

Impact of Loan Portfolio Diversification and Income Diversification on Interest Margin in ASEAN Banking Market

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ABSTRACT

This study aims to investigate the impact of loan portfolio diversification and income diversification in ASEAN-4 banking markets. Loan portfolio diversification consists of credit to different sectors and different types of credit offered to customers. This study applied a model of bank as a dealer, initiated by Ho and Saunders (1981), and the latest developed by Maudos and Solis (2009). We employed static and also dynamic panel data using System Generalised Method of Moment (System GMM) to estimate the model. The results show a decreasing trend in banks' net interest margins, which is consistent with the increase in selling of bank non-traditional products in this market that indicates the existence of cross-subsidy in revenue from non-traditional to traditional banking products. In addition, less diversification in credit sectors positively and significantly affects net interest margin. Furthermore, we also found that lesser competition, increases interest margin. However, foreign bank penetration will end up with a significant decrease in NIM.

Keywords: ASEAN; Foreign Bank Penetration; Market Power; Loan Portfolio Diversification; Net Interest Margin; Non-Interest Income Diversification

INTRODUCTION

A seminal paper by Ho and Saunders (1981), which analytically and empirically analysed the determinant factors of net-interest margin (NIM), has become a reference paper for many scholars. Their findings showed that the intermediation spread is determined by four factors, i.e: level of risk aversion of bank management, level of market competition of the banking system, average amount of the transaction value conducted by the bank and level of interest rate risk.

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Extension of this model has been conducted by several researchers. Allen (1988), for example, considered the different types of loan portfolio in the original model, whilst money market risk as a change of interest rate risk was used by Mc Shane and Sharpe (1985); credit risk and interest rate risk are added by Angbazo (1997). Maudos and Guevara, (2004) then proposed operating costs as one of determinants of interest margin, while Valverde and Fernandez (2007) found a significant effect of non-traditional banking products in European zone when this variable was included in the model. Furthermore, the basic model from Ho and Saunders (1981) and its expansions have also been applied by several researchers to estimate empirical data from banking system in Southeast Asia (Doliente, 2003), Latin America (Brock & Suarez, 2000; Martinez-Peria & Mody, 2004; Gelos, 2006), Europe and America (Saunders & Schumacher, 2000; Claeys & Vennet, 2008).

In the recent years, non-interest income from a wider range of non-traditional banking activities emerged as an important source of revenue (Valverde & Fernandez, 2007). This type of revenue has been subsidising the declining of interest margin due to the pressure of competition and deregulations in banking. Changes in income structure, as an effect of shift into non-interest income activities and its influence to intermediation margin in European banking, were also examined by Marcieca et al. (2007) and Lepetit et al. (2008). In addition, Maudos and Solis (2009) applied an integrated model

of NIM by combining several factors which concurrently included operating cost and diversification or specialisation. Meanwhile, diversification of loan portfolios may reduce interest rate spread when cross-elasticities between products are considered (Allen, 1998). However, when McShane and Sharpe (1985) applied Allen's model, the opposite result was obtained. Some literatures have focused on the impacts of loan portfolios diversification on risk-return profile (see Acharya et al., 2006; Berger et al. (2010a, b).

This study uses an integrative model adopted from previous researchers to examine the determinants of bank margins in the banking system of ASEAN-4 (Indonesia, Malaysia, Thailand and Vietnam) since these countries have experienced some stages of banking deregulation and consolidation after or before the global financial crisis in 2008. In this context, the research focuses on the effects of diversification undertaken by banks in each country. There are few studies dedicated on analysing determinants of net interest margin in ASEAN banking. For example, Doliente (2003) applied two-step regression to analyse the basic factors explaining NIM in the region. Limited articles focus on the impacts of diversification of non-interest income and diversification of loan portfolios in the banking system of developed countries (Valverde & Fernandez, 2007; Lapetit et al., 2008; Maudos & Solis, 2009). In contrast to previous studies that emphasised more on diversification of non-interest income, in this study, we examine the impacts of credit diversification on the industrial

sector and the diversification to the type of loans granted by banks. It is expected that the findings of this research will enrich the literature related to the link between diversification on credit portfolios on sectors and types and bank intermediation margin, especially in ASEAN.

