{ijt} = \alpha_0 + \beta MP_{ijt} + \rho(AFC * MP_{ijt}) + \sigma(GFC * MP_{ijt}) + \sum_{n=1}^{N} \gamma_k B_n + \sum_{x=1}^{X} \delta_p C_x + \varepsilon_{ijt}, \quad (1)$$

where subscripts *i* denote individual banks, *j* countries, *t* time horizon and q, n and x index the variables Y, B and C respectively. Y is the vector of dependent variables that represents non-performing loans (NPL) for *H1*, share on non-interest income (NII/TI) for *H2*, and Z-index for *H3*. The intercept α is a constant, and MP represents bank market power; the Lerner index (CLL and FLL) and bank size (SIZE) are used as proxies for market power. Bank-specific and country-specific variables are denoted by two vectors, B and C respectively. AFC and GFC are two dummy variables representing the two crisis-affected periods. β, ρ, σ, γ and δ are parameters to be estimated and ε denotes a random error term. Two interaction terms (AFC * MP) and (GFC * MP) are included to capture how the association between bank market power and the dependent variables has changed during AFC- and GFC-affected periods respectively.

We utilize the ratio of loan loss provision to loans (NPL) as a proxy for credit risk (Rogers and Sinkey, 1999). The ratio of non-interest income to total income (NII/TI) is used as a proxy for revenue diversification (Maudos and Fernández, 2004). The Z-index, which combines leverage, profitability and profit volatility, is employed as the measure of bank stability (Berger *et al*, 2009; Boyd *et al*, 2006; De Nicolo and Loukoianova, 2007) and is calculated as follows:

$$Z_i = \frac{ROA_i + \frac{E}{TA_i}}{\sigma_{ROA_i}}, \quad (2)$$

where ROA_i represents period-average return on assets for bank *i*, E/TA is the period-average equity to total assets ratio for bank *i* and σ_{ROA} is the standard deviation of return on assets (ROA) for bank *i*.

Measure of bank market power

We utilize the Lerner index as the proxy for bank market power (Nguyen *et al*, 2012b; Turk-Ariss, 2010), which is more informative than market concentration measures (Jimenez *et al*, 2010; Maudos and Fernández, 2004). It captures the deviation of price from a bank's marginal cost and is computed as follows:

$$\text{Lerner}_{it} = \frac{(P_{it} - MC_{it})}{P_{it}}, \tag{3}$$

where *P* is the price of total assets proxied by the ratio of total revenues to total assets and *MC* is the marginal cost of total assets. *MC* is derived using Berger *et al* (2009) and Turk-Ariss (2010) methodology.

In addition to Lerner indices, we utilize bank size (SIZE) (Berger *et al*, 2009; Mohamed and Luc, 2009; Molyneux and Nguyen-Linh, 2008; Ruby and Opiela, 2000; Todd *et al*, 1999; Yildirim and Philippatos, 2007) as a proxy for market power. It is argued that bank size is an alternative measure of bank market power since, the larger a bank, the more powerful it usually is.[3] To the extent that size reflects bank dominance and the ability to be selective in a lending market (Schaeck *et al*, 2006), SIZE reflects market power.

Control variables

Based on the existing literature, asset composition (AC) (Ahmad *et al*, 2008; Beck *et al*, 2006; Binici *et al*, 2010; Boyd *et al*, 2006; Jacques, 2008; Laeven and Levine, 2009; Stijn and Laeven, 2004), state ownership dummy (SO) (Berger *et al*, 2008, 2009; Cole, 2009; Haselmann *et al*, 2009; Lu *et al*, 2012; Luo *et al*, 2011), foreign ownership dummy (FO) (Berger *et al*, 2009; Bertus *et al*, 2008; Epstein, 2011; Gormley, 2010; Lee *et al*, 2011; Lensink *et al*, 2008), banking freedom (BF) (Nguyen *et al*, 2012b; Santiago *et al*, 2009) and corruption level (CS) (Barth *et al*, 2009; Weill, 2011) are utilized as control variables in Equation (1). We also include two additional dummy variables to capture the effects of Asian (AFC) and global (GFC) financial crises.

