EJEM
Econ. J. Emerg. Mark.

ECONOMIC JOURNAL OF EMERGING MARKETS
Available at http://jurnal.uii.ac.id/index.php/jep

Managing the endogeneity problem of the market structure: a study on banking competition

Tri Mulyaningsih [1], Anne Daly [2], Riyana Miranti [3]

[1]*Faculty of Economic and Business, Sebelas Maret Surakarta University, Surakarta, Indonesia.*
Corresponding author , *email*: trimulyaningsih.uns@gmail.com
[2]*Faculty of Business, Government and Law, University of Canberra, Australia,*
e-mail: *anne.daly@canberra.edu.au*
[3]*National Centre for Social and Economic Modelling, University of Canberra, Australia.*
e-mail: riyana.miranti@canberra.edu.au

Article Info

Article history:
Received :
Accepted :
Published : 1 October 2015

Keywords:
market structure, endogeneity, banking, industry, VECM

JEL Classification:
C32, D4, L1, G21

DOI:
http://dx.doi.org/10.20885/ejem.vol7.iss2.art6

Abstract

Recent literature suggests that the market structure is an endogenous variable that is determined by a firm's behaviour and the competitive environment of the industry. This study examines the relation between the market structure and the banks' behaviour in Indonesian banking by considering the endogeneity problem of them as variables. The estimations using the Vector-Error-Correction approach suggest that the structural approach provides a valid prediction of the relationship between market structure and bank behaviour by recognizing the endogeneity issue between those two variables. The banking industry would be more competitive if the market was less concentrated.

Abstrak

Literature menunjukkan bahwa struktur pasar adalah variabel endogen yang ditentukan oleh perilaku perusahaan dan kondisi persaingan dalam industri tersebut. Studi ini menganalisis hubungan antara struktur pasar dan perilaku bank di Indonesia dengan memperhatikan masalah *endogeneity* dalam model. Hasil estimasi dengan menggunakan pendekatan *Vector-Error-Correction* menunjukkan bahwa pendekatan struktural dapat digunakan untuk memprediksi hubungan antara struktur pasar dan perilaku bank. Bank-bank dalam industri yang memiliki indeks konsentrasi yang rendah akan berperilaku kompetitif.

Introduction

Indonesian banking has been consolidated since the late 1990s following the 1997 crisis. The Indonesian Banking Architecture (API) and Basel II were introduced to create a stronger and more stable banking industry. Banks have to meet a higher minimum capital requirement and a better risk management standard. To comply with the requirements, banks can merge or invite new shareholders. In addition to more stringent regulation, entry of newly established banks is prohibited (Rosengard and Prasetyantoko, 2011). In the 2000s, the number of banks reduced significantly into a half of the figure in the early 1990s. There were 109 commercial banks in 2010 down from 228 banks in 1994. In terms of market concentration, the Herfindahl-Hirschman index was higher, particularly in the early 2000, and increased by 45 per cent compared to period prior to 1997 crisis. This indicates that recently the Indonesian banking industry became more concentrated than in the 1990s.

The current policies contributed to create a more concentrated industry. A higher degree of market concentration is caused by the banking consolidation and the introduction of barrier to entry for newly established banks and the change of

mode of entry of foreign banks. Recently, foreign banks entered the local market through acquisition of the local existing banks. This mode of entry is more common than the establishment of *de novo* banks (new established banks, not necessarily foreign banks), for example through new joint ventures or branches of foreign banks. Thus, the increasing number of foreign banks was not associated with a growing number of banks in the industry. It is important to examine the relationship between market concentration and competition in the Indonesian banking industry. The Structure-Conduct-Performance (SCP) or structural approach, a well-established theory, suggests that a concentrated market leads to less competitive behaviour and creates excess profit for firms (Mason, 1939). In contrast, a less concentrated market enhances competition and produce better market performance such as a lowering of profits and prices.