The impact of regulations and consolidation carried out by each country to bank margins vary in every country. In general, in the last seven years (2006-2012) NIM in ASEAN-4 tends to decrease. The decline is in line with the trend of increasing the portion of non-interest income. Meanwhile, the market power of bank is measured by Lerner Index has a tendency to increase, aligned with the incremental of foreign banking penetration in this region. The question is whether declining in intermediation margin can be interpreted as a result of diversification of banking products and credit? Therefore, it is interesting to further study factors influencing the level of margin apart from diversification, and if there is any impact from the decrease in degree of competition as stated in the basic model, as well as the impact of foreign bank penetration on interest margin.

Our findings suggest that diversification of non-traditional products has been applied by banks to subsidise their decreasing revenue in traditional loan products. However, less diversified banks in credit portfolio sectors enjoy higher margins because of their high skills in handling these sectors. Additionally, banks with higher market power also charge higher rate, while

penetration of foreign banks contributes in lowering intermediation margin in host country. Other factors that generally determine interest margin have expected signs, as discussed in previous literature. Credit risk, market risk, operational expenses and size of loan and liquidity have positive impacts, whereas a negative relationship is obtained for size of assets and efficiency.

The remainder of the paper is as follow. Section 2 presents a brief literature on the impact of diversification on bank's net interest margin and its determinants. Section 3 provides the research methodology, while results of the study are presented in Section 4. Lastly, conclusion of the paper in given Section 5.

LITERATURE REVIEW

Ho and Saunders (1981) found market competition affected interest margin in the American banking market. Even in a highly competitive market, interest margins will exist as long as there is uncertainty of the arrival of deposits to bank and credit demand from the debtor. Other factors influencing the interest margin are the level of risk aversion, average size of transactions and risk of interest rate. Dealership framework models of Ho and Saunders consider homogeneous portfolio of assets. Allen (1988) then considers the presence of the diversity of the loan portfolio of banks. The results showed that interest margin would decline when cross elasticity of demand for banking products were considered in the model. This study became the basis of some researchers linking diversification

factor that affects intermediation margin. In line with this, Mc Shane and Sharpe (1985) empirically examined the determinants of bank interest margin using Australian commercial bank data. Their study showed a non-linear relationship between interest margins with market power, the level of risk aversion and interest rate uncertainty. In addition, when banks diversified their credit, shifting from selling commercial loans to individual loans, it resulted in an increase in interest margin.

Valverde and Fernandes (2007) made a new contribution to the literature on the relationship between bank non-interest income products and interest margin. They took into account multi-products concepts from the bank that generates interest income and non-interest income, and found a negative and significant relationship between revenue diversification and bank margin. Diversifications of non-interest income products in European banking have increased revenues and heightened the market power of banks. Raising revenue from business shifting to non-traditional products has been conducted to cover the margin decline in interest income due to the intense competition in the traditional markets of credit and deposits. Consistence with this finding, Maudos and Solis (2009) also found cross subsidise strategy of revenues from non-traditional to traditional products in Mexico banking system, even though the impact is economically and relatively low. In line with this, Lepetit et al. (2008) also recorded that the shift in the bank's business in non-traditional products

that generate commissions and fees had reduced interest margins and credit spreads in the European banking.

In his study, Angbazo (1997) added credit risk factors, including the risk of market interest rates and off-balance sheet transactions into factors that affect net interest margin in the model. Using the American banking data in 1989 to 1993, Angbazo recorded that NIM was positively associated with the risk premium on loans and interest rates. Rising credit risk and market risk forcing banks to raise loan interest rates to compensate for losses due to non-performing loans. A study of Latin American data by Brock and Suarez (2000) shows similar results where credit risk raises the spreads even though these effects are not the same across the countries. These findings are also support by Maudos and Solis, (2009) and Maudos and de Guevara (2004), who analysed the banking system in Mexico and European Union, respectively. However, the different results obtained by Martinez-Peria and Mody (2004) in their study on Latin American banks in 1994-1999 did not show significant results on the influence of non-performing loans to the interest margin.