With regard to NPL (associated with *H1*), foreign ownership dummy (FO), banking freedom (BF) and corruption level (CS) are expected to have negative coefficients. Foreign banks should be exposed to lower NPLs due to their superior credit assessment, monitoring capacity and operational independence (Berger *et al*, 2009; Bertus *et al*, 2008). BF indicates the banking system's openness to foreign bank entry and operations as well as governments' influence over bank asset allocation. Greater banking freedom (BF) means more operational flexibility in loan contract creation, resulting in lower non-performing assets (Mercieca *et al*, 2007). Likewise, more corruption (that is, lower CS values)[4] will lead to

[3] We thank an anonymous reviewer for this insightful addition to our work.

[4] Corruption score (CS) signifies the transparency of competitive atmosphere where the banks operate. This index sketches a country's overall level of accountability and trustworthiness towards a sound financial system where higher values indicate less corruption (Pasiouras, 2008).

Table 2. Definition of variables.

Panel A: Dependent variables	Definition	Source
Credit risk (NPL)	Bank-level ratio of non-performing loans to total loans	BankScope
Revenue diversification (NII/TI)	Bank-level non-interest income to total income ratio	BankScope
Bank stability (Z-index)	Bank-level Z-index as given in Equation (2)	BankScope
Panel B: Bank-specific variables		
Conventional Lerner index (CLL)	As defined in Equation (3) (reflects bank's ability to price above its marginal costs)	BankScope
Fund-adjusted Lerner index (FLL)	Improved version of CLL as defined in Equation (6)	BankScope
Bank size (SIZE)	The log value of total assets	BankScope
Asset composition (AC)	Net loans to total assets	BankScope
Foreign-owned (FO)	A dummy variable that takes the value of 1 for banks that are 50% or more foreign-owned	BankScope
State-owned (SO)	A dummy variable that takes the value of 1 for banks that are 50% or more state-owned	BankScope
Growth rate of bank size (GRSZ)	Change in the bank size in a year as a percentage of previous year's bank size	Compiled by authors
Panel C: Country-specific variables		
Banking freedom (BF)	An index ranging from 1 to 100 (higher values indicating more banking freedom)	Index of Economic Freedom
Corruption level (CS)	An index varying from 1 to 100 (higher values indicating less corruption)	International financial statistics
Asian financial crisis (AFC)	Take value of 1 for crisis years (1998–1999) and 0 otherwise	
Global financial crisis (GFC)	Take value of 1 for crisis years (2007–2010) and 0 otherwise	

bank inefficiency, thereby increasing NPLs (Jacobson and Roszbach, 2003). Coefficients of asset composition (AC) and state ownership (SO) are expected to be positive. The greater the exposure to loan assets (AC, measured as the ratio of loans to total assets), the higher the expected loan losses (NPL measured as the ratio of non-performing loans to total assets) (Laeven and Levine, 2009; Peek and Rosengren, 1995).

With regard to the association between control variables and revenue diversification (NII/TI, associated with *H2*), the following *a priori* expectations are put forward. Positive coefficients are expected for state ownership (SO) and banking freedom (BF) variables. State-owned banks (SO) have better opportunities to diversify due to government support and sponsorship, and this is particularly true in ASEAN where regulators responded to the AFC by nationalizing banks (Williams and Nguyen, 2005). State-owned banks may also be forced to lend to certain sectors or industries to fulfil political objectives, rather than solely on commercial grounds (Sapienza, 2002). Their customer base is, therefore, relatively larger than that of privately owned banks, possibly resulting in higher non-interest income. Greater banking freedom (BF) will encourage banks to operate freely in the market, thus providing enhanced scope for revenue diversification (Mercieca *et al*, 2007). It is expected that more banking freedom enables banks to be more diversified (Lepetit *et al*, 2008b). In contrast, negative coefficients are expected for asset composition (AC) and AFC and GFC dummy variables. Banks with higher loans to total assets ratios (AC) should have lower shares of non-interest income, since their resource allocation is skewed towards interest income (Ruby and Opiela, 2000). To the extent that banks refocus and concentrate on their core lending function during crisis periods, AFC and GFC should be negatively associated with NII/TI.

With regard to bank stability (Z-index, associated with *H3*), the foreign ownership dummy (FO) and corruption level (CS) are expected to have negative coefficients. Lower corruption will promote greater bank stability. Positive coefficients are expected for state ownership (SO) and banking freedom (BF) variables. More banking freedom will enhance possibilities to adopt various risk mitigation methods to foster stability.