This study contributes to knowledge development by considering the recent development of market structure research of the New Industrial Organization approach in examining the competitive environment in the Indonesian banking industry. The market structure, which is usually measured by market concentration, is not an exogenous variable. Rather, it is an endogenous variable that is also determined by other variables, for example the existence of barriers to entry (Baumol, 1982) and the level of efficiency (Peltzman, 1977; Smirlock, 1985). It is argued that the structure of a market depends on its output vector rather than it is being determined exogenously Baumol (1982). An efficient scale of production determines the number of firms supplying market. The Vector Error Correction Model (VECM) is applied to manage the endogeneity problem of the market structure. Furthermore, this study covers the recent three-decades of Indonesian banking to reflect the structural changes from a highly regulated industry to a less regulated and liberalized industry. The structural changes influence the degree of market concentration and the competitive environment in the Indonesian banking industry.

There are two competing paradigms which attempt to address the issue of market structure; firms' behaviour and market performance. The first paradigm is the Structure-Conduct-Performance (SCP) and the second paradigm is the New Industrial Organization (NIO). The first paradigm emerged in 1939 through an article written by Edward S. Mason in the American Economic Review, entitled "Price and production policies of large-scale enterprises". The article argued that differences in market structure are the source of the differences in price responses (Mason, 1939). Further, market structure determines the distribution of economic resources among different users, for example between producers and consumers. In a monopoly market, firms restrict output and investment below the level of a competitive market and drive the price up. Monopoly markets create excess profit for the producers at the expense of consumers. In contrast, firms in a perfectly competitive market could not affect market price as the demand curve is perfectly elastic for each individual firm. In equilibrium, the market produces at the lowest average cost where the price level is the same as the marginal cost. Therefore, perfect competition will not create an excess profit for producers and will not create loss for the consumers.

The study of Mason Mason (1939) became the foundation of the first paradigm. It is known as the Structure-Conduct-Performance hypothesis or the structural approach because it argues that there is a direct relationship between market structure, the behaviour of firms and market performance (Mason, 1939) In most studies market structure is determined by the level of concentration of output in a few (Bain, 1951; Berger and Hannan, 1989; Bikker

and Haaf, 2002; Neumark and Sharpe, 1992). The concentrated market reduces the cost of collusion so it facilitates collusive behaviour. Therefore, this market produces poor performance where the price ratio to cost is high at the expense of lower consumer welfare. In contrast, the competitive market will produce an efficient outcome as price equals marginal cost. Thus, an increase in firm numbers and lower market concentration will lead to more competitive conduct evidenced by lowering prices and reducing a firm's profitability. In general, the structural approach argues that market structure is an exogenous variable that comes from outside the model. Further, market structure determines firms' behaviour and market performance.

However, other studies found evidence that the relationship between market structure, firm behaviour and market performance is not linear (Baumol, 1982; Demsetz, 1973; Peltzman, 1977; Smirlock, 1985; Smirlock et al., 1984). The findings are consistent with the second paradigm of the Non-structuralist. Under the second paradigm, economists look beyond the number of firms and market concentration in an industry in determining the characteristics likely to promote a competitive industry and keep economic profit low. They argue that a competitive industry may also exist even when only a small number of firms operate in the industry or in the case of a concentrated market.

The market structure is an endogenous variable rather than an exogenous variable. Further, some studies suggest that the existence of contestable markets determines the structure of a market (Baumol, 1982; Demsetz, 1973; Molyneux et al., 1996; Peltzman, 1977; Smirlock, 1985; Smirlock et al., 1984). Contestable markets require freedom of entry and exit. The removal of restrictions to enter the market is one main factor creating contestable markets (Claessens and Laeven, 2004; Sengupta, 2007). In addition, the removal of restrictions in conducting business, for example interest rate control and lending limits, contribute to creation of contestable markets.

Some studies found that the penetration of foreign banks into a market is also important for creating contestable market. The entry of foreign banks encourages local banks to be more competitive by enhancing their efficiency and lowering the spread of interest rates (Claessens et al., 1998; Cole et al., 2004; Jeon et al., 2011; Manlagñit, 2011; Martinez Peria and Mody, 2004; Unite and Sullivan, 2003). Particularly, the penetration of foreign banks put pressure on local banks to lower their costs (Clarke et al., 2001, and to increase their efficiency and lower profits (Manlagñit, 2011; Sengupta, 2007). Penetration of foreign banks also explains the lower intermediation costs in the local banking (Claessens et al., 1998 because foreign banks had lower operating expenses (Martinez Peria and Mody, 2004; Unite and Sullivan, 2003 and overhead costs (Manlagñit, 2011). In addition, foreign banks had a lower spread of interest rates (Martinez Peria and Mody, 2004) and better loan (Claessens et al., 1998).