A declining trend in the bank interest margins in five European countries (Germany, France, Britain, Italy and Espanola) in the period of 1993-2000 motivated Maudos and De Guevara (2004) to find out factors affecting it. They took into account operating cost as one of the factors that determined the volatility in interest margin apart from the level of competition,

interest rate risk and credit risk. When the bank has a high cost in its operation, logically bank needs a high margin of interest rates to retain the profit. The study shows that the decrease in operating costs is an important factor that leads to declining margins. Consistent with these findings, Brock and Rojas (2000) also noted that the cost of banking operations, i.e. cash reserve at the central bank, was an important factor in determining the interest margin in seven Latin American countries in the mid-1990s. Furthermore, Dick (1999) also viewed significant impact on the operating costs of banking in Central American countries.

Saunders and Schumacher (2000) found that intermediation margins were affected by the level of capital, market structure and interest rate risk on banking in six developed countries in Europe and America over the period of 1988-1995. The same finding and bank's capital level are also factors affecting the level of margin in Latin American (Brock & Rojas, 2000). Additionally, Gelos (2006) examined more comprehensive determinants of the interest margin covering eighty-five countries including banks in Latin American over the period of 1999-2002. He recorded that interest margin in Latin American countries was relatively high (around 9%) compared to other countries and other regions. The high interest margin in the region was due to

the high bank interest rates, higher reserves at the central bank compared with other countries, as well as the inefficiency of the operating costs.

RESEARCH METHODOLOGY

The Empirical Model

Ho and Saunders (1981) viewed bank as a risk-averse dealer in the credit markets that act as intermediaries between depositors and borrowers. They assumed no fee for processing credits and deposits. Other assumption is single time horizon of the period, while the arrival of deposit and demand for loan is random. At the end of the period, the model will maximise welfare (expected utility) of the banks. Additionally, the risks volatility in interest rates and uncertainty on return of credits are among the risks faced by the bank. This study adopts integrated determinants of net interest margins model developed by Maudos and Solis (2009). Some factors are added into the basic models such as diversification of credit products from Allen (1988), diversification of non-interest income products (Valverde & Fernandez, 2007), operating costs (Maudos & de Guevara, 2004), credit risk (Angbazo, 1997). Following Martinez-Peria and Mody (2004), we also added foreign bank penetration in the host country as one of determinants so that our empirical model of NIM to be estimated is as follows:

$$\begin{aligned}
 NIM_{i,j,t} = & \alpha + \beta_1 LFOC_{i,j,t} + \beta_2 ReFOC_{i,j,t} + \beta_3 ForP_{j,t} + \sum_{n=1}^M \varphi_n PS_{i,j,t} + \sum_{n=1}^N \epsilon_n BS_{i,j,t} \\
 & + \sum_{k=1}^K \theta_k ME_{j,t} + \sum_{k=1}^{\epsilon} \zeta_c D_c + \varepsilon_{i,j,t} \quad (1)
 \end{aligned}$$

where $t=1, \dots, T$ is the number of period, $i=1, \dots, I$, I is the total number of bank, $j=1, \dots, J$, J is the number of country. Thus, from the subscript, i represents individual bank in country j at time, t . NIM is defined as the difference between interest income and interest expenses divided by total assets. LFOC is a measure of focus or diversification of the loan portfolio of banks, while ReFOC is level measurement focus or diversification of banks in terms of sales of non-interest income products. In order to measure whether banks focus or diversify in one field then we use Herfindahl Hirschman Index (HHI), as used by Acharya et al. (2006) and Berger et al (2010a, 2010b). Moreover, credit diversification will be divided into two categories, namely, credit-sectoral (S-FOC) and type (T-FOC). Type of credits is divided into consumption, working capital, investments and exports. Focus or diversification of non-interest income is also categorised into two categories. First, the diversification of interest income and non-interest income which is referred as (R-FOC), where the diversification within non-interest income consists of fees / commissions, trading and other (N-FOC), as applied by Marcieca et al. (2007).