The following section reports and discusses the key findings that have been obtained from model estimation.

Results

The correlation matrix for regression variables utilized in Equation (1) is provided in Table 3. The regression results pertaining to *H1 H2* and *H3* are presented in Tables 4, 5 and 6. Bank market power is proxied by the conventional Lerner index (CLL) in Table 4, fund-adjusted Lerner index (FLL) in Table 5, and bank size (SIZE) in Table 6. The reported *t*-statistics are corrected for heteroskedasticity using White diagonal standard errors adjustment (White, 1980).

Association between bank market power and credit risk

Our consistent results indicate that ASEAN banks with more market power had greater credit risks. This is evident in positive and significant coefficients obtained

Table 3. Correlation matrix (continued on next page).

	NPL	ZI	NII/TI	CLL	FLL	SIZE	AFCCLL	GFCCLL
NPL	1	–0.2244	–0.1810	0.1563	–0.1831	0.1665	0.1534	–0.0596
ZI	–0.2465	1	0.1321	0.0302	0.0809	–0.3172	0.0698	0.1089
NII/TI	–0.0579	0.1030	1	–0.0093	0.1703	–0.1752	–0.0217	0.0136
CLL	0.1619	0.0264	–0.1065	1	0.7052	0.3378	0.1355	0.3201
FLL	–0.0676	0.0668	0.0183	0.6811	1	0.4563	0.0716	0.2090
SIZE	0.1253	–0.3678	–0.0734	0.2191	0.3846	1	–0.2306	–0.0047
AFCCLL	0.2000	0.0394	–0.0118	0.0140	–0.1152	–0.1082	1	–0.0524
GFCCLL	0.1275	0.0837	–0.1979	0.2761	–0.0648	0.1170	–0.0845	1
AFCFLL	0.2015	0.0366	–0.0123	0.0133	–0.1147	–0.1075	0.9998	–0.0848
GFCFLL	–0.2629	0.1781	0.1325	–0.1267	0.2111	–0.0506	–0.1546	0.5074
AFCSIZE	0.0316	0.0750	–0.0105	0.0480	–0.0398	–0.1539	0.4843	–0.0275
GFCSIZE	0.1369	0.0477	–0.2022	0.1128	–0.1932	0.0793	–0.0300	0.6515
AC	–0.0160	–0.2735	–0.0848	–0.0705	–0.0900	0.1188	–0.1091	0.0348
SO	0.0705	–0.1926	–0.1319	–0.0631	–0.0811	0.2243	–0.0283	0.0262
FO	–0.0124	–0.1119	–0.2226	0.0936	0.2300	0.0563	–0.0416	0.0597
BF	0.1408	–0.2787	0.0301	–0.2945	–0.3230	0.4206	0.0855	0.1934
CS	0.0004	–0.0799	0.0708	–0.5747	–0.7079	0.4535	0.1817	0.0291

Note: The top right diagonal reports Spearman correlation matrix and the lower left diagonal reports Pearson correlation matrix. NPL = non-performing loan, ZI = Z-index, NII/TI = non-interest income/total income, CLL = conventional Lerner, FLL = fund-adjusted Lerner, SIZE = bank size, AFC = Asian financial crisis, GFC = global financial crisis, AFCCLL = (AFC*CLL), GFCCLL = (GFC*CLL), AFCFLL = (AFC*FLL), GFCFLL = (GFC*FLL), AFCSIZE = (AFC*SIZE), GFCSIZE = (GFC*SIZE), AC = asset composition, SO = state-owned banks, FO = foreign-owned banks, BF = banking freedom, CS = corruption score.

for all market power proxies (CLL: column 1, Table 4; FLL: column 1, Table 5; and SIZE: column 1, Table 6), indicating that dominant banks with greater market power had risky loan portfolios. Thus, *H1* is not supported.

However, this observed positive association between bank market power and credit risk has diminished during the GFC period, implying that banks with more market power have performed better in recovering non-performing loans. This is evidenced by the negative and statistically significant (at the 1% level) coefficients for (GFC*conventional Lerner), (GFC*fund Lerner) and (GFC*bank size) variables (column 1, Tables 4, 5 and 6 respectively). This seems to be a lesson dominant banks have learnt following large loan losses incurred during the AFC, as reflected by AFC interaction variables (AFC*conventional Lerner) and (AFC*fund Lerner).