However, the current penetration of foreign banks in the form of merger and acquisition of local existing banks (foreign acquired banks) is less effective in improving banking competitive environment compared to the establishment of *de novo* banks. D*e novo* operations as either penetration through the establishment of branches or the formation of subsidiaries of foreign banks in local banking (Claeys and Hainz, 2006; Clarke et al., 2001; Sengupta 2007). Subsidiary refers to a fully owned subsidiary of foreign banks or joint ventures with foreign banks as a majority shareholder (Montgomery, 2003). It is argued that *de novo* banks operated with lower spreads compared to foreign banks that entered the market by acquiring local existing (Martinez Peria and Mody, 2004). The

literature also suggests that *de novo* banks are more aggressive because they are new business entities unlike the foreign acquired banks. On one hand, *de novo* banks as the newcomers are more willing to charge lower rates because they have to work hard to establish market share (Martinez Peria and Mody, 2004). On the other hand, the foreign acquired banks already have a captive market from the acquired local banks. In addition, as a new business entity a *de novo* bank is not likely to possess knowledge about borrowers in the local banking industry. Furthermore, *de novo* banks focus on transparent segments of the market where the information asymmetry is lower and information about borrowers can be accessed (Martinez Peria and Mody, 2004; Martinez Peria and Mody, 2004). The segment of the transparent borrowers is perceived to be more competitive thus *de novo* banks have to charge a lower spread in order to attract these borrowers (Dell'Ariccia and Marquez, 2004).

Other studies also suggest that a *de novo* foreign bank entry had a stronger positive impact on competition than foreign acquired banks. Furthermore, literature highlighted another disadvantage of having foreign entry through the acquisition of local existing banks. Two studies confirm that foreign presence through acquisition of local existing banks reduced the supply of small business credit (Clarke et al., 2001; Berger et al., 2004). However, foreign entry through the acquisition of local existing banks may induce the entry of *de novo* in order to supply loans to small firms.

In addition to the modes of entry, the level of development also contributes to explain the role of foreign banks in creating a contestable market. The study about impact of foreign penetration in the local banking market revealed that with different levels of development, the influence of foreign banks changed (Lensink and Hermes, 2004). Foreign penetration in the countries with lower levels of economic development had a higher spill-over impact than foreign penetration in developed countries. In countries with lower levels of development, the gap in terms of the adoption of modern techniques and practices between foreign and local banks was larger. Consequently, the gap between local and foreign banks was smaller in developed countries. However, their study also found that the spill-over effect of foreign banks may also be lower in developing countries where the banking industry is segmented and the incumbent local banks possess substantial market power.

In addition to the penetration of foreign banks, the relationship between market structure and competition is also influenced by the proportion of government banks in the local banking market. Government banks are less competitive than their private counterparts because they have a long hierarchical organizational design (Williamson, 1967) and had a captive market for both loans and deposits amongst the state enterprises (McLeod, 1999). The larger proportion of government banks in the local market signals the existence of barriers to entering or expansion by private banks. In the case of Indonesia prior to the banking reforms in the 1980s, state-owned banks dominated the banking industry with more than 80 per cent of deposits. The banking reforms in the 1980s removed the restrictions to enter the market. In addition, the reforms also lifted some hidden subsidies and controls. Those policies provided equal treatment for state-owned, private, local and foreign banks. After the banking reforms, the domination of state commercial banks declined and was replaced by their private counterparts. The above illustrations suggest that the domination of government banks in the local banking market determines the level of restrictions in the banking industry.

Finally, the literature suggests that the macroeconomic environment determines the level of competition in the bank-

ing industry. One study found that unfavorable macroeconomic conditions, for example high inflation rates, may constrain competition in the banking industry (Claessens and Laeven, 2004). Under conditions of high inflation, prices of financial services, for example interest rates, will be less informative. During the high inflation, the increase of interest rates reflects the increase in inflation rather than a more expensive price of financial services. A study on emerging economies in Asia and Latin America also found that in a better macroeconomic environment with a high level of economic growth, a high level of gross domestic product and lower inflation are more capable of enhancing competition in the banking industry (Jeon et al., 2011).