The effect of foreign bank penetration (ForP) is measured by the percentage of foreign banking assets in the host country compared to total assets of the banking system in host country. The definition of a foreign bank in this study corresponds to the categories used by World Bank. Bank is

classified as a foreign company if the portion of foreign ownership exceeds 50%.

PS is a vector for the variable *pure spread* consisting of the market structure (proxy by bank market power) where bank operates, interest rate risk, bank management risk aversion, and the average amount of bank transaction. We used Lerner Index (LI) as a proxy measure of market power or level of competition. It is measured by a ratio between differences in the price of total assets (revenue from interest income + non-interest income) and marginal cost of total asset (cost of labour, cost of loanable fund and operational and administrative cost) over price of total assets. The marginal cost of total asset is estimated using translog total cost function (for more details, see Berger et al, 2009; Maudos & Solis, 2009). Interest rate risk is measured by standard deviation of monthly interbank market rate (Maudos & Solis, 2009; Angbazo, 1997). Capital level ($EQUITY = TE / TA$) is used to measure the level of risk aversion (Mc Shane & Sharpe, 1985; Maudos & de Guevara, 2004). The proxies for size of the bank transactions are the portfolio credit (\ln Loans) and \ln total assets (Maudos & Guevara, 2004; Maudos & Solis, 2009).

BS is a vector for individual *bank specific* characters consisting efficiency ratio, liquidity risk level, operating costs, credit risk and variable that measures non-interest income. Efficiency ratio ($EFF = \text{Total Cost} / \text{Total Revenue}$) is used to capture whether the bank management has the

ability to manage lower cost to produce higher yield (Maudos & Guevara, 2004; Maudos & Solis, 2009). Liquidity Risk measures opportunity cost of bank hold reserve funds and other cash equivalent in term of total bank assets (Angbazo, 1997; Valverde & Fernandez, 2007; Maudos & Solis, 2009). Following Angbazo (1997), credit risk is measured by the ratio of loan loss provision to total loans. Operating costs is represented by the ratio of operating expenses over total assets (Maudos & de Guevara, 2004). Furthermore, we include specialisation or diversification variables net non-interest income (NNOI) adopted from Maudos dan Solis (2009) and Valverde and Fernandez (2007). NNOI is the ratio of non-interest income minus non-interest expense over total assets. We also decomposed the variable of non-interest income into income from commission and fee, as well as income from trading. Those two variables are measured in percentage of total assets.

Macroeconomic factors (ME) are inserted in the model to capture the effect of external macroeconomic condition in each country that will affect the volatility of interest margin (Demirguc-Kunt & Huizinga, 1999; Claeys & Vennet, 2008). They are economic growth (GDP growth), inflation rates, depreciation of currency, as well as the growth rate of banking assets in term of capital markets. While D is a dummy, there are several dummies, firstly, bank ownership dummy (government and private, local and foreign bank). Secondly we also included host country dummy

(Indonesia, Malaysia, Thailand and the Philippines).

DATA

Our sample comprised of unbalanced panel data consisting of 74 banks in Indonesia, 27 banks in Malaysia, 20 Bank in Thailand and 18 banks in the Philippines for period between 2006 and 2012. The financial data were collected from Bureau Van Dijk's Bank Scope Data Base, loan portfolio by sectors and the type of credits was taken from the bank's financial reports downloaded from their website in respective country. The analysis was conducted based on individual bank annual data. We used a single-stage methodology to estimate the model following Maudos and de Guevara (2004) and Maudos and Solis (2009). As our time series observation was only for seven years (2006-2012), it is not possible to apply two-stage methodology used by Ho and Saunders (1981) and Saunders and Schumacher (2000).

The model in equation (1) is estimated with random effect, because country specific variables are included in the model as supported by Demirguc-Kunt et al. (2003). Furthermore, a dynamic approach was also applied in the model to accommodate stochastic arrival of deposit and demand for loan and non-traditional activities across the period (Valverde & Fernandez, 2007; Maudos & Solis, 2009). Maximisation wealth of bank considering beginning and ending period information, so it was considered that the current value of margin

might be affected by the previous value. The methodology used to estimate the dynamic model is system GMM, as proposed by Arrelano and Bover (1995) and Blundell and Bond (1998). This method estimates the regression in differences and jointly with the regression in the levels. To minimise endogeneity problem of explanatory variables, lagged levels and lagged differences of explanatory variables are used as instruments. In this process, we use the one-step GMM estimator with asymptotic standard errors robust to heteroskedasticity. As proposed by Arrelano and Bond (1991),

we tested the validity of instruments using Sargan test and validity of assumption that no serial correlation on the error term. The results presented in Table 2 have meet this test requirements.