One of the reasons behind such losses may be the higher unavoidable fixed costs associated with the lending process, which banks failed to manage during the AFC (Okuda and Hashimoto, 2004). Our findings are consistent with Okuda and Hashimoto (2004), who showed that during the AFC, economies of scale did exist for larger banks with more market power.

Not surprisingly, banks with greater exposure to loan assets (as reflected in loans to total assets ratio (AC)) have more loan losses. Similar findings have been reported by Bikker and Haaf (2002). Banking systems characterized by less corruption (reflected in higher values for CS variable) have lower credit risk and loan losses. Arguably, this signifies the high loan risk that results due to distortions introduced by politically driven loan provisions and channelling of funds (Barth *et al*, 2009; Weill, 2011).

Consistent results are also obtained for FO variables. Compared with their

AFCFLL	GFCFLL	AFCSIZE	GFCSIZE	AC	SO	FO	BF	CS
0.1482	–0.3994	0.0667	0.3788	0.4452	0.0702	–0.0016	0.1674	0.0733
0.0540	0.1618	0.0224	0.0223	–0.1958	–0.2058	–0.1040	–0.2433	0.0095
–0.0192	0.1712	–0.0271	–0.2259	0.0862	–0.1060	–0.1619	0.0029	0.0441
0.1545	–0.0264	0.0396	0.2719	–0.0636	–0.0904	0.0801	–0.3203	–0.5388
0.1089	0.3886	0.0095	–0.2462	–0.0255	–0.1448	0.1523	–0.3283	–0.6505
–0.2364	–0.1031	–0.0955	–0.0068	0.1219	0.2170	0.0497	0.4018	0.4075
0.9831	–0.0841	0.3862	0.0723	–0.0769	–0.0501	–0.0124	–0.0535	0.0523
–0.0415	0.7138	0.0538	0.2524	–0.0789	–0.0307	0.0454	0.1533	–0.1059
1	–0.0714	0.3715	0.0725	–0.0750	–0.0429	0.0026	–0.0831	0.0065
–0.1549	1	0.0259	–0.3050	–0.0255	–0.1010	0.0561	0.0914	–0.1230
0.4807	–0.0619	1	0.1206	–0.0742	–0.0276	–0.0254	–0.0133	0.0449
–0.0302	0.1668	–0.0016	1	–0.0818	0.0303	0.0596	0.0595	0.0054
–0.1071	0.0460	–0.1861	0.0327	1	0.0222	0.0708	0.1465	0.0631
–0.0270	–0.0779	–0.0737	0.0077	–0.0309	1	0.1676	0.0662	–0.0383
–0.0415	0.0682	–0.1191	0.0448	0.0425	0.1676	1	–0.0024	–0.4032
0.0855	0.2106	–0.0185	0.0919	0.3220	0.0607	0.0068	1	0.4450
0.1805	0.0483	0.0990	0.0566	0.1583	–0.0023	–0.3050	0.5364	1

domestically owned counterparts, foreign-owned banks have lower non-performing loans. Arguably, foreign banks are exposed to lower NPLs due to their superior credit assessment, monitoring capacity and operational independence (Epstein, 2011; Lensink *et al*, 2008; Saunders *et al*, 1990). These results are also consistent with the 'global advantage hypothesis' (Berger and Hannan, 1998), which posits that foreign institutions with better practice and superior managerial skills are able to overcome any cross-border disadvantages and operate abroad more efficiently than domestic institutions.

The significant positive coefficients for banking freedom (BF) indicate that more operational flexibility in loan contract creation resulted in higher non-performing loans. Liu *et al* (2011) report similar findings for the European banking market. State ownership (SO) has insignificant coefficients. The coefficients for SO may be driven by the fact that most large banks in ASEAN countries are state-owned. Thus, state ownership may already be accounted for by the scale variable (SIZE).