Research Method

The Vector Error Correction Model (VECM) is perceived as a suitable approach to examine the long-run relationship of market concentration evolution and the trend in foreign penetration on the evolution of banking competition. The model measures the long-run relationship and reveals the speed of adjustment to the equilibrium. Furthermore, this model is suitable for a system that has a potential endogeneity problem. Research under the New Industrial Organization approach argues that market concentration is an endogenous variable rather than an exogenous variable. This study performed the weak exogeneity test to examine the endogeneity in the model particularly between the measure of market concentration and competition. This study also acknowledges the possible endogeneity problem between the measure of foreign penetration and competition as signaled by the literature. It is argued that the decision of foreign banks to penetrate local banking may depend on the level of competition in the local banking industry. The foreign banks are more likely to enter a less competitive market. Therefore, the level of competition could be a determining factor for foreign penetration. This implies that foreign penetration may be endogenous in the model rather than being exogenous.

The present study used a weak exogeneity test to examine whether there is an endogeneity problem in the model. The test uses the VECM equation 1 as below:

$$\Delta y_t = \pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \ldots + \Gamma_{p-1} \Delta y_{t-p+1} + BX_t u_t \quad (1)$$

Where Π is αβ matrix and α is the adjustment coefficient informing the speed of adjustment to equilibrium. If all α_{ij} in row *i* of α are equal to zero, the corresponding cointegration equation determines the i^{th} element of ΔX_t is weakly (Lutkepohl and Kratzig, 2004). Table 1 shows that competition and market concentration are endogenous while foreign penetration is weakly exogenous. This test supports the argument that there is a potential endogeneity problem in a system.

For the three variables case with one cointegrated relationship, the VECM can be expressed as follows:

$$\Delta(\ln H_t) = \mu_1 + \alpha_{11} ECT_{t-1} + \sum_{j=1}^{p-1} \emptyset_{1j} \Delta(\ln H_{t-j}) + \sum_{j=1}^{p-1} \vartheta_{1j} \Delta(\ln HHI_{t-j}) + j=1p-1\theta 1j\Delta(\ln FPt-j)+\varepsilon 1t \quad (1)$$

$$\Delta(\ln HHI_{t)} = \mu_2 + \alpha_{21} ECT_{t-1} + \sum_{j=1}^{p-1} \emptyset_{2j} \Delta(\ln H_{t-j}) + \sum_{j=1}^{p-1} \vartheta_{2j} \Delta(\ln HHI_{t-j}) + j=1p-1\theta 2j\Delta(\ln FPt-j)+\varepsilon 2t \quad (2)$$

$$\Delta(\ln FP_t) = \mu_3 + \alpha_{31} ECT_{t-1} + \sum_{j=1}^{p-1} \emptyset_{3j} \Delta(\ln H_{t-j}) + \sum_{j=1}^{p-1} \vartheta_{3j} \Delta(\ln HHI_{t-j}) + \sum_{j=1}^{p-1} \theta_{3j} \Delta(\ln FP_{t-j}) + \varepsilon_{3t} \quad (4)$$

Table 1: Weak Exogeneity Test

	Competition	Market concentration	Foreign penetration
Chi-square(1)	6.847378	9.041818	0.646321
Probability	0.008877*	0.002639*	0.421431

* Denotes rejection of the hypothesis at a 1 per cent level.

Note: the test for weak exogeneity is run under the assumption of one cointegrating equation. The failure to reject the null hypothesis is evidence of the weak exogeneity of the variable of interest.

Table 2: Specification of the Variables

Variable	Definition	Specification
H	Competition	Yearly H-statistics of the Panzar-Rosse method *.
HHI	Market (Measure of Market Structure concentration)	Herfindahl-Hirschman Index. The formula to calculate HHI $= \sum_{i=1}^{n} s_i^2$ **
FP	Foreign penetration	The proportion of foreign banks in the banking industry. Foreign banks are defined as those with foreign ownership ofat least 50 per cent.
DE NOVO	*De novo* banks	The proportion of *de novo* banks in the banking industry. *De novo* banks are joint venture and branches of foreign banks.
GOV	Government banks	The proportion of assets of government banks in the banking industry.
GDP_percapita	GDP per capita	A measure of the level of development.
INFLATION	Inflation	The inflation rate.
D2000	Dummy of the year 2000	D2000 equals one if the observation period is between 2000 and 2010, and zero if otherwise ***.