RESULTS AND ANALYSIS

Descriptive Statistics

Table 1 shows the descriptive statistics of our data. The average NIM is relatively higher (3.45%) compared to the bank interest margins in developed countries. However, there is a declining trend in this

Table 1
Descriptive Statistics

Variables	Mean	Std. Dev	Min	Max
Net Interest Margin (NIM) %	3.451	2.168	-2.280	12.580
Lerner Index (LI)	0.206	0.280	-1.733	0.839
NNON	-0.020	0.021	-0.213	0.084
SFOC	0.424	0.248	0.144	1.000
TFOC	0.609	0.230	0.252	1.000
RFOC	0.743	0.139	0.500	1.000
NFOC	0.628	0.210	0.334	1.000
ForP (Foreign Penetration)	0.237	0.089	0.082	0.410
Ln Assets	19.003	4.938	11.405	33.303
Ln Loans	17.819	5.425	6.558	31.205
EQUITY	0.148	0.126	-0.069	0.989
EFFICIENCY	0.831	0.232	0.124	2.505
LIQUIDITY	0.067	0.098	0.010	0.700
CRISK	0.010	0.021	0.001	0.298
MRISK	0.007	0.007	0.000	0.023
OPEX (Operating Cost)	0.040	0.025	0.007	0.294
FEE & COMMISSION	0.006	0.006	0.000	0.066
TRADING	0.009	0.013	0.000	0.084
DEPCURR	-0.018	0.084	-0.172	0.151
GDP GROWTH (%)	5.262	2.134	-2.330	7.811
INFLATION (%)	4.529	2.731	0.390	11.060
TA/MCAP Growth	0.847	2.731	-4.140	9.561

margin, i.e. from 3.65% in the year 2006 to 3.19% in the year 2012. Market structure measured by Lerner Index had average number 0.206, which meant that the market in this region was quite competitive, even though the trend in this figure increased (all trends are not shown in the table). The raise of market power in this region might be caused by mergers acquisition and also banking consolidation policy from each central bank. Measurement of diversification of revenue (RFOC) is 0.743. It seems that interest revenue from traditional products are still dominance, as supported by NNON that has negative sign. However, from the data series, there is an increasing trend in revenue from the non-traditional products. Diversification on credit to certain sectors (SFOC) is 0.424. It indicates banks in this region have already diversified its portfolio into sectors moderately; however, in term of diversification in type (TFOC), banks still focus on the type of products that they have more expertise. Other main variable is foreign bank penetration. The average number is 0.237 although the share of assets of bank owned by foreign banks increased over the periods of observation.

Analysis and Discussion

Table 2 shows the determinants of net interest margin using static and dynamic panel data. There are 6 columns of estimation; the first three columns are the results of static and three other columns are for dynamic estimation. Columns 1 and 4 are the results of a modified regression model from

previous studies in which all diversification factors and foreign bank penetration (For P) are included in the model. Influence of foreign bank penetration is then substituted by foreign ownership factor in column 2 and column 4. Following Maudos and Solis (2009), we included disaggregate factor of non-interest income in column 3 and column 6, namely, fee and commission income and income from trading.

Results presented in Table 2 show that market power (indicated by Lerner Index) has a positive and significant impact on interest margins. It shows that in less competitive markets, banks earn higher intermediation margin. Mergers and acquisitions, as a result of bank consolidation in this region, might cause banks to be concentrated and decrease the competitive pressures. Consequently, some banks enjoy market dominance by charging higher interest rate on loans. This result is in line with the findings obtained Maudos and de Guevara (2004) in the banking system in developed European countries, Maudos and Solis, (2009) in the Mexican banking, and Claeys and Venet (2008) in the banking system in Central and East Europe.