Association between bank market power and revenue diversification

Our estimations present positive and statistically significant coefficients for all market power proxies (CLL, FLL and SIZE respectively in column 2, Tables 4, 5 and 6) and provide strong support for *H2*. These findings indicate that market power in loan and deposit markets helps ASEAN banks to exploit growth opportunities in non-traditional markets, which in turn leads to higher income share from fee- and commission-based banking products. Our results are consistent with previous studies (Deyoung and Roland, 2001; Lepetit *et al*, 2008b), which found that increases in market power led to changes in banks' income structure by reducing the importance of their traditional business lines. Put differently, increasing bank market power in deposit and loan markets encourages banks to diversify their income-generating activities (Nguyen *et al*, 2012b).

Interestingly, this positive association has diminished during the GFC period. This is evident in the negative and statistically significant coefficients for

Table 4. System GMM estimates, using conventional Lerner as the proxy for market power.

	Credit risk 1	Revenue diversification 2	Bank stability 3
Constant	–2.5213***	0.0001	0.4911***
Conventional Lerner (CLL)	0.3051***	0.0048***	–0.2278
AFC*conventional Lerner	0.6212***	0.0061***	0.0014**
GFC*conventional Lerner	–0.1034***	–0.0015***	0.0092**
State-owned (SO)	0.1282	–0.0087**	–0.0020***
Foreign-owned (FO)	–0.2488*	–0.0007***	–0.2703
Asset composition (AC)	0.7536***	0.0059*	–0.0143***
Banking freedom (BF)	0.0113***	0.0001	–0.0023***
Corruption score (CS)	–0.0245***	0.0002**	0.0020
Adjusted R-squared	0.36	0.05	0.12
No of observations	1,877	1,877	1,877

Note: This table presents the system GMM estimates for selected ASEAN banks during 1998–2010 from the following model:

$$\sum_{q=1}^{Q} Y_{ijt} = \alpha_0 + \beta MP_{ijt} + \rho(AFC * MP_{ijt}) + \sigma(GFC * MP_{ijt}) + \sum_{n=1}^{N} \gamma_k B_n + \sum_{x=1}^{X} \delta_p C_x + \varepsilon_{ijt},$$

where, subscripts *i* denote individual banks, *j* countries, *t* time horizon. Y represents a vector of dependent variables (non-performing loans, revenue diversification and bank stability); and α is a constant, MP is the proxy for market power (conventional Lerner), B and C are vectors of bank-specific and country-specific variables, AFC and GFC are two dummy variables representing the two crisis-affected periods. β, ρ, σ, γ and δ are parameters to be estimated and ε denotes the random error term. ***, ** and * represent statistical significance at the 1%, 5% and 10% level respectively.

Table 5. System GMM estimates, using fund Lerner as the proxy for market power.

	Credit risk 1	Revenue diversification 2	Bank stability 3
Constant	–1.1902***	–0.0054	1.6966***
Fund Lerner (FLL)	0.7487**	0.0009**	–0.0382
AFC*fund Lerner	0.9579***	0.0072***	–0.0089
GFC*fund Lerner	–0.5830***	–0.0032	0.0537
State-owned (SO)	0.0290	–0.0099	–0.0059
Foreign-owned (FO)	–0.6664**	–0.0024	–0.3173
Asset composition (AC)	0.9893***	0.0064	–0.0240
Banking freedom (BF)	0.0188***	0.0007	–0.0013
Corruption score (CS)	–0.0018	0.0009***	0.0053
Adjusted R-squared	0.47	0.10	0.12
No of observations	1,877	1,877	1,877

Note: This table presents the system GMM estimates for selected ASEAN banks during 1998–2010 from the following model:

$$\sum_{q=1}^{Q} Y_{ijt} = \alpha_0 + \beta MP_{ijt} + \rho(AFC * MP_{ijt}) + \sigma(GFC * MP_{ijt}) + \sum_{n=1}^{N} \gamma_k B_n + \sum_{x=1}^{X} \delta_p C_x + \varepsilon_{ijt},$$

where subscripts *i* denote individual banks, *j* countries, *t* time horizon. Y represents vectors of dependent variables (non-performing loans, stability and revenue diversification); α is a constant, MP is the proxy for market power (fund Lerner), B and C are vectors of bank-specific and country-specific variables, AFC and GFC are two dummy variables representing the two crisis-affected periods. β, ρ, σ, γ and δ are parameters to be estimated and ε denotes the random error term. ***, ** and * represent statistical significance at the 1%, 5% and 10% level respectively.