Note:

* The description of the yearly H-statistics of the Panzar-Rosse method is available in the appendix.

** s_i refers to the market share of bank i in the market and n is the number of banks. The Herfindahl-Hirschman Index (HHI) ranges from 1/N to one, where N is the number of banks in the market. The magnitude of HHI implies the level of concentration in the industry where the larger the value of the index demonstrates a more concentrated market. For an industry that consists of a single monopoly, HHI=1 because a monopolist has a market share of s_1 =1 thus $S_1^2=1$ =1. On the other hand, an industry with N banks with equal market shares will have HHI=1/N ((Lutkepohl and Kratzig, 2004).

*** This dummy provides information on the impact of the changing type of foreign penetration. Prior to the year 2000, foreign penetration was only in the form of de novo operations. After 2000, foreign entry to the market was in the form of de novo and foreign acquired banks.

Source: The annual financial reports of banks collected from the Central Bank of Indonesia.

Results and Discussion

The Augmented Dickey Fuller test was employed to test the existence of unit roots for each variable. In order to determine whether the test requires a constant and/or trend or not, the graphical presentation of time-series data for each variable can be used. The plots demonstrate whether the time-series data fluctuates around a non-zero mean or not. If yes, it is more appropriate to include a constant in testing the unit-root. In applying the Augmented Dickey Fuller test, this study selected the length of lag for testing the variable. Some model selection parameters, for example, AIC, SIC and FPE, can be used to guide the selection of the lag length. For variables H, HHI, FP, *DE NOVO*, GOV, and GDP_percapita, all model selection parameters suggest using the lag length of one. In regard to INFLATION, model selection of the FPE suggests using a lag length of 2, the AIC suggests employing a lag length of

3, and the SC advises using a length of lag of 0. The unit root tests in table 3 show that the null hypothesis for the existence of a unit root cannot be rejected at the 5 per cent significance level. Further, the unit root test was carried out on the first difference. The test results showed that all variables are stationary at the first difference. It indicated that the variables are jointly integrated in the same level - I(1).

A cointegrated test was conducted to confirm the previous presumption that the system of the variables is stationary at the first difference and jointly integrated. The Johansen cointegration test is conducted by firstly selecting the length of lag for the system. The model selection parameters, such as AIC, SIC and FPE are employed to determine the length of lag. This study ran some exercises involving the basic variables, competition, market concentration and foreign penetration, and added other variables to the right-hand side of the equation. Table 5 and 6 propose some models to explain the relationship between the evolution of market concentration, trends in foreign penetration and the evolution of banking competition in the Indonesian banking industry between 1980 and 2010. The cointegration tests show that Max-Eigen statistics and Trace statistics rejected the null hypothesis that the model has zero cointegrated rank. Further, when we test the null hypothesis of one cointegration rank, the Max-Eigen statistics and Trace statistics show that the null hypothesis could not be rejected at the 5 per cent significance level. The result of cointegration tests reveal that in all models, the variables are integrated and they have one cointegrated rank. Table 4 provides the descriptive statistics of all variables employed in this study. The dependent variable is the level of competition which is measured by H-statistics (H).