The effect of income diversification (NNON) is negative but strongly affects interest margin. This implies that shifting on non-interest income contributes to the increase of total income of the bank, and has subsidised to declining interest margin from selling traditional products. This cross-subsidy strategy can also be viewed as a marketing strategy to retain the old debtors or to attract new debtors by offering loans

at lower interest rate, but charging higher fees to other integrated credit products such as cash management, trade finance, bank guarantees, etc. Furthermore, disaggregate variables of non-interest income such as fee and commission supports this finding in shorter equilibrium (column 6). However, trading revenue associated with an increase in margin, this might be due to the lack of expertise of some banks in trading activities, hence, loss in trading has been compensated with higher margin (Lepetit et al. 2008). Other measurements of revenue diversifications R-FOC and NFOC support our finding. RFOC variables positively and significantly associated with interest margins (NIM), indicating that the concentration of interest income or non-interest income revenues resulted in an increase in NIM. This implies that diversification into non-traditional banking products that generate non-interest income would decrease bank intermediation margins (Valverde & Fernandez, 2007; Maudos & Solis, 2009). Additionally, NFOC also shows a positive and significant relationship to the interest margin, which implies that less diversified of non-interest income in one of the products (either fee and commission or trading) have an impact on increasing bank margins.

Diversification credit in sector (SFOC) consistently has a positive relationship with NIM. It shows that diversified bank in portfolio sectors results in lower interest margins; conversely focused bank will charge higher interest. This indicates that the banking sector in this region prefer to channel its portfolio to certain industrial

sectors where they have an expertise in that sector. As a result, competition in a particular sectors becomes lower, therefore specialised banks could freely charge higher interest rate and consequently higher interest margin (Dell'Araccia & Marquez, 2005). This argument is also consistent with the hypothesis lending relationship by Petersen and Rajan (1994), where bank charges higher interest rates to borrowers because of long-time relationship and high switching costs to start a new relationship with other bank. This finding is consistent with the findings of Acharya et al. (2006) who found that the credit portfolio diversification to many sectors is unprofitable because there is diseconomy of scope arising from lack of expertise and monitoring when banks expand into new sectors. Different results were obtained by Mc Shane and Sharpe (1985) who recorded an increase in NIM in Australia when banks diversified their portfolios.

Results also showed that the higher foreign penetration in controlling banking assets in the host country, the lower the interest margin earns by banks would be. This suggests that expansion of foreign banks in the regional ASEAN-4 has a positive impact on the reduction in intermediation costs. Similar to our finding, Barajas et al. (2000) documented that foreign banking penetration in Colombia contributed positively in decreasing interest margin. While the cross-country study by Claessens et al. (1998) also showed the significant role of foreign penetration in lowering the cost of intermediation in developing

countries, which is an opposite result when they operated in industrial countries. The effect of foreign bank ownership shows a negative relationship with NIM in long-time equilibrium and flipping the relationship in short-term equilibrium, although it is not significant.

Table 2
Determinants of Net Interest Margins (Static and Dynamic Model)