(GFC*conventional Lerner), (GFC*fund Lerner) and (GFC*bank size) variables (in column 2, Tables 4, 5 and 6 respectively). Given the heightened uncertainty and turmoil in global financial markets during this period, ASEAN banks have apparently refocused on the core interest-based lending market.

We also find that large banks earn a higher share of non-interest income, which

is consistent with results obtained by Lepetit *et al* (2008b). This is also compatible with our results for *H2*, since large banks are usually the ones with greater market power. Also, greater banking freedom (BF) helps ASEAN banks to diversify their revenue sources and earn a higher share of fee and commission income. The coefficient for FO confirms Acharya *et al*'s (2006) finding that foreign-owned banks are more likely to experience competitive disadvantages relative to local banks.

Association between market power and bank stability

Our results present statistically insignificant coefficients for CLL, FLL and SIZE (in column 3, Tables 4, 5 and 6 respectively), suggesting that bank market power is not associated with overall bank risk in ASEAN countries. Put differently, we do not find significant evidence of association between market power and bank stability in these banking markets. Hence, *H3* is not supported.

This explains that, despite increases in market power and their effect on credit risk, the overall bank risk does not necessarily need to rise. As Berger *et al* (2009) suggest, banks with market power can protect their franchise value from higher loan risk using other risk mitigation strategies. A higher value for the Z-index may come from either more capital or higher earnings, which indicate more financial stability, while greater unpredictability in earnings reduces the Z-index and hence increases the bank's overall risk (Boyd and De Nicolo, 2006). Interestingly, our results indicate that, during the GFC, ASEAN banks were relatively more stable. This is evident in the statistically significant positive coefficients for (GFC*conventional Lerner), (GFC*fund Lerner) and (GFC*bank size) in column 3 of Tables 4, 5 and 6 respectively.

Table 6. System GMM estimates, using bank size as the proxy for market power.

	Credit risk 1	Revenue diversification 2	Bank stability 3
Constant	–3.0465***	0.0193***	1.1784***
Bank size (SIZE)	0.5122**	0.0322***	–0.6263
AFC*bank size	0.0673*	–0.0057**	–0.0297
GFC*bank size	–0.0207***	–0.0089***	0.0026***
State-owned (SO)	0.3741	–0.0103**	–0.5514***
Foreign-owned (FO)	–0.7197***	0.0012**	0.2123
Asset composition (AC)	0.7092***	0.0062	–0.0626***
Banking freedom (BF)	0.0086**	0.0001	–0.0007***
Corruption score (CS)	–0.0076**	0.0005**	0.0011***
Adjusted R-squared	0.36	0.05	0.12
No of observations	1,422	1,422	1,422

Note: This table presents the system GMM estimates for selected ASEAN banks during 1998–2010 from the following model:

$$\sum_{q=1}^{Q} Y_{ijt} = \alpha_0 + \beta MP_{ijt} + \rho(AFC * MP_{ijt}) + \sigma(GFC * MP_{ijt}) + \sum_{n=1}^{N} \gamma_k B_n + \sum_{x=1}^{X} \delta_p C_x + \varepsilon_{ijt},$$

where subscripts *i* denote individual banks, *j* countries, *t* time horizon. Y represents vectors of dependent variables: that is, non-performing loans, stability and revenue diversification; α is a constant, MP is the proxy for market power (bank size), B and C are vectors of bank-specific and country-specific variables, AFC and GFC are two dummy variables representing the two crisis-affected periods. β, ρ, σ, γ and δ are parameters to be estimated and ε denotes the random error term. ***, ** and * represent statistical significance at the 1%, 5% and 10% level respectively.

Interestingly, state-owned banks have a shorter distance to failure than their privately owned counterparts. This is so despite the fact that the former operate under government sponsorship and are protected by various policies and guarantees. Banking freedom (BF) inversely affects bank stability, and this finding is consistent with Stijn and Laeven (2004). Arguably, this is so because more banking freedom may encourage banks to reach suboptimal risk–return combinations due to lack of supervision (Beck *et al*, 2006).