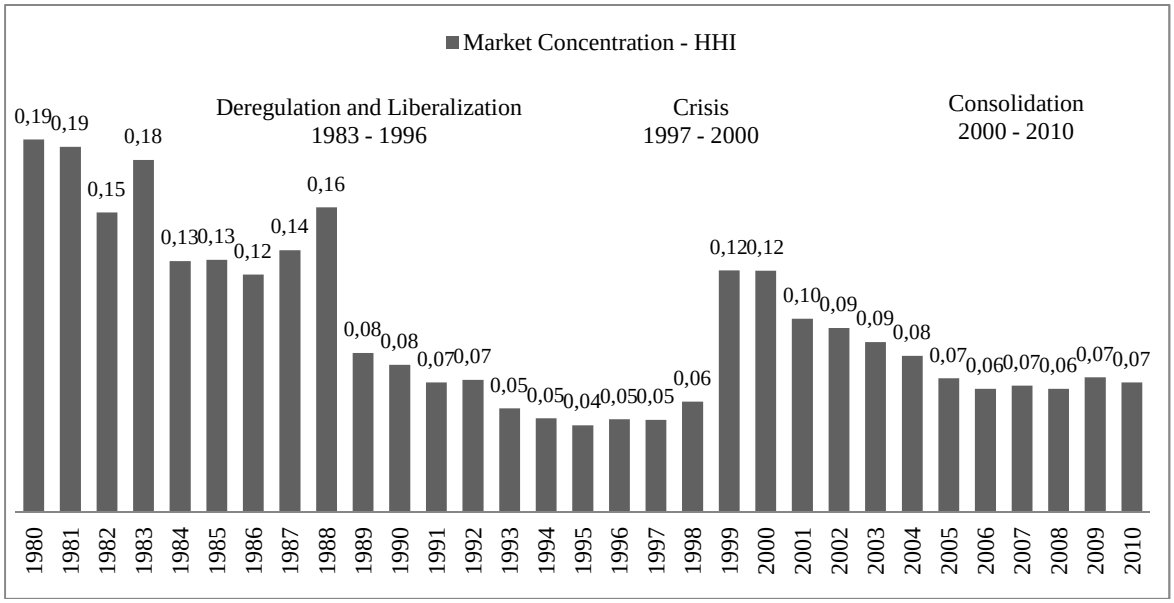
Table 3: Unit Root Test

Variable	No. of lags	ADF Test Statistics		ADF Critical Value (1 %)	Result
		Levels	First difference		
Ln(H)	1	-3.075	-3.893	-2.968	I(1)
Ln(HHI)	1	-2.217	-3.377	-2.968	I(1)
Ln(FP)	1	-0.064	-6.104	-2.968	I(1)
Ln(*DE NOVO*)	1	-1.188	-6.149	-2.968	I(1)
Ln(GOV)	1	-1.642	-5.134	-2.968	I(1)
Ln(GDP_percapita)	1	-0.546	-3.306	2.968	I(1)
Ln(INFLATION)	2	-2.731	-4.764	2.976	I(1)

Note: The null hypothesis of unit root is rejected if ADF test statistics < ADF critical value.
ADF critical values are MacKinnon (1996) one-sided p-value at 5 per cent significance level, provided by Eviews software.

Table 4: Descriptive Statistics

Descriptive Statistics	H	HHI	FP	*DE NOVO*	GOV	GDP_ Percapita (US$)	INFLATION (per cent)
Mean	0.28	0.09	0.17	0.09	0.59	717.03	10.69
Median	0.29	0.08	0.08	0.08	0.51	748.32	9.28
Maximum	0.87	0.19	0.43	0.19	0.88	1,145.38	58.39
Minimum	0.01	0.04	0.03	0.03	0.26	390	3.72
Std. Dev.	0.17	0.04	0.15	0.04	0.17	215.17	9.57
Skewness	1.10	0.97	0.79	0.40	0.39	0.12	4.19
Kurtosis	5.68	2.99	1.91	2.26	1.97	1.99	21.32
Jarque-Bera	15.51	4.86	4.73	1.50	2.15	1.38	524.14
Probability of Jarque-Bera	0.000	0.09	0.09	0.47	0.34	0.50	0.00
Sum	8.70	2.90	5.25	2.83	18.36	22,228	331.39
Sum Sq. Dev.	0.88	0.05	0.64	0.05	0.88	1,435,085	2,748.87
Observations	31	31	31	31	31	31	31



Note: There is some rounding as the heights of some bars with the same HHI index are not similar.

Figure 1: The Banking Concentration, Herfindahl-Hirschman Index in the Indonesian Banking between 1980 and 2010

In regard to the measure of market structure, the degree of market concentration began to increase following the 1997 crisis. As shown in figure 1, in 1999 and 2000 the HHI index reached its highest level of 0.12 after the banking deregulation in the 1980s. The increase in market concentration was associated with the reduction in the number of banks due to the closure of banks and bank mergers. The closure of banks, many of which were small banks, had skewed the market share distribution to large banks. Furthermore, the merger of state banks into Bank Mandiri also contributed to increased market inequality. During the consolidation period in the 2000s, the HHI index was higher compared to the deregulation and liberalization period; however it was still lower compared to the crisis period in 1998-2000. In the 2000s the degree of market concentration gradually lowered to 0.06, especially after 2004. In order to comply with the current minimum capital requirement that was introduced in 2004, small and medium-sized banks merged. The mergers of medium-sized and small banks improved the distribution of market share and reduced the market concentration.