Variable	Static Model			Dynamic Model		
	1	2	3	4	5	6
NIM(-1)				0.026 (0.817)	0.029 (0.798)	0.041 (0.744)
Lerner Index (LI)	0.011*** (0.000)	0.011*** (0.000)	0.002 (0.609)	0.003 (0.784)	0.002 (0.844)	0.004 (0.740)
NNON	-0.618*** (0.000)	-0.636*** (0.000)		-0.677*** (0.002)	-0.738*** (0.000)	
- FEE & COMMISSION			0.050 (0.565)			-0.766* (0.079)
- TRADING			-0.024 (0.558)			0.355* (0.083)
SFOC	0.006** (0.027)	0.005** (0.047)	0.005 (0.146)	0.031* (0.056)	0.031* (0.081)	0.026 (0.226)
TFOC	-0.001 (0.660)	-0.001 (0.765)	0.001 (0.826)	-0.014 (0.238)	-0.014 (0.261)	-0.030 (0.171)
RFOC	0.013*** (0.005)	0.010** (0.042)	0.028*** (0.000)	0.006 (0.603)	0.004 (0.769)	0.054* (0.071)
NFOC	0.006** (0.026)	0.006** (0.033)	0.003 (0.305)	0.002 (0.986)	0.001 (0.944)	-0.015 (0.351)
ForP (Foreign Penetration)	-0.040*** (0.000)		-0.206*** (0.000)	-0.019 (0.687)		-0.350* (0.089)
Foreign OWN		-0.001 (0.705)			0.001 (0.943)	
Ln Assets	-0.001** (0.040)	-0.001** (0.026)	-0.001 (0.426)	-0.002 (0.200)	-0.003 (0.194)	-0.005 (0.240)
Ln Loans	0.002** (0.020)	0.002*** (0.009)	0.001 (0.101)	0.001 (0.665)	0.001 (0.624)	0.006 (0.121)
EQUITY	0.008 (0.208)	0.011* (0.095)	0.012 (0.130)	-0.001 (0.982)	-0.001 (0.986)	0.030 (0.379)
EFFICIENCY	-0.054*** (0.000)	-0.053*** (0.000)	-0.094*** (0.000)	-0.089*** (0.006)	-0.091*** (0.004)	-0.132* (0.072)
LIQUIDITY	-0.008 (0.239)	-0.006 (0.413)	-0.004 (0.611)	0.004 (0.899)	0.004 (0.888)	-0.060 (0.245)
CRISK	0.210*** (0.000)	0.220*** (0.000)	-0.196*** (0.000)	0.254 (0.141)	0.276* (0.067)	-1.413** (0.022)
MRISK	-0.203 (0.299)	0.276* (0.064)	-0.288 (0.210)	-0.531 (0.483)	-0.219 (0.583)	-1.098 (0.258)

Table 2
Determinants of Net Interest Margins (Static and Dynamic Model) (continue)

Variable	Static Model			Dynamic Model		
	1	2	3	4	5	6
OPEX (Operating Cost)	-0.025 (0.517)	-0.055 (0.145)	0.345*** (0.000)	0.017 (0.850)	-0.019 (0.817)	0.559*** (0.000)
ForP*Efficiency			0.192*** (0.000)			0.284 (0.226)
CRISK*MRISK			23.79*** (0.000)			101.73 (0.108)
Constanta	0.063*** (0.000)	0.046*** (0.000)	0.081*** (0.000)	0.136*** (0.001)	0.131*** (0.008)	0.107 (0.130)
R Square	0.731	0.723	0.617			
Sargan Test				26.54	26.49	16.44
AR (1)				-2.272*	-2.061*	-1.957
AR (2)				0.894	-1.109	-1.041

*significant at 1%, **significant at 5%, significant at 10%. Value in parentheses is t-probability, based on robust standard error. System GMM results are one-step estimate. Limited space macro-economics, country effects and time effects variable are not included in this table (available upon request).

Size of bank has a significant negative correlation with the interest margin. This illustrates large banks with economics of scale that tend to offer lower interest rates to debtors. Accordingly, banks will be able to maintain its market power and increase their market share. This finding is consistent with the result obtained by Demirguc-Kunt et al. (2003). Positive coefficient on loan implies that the greater exposure portfolio, the higher the risk will be and the more expensive the cost to acquire and manage the portfolio, as a result will set higher premium spread. This result is consistent with the findings of Maudos and Solis (2009) on the banks of Mexico, Claeyns and Vennet (2008) in banking accession countries (mostly in the Eastern Europe). However, different conditions emerge

in main banking in Western Europe (Maudos & de Guevara, 2004; Valverde & Fernandez, 2007).

As predicted by the model, variable risk aversion (Equity) has a positive relationship with the margin. The high level of expensive capital owned by bank signals trustworthy and lower bankruptcy risk (see Saunders & Schumacher, 2000; Valverde & Fernandez, 2007; Maudos & Solis, 2009). Management quality measured by the efficiency ratio has a significant negative relationship with interest margins. Non-efficient banks earn low yield assets but pay higher interest to depositor. The positive coefficient on operating cost shows us that banks in this region transfer their operating

cost to their customers by charging them higher margin (Maudos & de Guevara, 2004). Liquidity variable consistently has a negative relationship with interest margins although it is not significant.