Robustness tests

For the purpose of robustness, we perform several tests. To capture the possible changes in size effects during the crisis periods, we use the growth rate of bank size (GRSZ) as an alternative proxy for market power.[5] The results are available upon request from the authors. Those ASEAN banks with increased growth in size were found to be more stable, yet these banks had lower engagement in revenue diversification activities. This implies that such banks had expanded their core lending activities to sustain stability, instead of focusing on revenue diversification.

We include the bank's total equity to total assets ratio (EQUITY) as a bank-level control variable in Equation (1).[6] The expected sign of this variable is not determined *a priori*. On the one hand, the negative relationship is documented by Lepetit *et al* (2008a), who find that market power allows banks to enjoy relatively lower costs of capital. On the other hand, consumers may view banks with a lower capital ratio as 'too risky' and seek 'less risky' ones to transact business in non-traditional markets (Lepetit *et al*, 2008b; Rogers and Sinkey, 1999). The findings further confirm our main regression results for *H1*, *H2* and *H3*.

Also, we tested our results by including ratio of total cost to total income ratio (EFFICIENCY) instead of asset composition.[7] Our findings for EFFICIENCY confirm a well managed bank's ability to reduce costs and associated risks by improving its earnings capability (Elsas *et al*, 2010). The results for the three hypotheses remain consistent.

Conclusion

This paper has investigated whether those ASEAN banks with greater market power (1) have lower credit risk, (2) earn higher non-interest income from revenue diversification, and (3) have greater stability (lower overall bank risk). The sample consisted of 153 commercial banks operating in five ASEAN countries (Indonesia, Malaysia, the Philippines, Thailand and Vietnam). System Generalized Method of Moments (GMM) estimators were obtained for 1998–2010, including the periods affected by the AFC and GFC.

[5] We thank an anonymous reviewer for this insightful comment. In Equation (1), we utilized (AFC*GRSZ) and (GFC*GRSZ) to capture the impact of crises when we used growth rate of bank size as a proxy for market power.

[6] Due to high Variance Inflation Factor (VIF) values between EQUITY and SIZE, we excluded EQUITY from our main regressions.

[7] Due to high Variance Inflation Factor (VIF) values between EFFICIENCY and AC, we excluded EFFICIENCY from our main regressions.

It is found that ASEAN bank market power is positively associated with credit risk (higher NPLs) and hence *H1* is not supported. Banks with greater market power incurred greater loan losses during AFC-affected periods, but managed to avoid the same during the GFC. This finding suggests that dominant banks had more sustainable and less risky loan portfolios during GFC-affected periods. Arguably, these low loan losses were driven by these banks' ability to cherry-pick low-risk loan contracts. Also, compared with domestically owned counterparts, foreign-owned ones had lower non-performing loans. Our findings support the argument that foreign banks are exposed to lower NPLs due to their superior credit assessment, monitoring capacity and operational independence.

We found strong support for *H2* – that market power in loan and deposit markets helps ASEAN banks to earn a higher share of income from fee-based and commission-based banking products. Our results indicate that increases in market power lead to changes in banks' income structure by reducing the importance of their traditional business lines. Interestingly, ASEAN banks with greater market power had lower non-interest income shares (ratio of non-interest income to total income) during the GFC-affected period. Given the heightened uncertainty and turmoil in global financial markets during this period, ASEAN banks have refocused on the core interest-based lending market.

Our results do not support *H3* – that market power is positively associated with overall bank stability. Despite lack of support for *H3*, bank stability is found to be a negative function of state ownership, asset composition and banking freedom. Interestingly, state-owned banks are unstable and have a shorter distance to failure than their privately owned counterparts.

From a cross-country perspective, banks operating under more freedom have (1) higher credit risk (and NPLs), (2) a higher share of fee- and commission-based income, and (3) greater overall bank risk. Arguably, the latter is so because more banking freedom on activities encourages banks to invest in risky asset portfolios, thereby increasing the possibilities of higher NPL and overall risk.

Our findings for *H1* imply that banks with greater market power should be more selective in core lending practices. This will help them to control the on-balance-sheet default risk arising out of less creditworthy borrowers. With the results obtained for *H2*, if banks choose to be selective in lending, they can diversify their revenue to offset any loss of income due to reduced lending activities. Finally, findings for *H3* imply that policies and practices aimed at better managing credit risk *per se* do not ensure lower levels of overall bank risk (higher bank stability).

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