Credit risk and market risk factors have positive and significant association with interest margin. Banks will set higher margin to compensate the risk involved in their loan portfolio and uncertainty in interest rates in the market. These results are consistent with the findings in some previous studies (see Ho & Saunders, 1981; Angbazo, 1997; Brock & Suarez, 2000; Maudos & Solis, 2009). Ensuring a smooth process of recording loan loss provisioning might cause the presence of a negative relationship between credit risk and margins. Furthermore, the interaction between these two risk components has a positive and significant relationship with NIM. Consistent with the sign of two coefficients variables, it implies that banks anticipate raising probability loan defaults and higher volatility of market interest rates by charging higher margin.

Macroeconomics factors affect NIM heterogeneously. Economic growth provides extensive investment opportunities in the business. Align with the growth of economic; bank could also increase its intermediation margin (Claessens, Demirguc-Kunt, & Huizinga, 1998). In the short-time period (dynamic model), inflation affect margin negatively (Denizer, 2000), whereas depreciation of currency forces banks to increase their margin. In addition, the variable that measures banking growth

in relation to growth of capital market shows negative relationship with NIM. It suggests increasing financing from banks will tighten competition in the market, consequently lowering bank margin (Demirguc-Kunt & Huizinga, 1999).

CONCLUSION

Relatively high growth of economic and business in the ASEAN region is characterised by an increase in selling non-traditional banking products that generate non-interest income. This condition is also supported by consolidation of the banking and the rise of foreign bank penetration in the host country. Along with this, there is a declining trend in intermediation margins. This phenomenon is the reason for the importance of knowing the determinant factors causing the decline in the interest margin in ASEAN-4 banking system over the period of 2006-2012.

In comparison to other papers that analysed determinants of NIM, the research contributes to literature on the the impacts of revenue diversification and credit diversification simultaneously on intermediation margins. In this research, the integrated model of NIM from Maudos dan Solis (2009) was adopted by linking credit diversification (Acharya et al., 2006), diversification of non-interest income (Valverde & Fernandez, 2007), as well as foreign banks penetration (Claessens et al., 1998). The model is estimated using random effect panel data regression and system GMM estimator.

The findings of this study show that decreasing interest margin is determined by diversification of non-interest income products, foreign bank penetration, as well as size of banks and efficiency. Non-traditional products become important sources of revenue, especially ones that generate fees and commissions because they have already subsidised decreasing in revenue on traditional products. Foreign bank expansion in host country provides positive impact in lowering margin. Efficiencies, technology advantages and motivation to increase market share might drive foreign banks to cut the spread, followed by local banks, in order to stay in market. Larger bank, due to its scope of economic, could charge lower interest rate. Meanwhile, banks do not pass through their inefficiencies in operating cost to the customers. Inefficient banks do not enjoy higher margin; instead they are penalised with a decline in margin.

Decrease in intermediation margins is countered off by several factors such as market power, credit sector diversification, size of loan, credit risk and market risk. There is evidence that banks in this region exploit their market power by charging higher interest margin. Similarly, when they have high capability in certain sectors, so less diversified in loan portfolio is a choice to obtain higher margin. Additionally, banks with greater size of loan in their portfolio, higher operating cost and higher volatility of credit risks and interest rate risks protect themselves by charging higher intermediation margin.

As a financial intermediary, bank has a role in improving social welfare. In order to achieve this function, the banking industry needs to reduce the intermediation margins. Declining margins mean reduction social cost from intermediation process. In line with this, the implications of our study for banking regulator are as follows: first, setting prudent regulations on expansion of non-interest income products because risk involved in these products is high, especially for trading activities. Second, it needs policies that encourage increased banking competition. Third, publish prudent regulations that support the penetration of foreign banks; therefore, they provide spillover effect in decreasing margins. Fourth, encourage banks to manage their cost efficiency through set regulations so that they can enjoy the intermediation margins.

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