The main focus of the seven models in table 5 is on the contribution of market concentration to banking competition. The long-run coefficients of market concentration (HHI) of all seven models are negative and the values are significant in five of seven models. These findings support the structural approach that market concentration was negatively related to the competition in Indonesian banking during the past thirty years. The banking industry was more competitive when the market was less concentrated. In the un-concentrated market, it had a large number of banks and/or a more equal-distribution of market shares between banks. The larger number of banks increased the cost of collusion. Thus, a smaller number of banks were more favorable to uncompetitive behaviour. In regards to the distribution of market share, a small number of large banks were likely to contribute to create a concentrated market, even though the overall number of banks was large. In contrast, a handful of banks with relatively equal market share contributed to a less concentrated market.

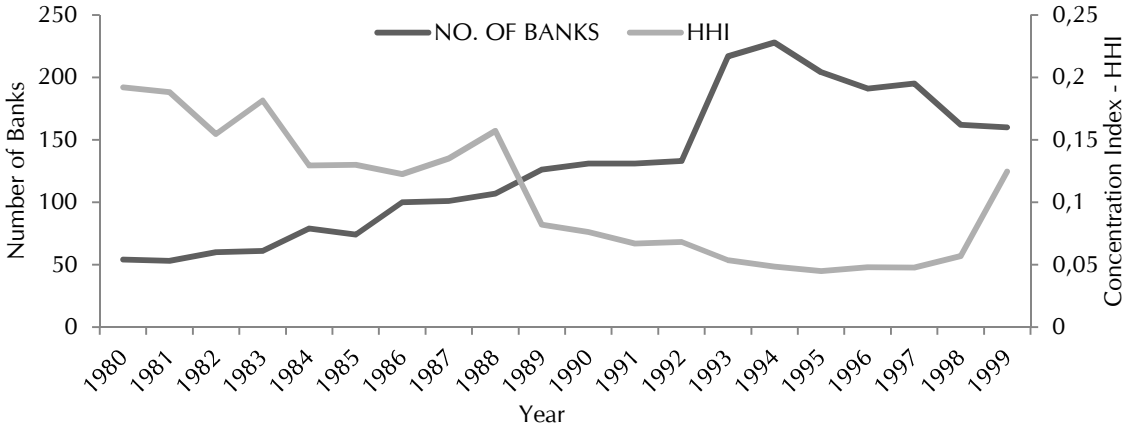


Figure 2: Market Concentration Index and the Number of Bank

Figure 2 demonstrates that the number of banks has a negative relation to the degree of market concentration. The figure below shows the evolution of market structure by comparing the number of banks prior to deregulation and after deregulation periods. Prior to deregulation, there were substantial barriers to entry, both for local private and foreign banks. Furthermore, the restrictive banking environment, for example, the limits on loans and limits on interest rates of time deposits for state banks, created an unattractive industry. As a result, the number of banks was relatively small after a series of banking reforms in the 1980s. The introduction of the first banking reform in 1983 and the second banking reform in 1988 contributed to a reduction in the barriers to enter the market and relaxed some restrictions in the market. As a result, the number of banks increased substantially and created a less concentrated market.

The distribution of market share was important in explaining the role of market concentration in influencing competition during the consolidation period. The data reveal that mergers and acquisitions in the 2000s reduced the skewness of the distribution of market share[1]. This occurred as mergers and acquisitions took place within the medium-sized and small banks, rather than being conducted by the large banks. Consolidation within smaller banks enhanced the size of merging banks and produced a more equal distribution of market share in Indonesian banking. Figure 3 demonstrates the positive relationship between the concentration index and the skewness of the market share distribution. A less skewed distribution of Indonesian banking in the 2000s would contribute to a less concentrated market if we compared to the 1997 crisis period.

Tables 5 and 6 present the results of the estimations using the VECM, examining the role of market concentration and foreign penetration on competition. With regard to model number 5 in Table 5 and model 12 in Table 6, either the coefficient of market concentration or foreign penetration was negative but it was not significant. The estimations of models number 5 and 12 reveal that there was another variable capable of explaining the evolution of banking competition. They indicate that the share of government banks, consisting of state owned banks and regional development banks, negatively and significantly influ-

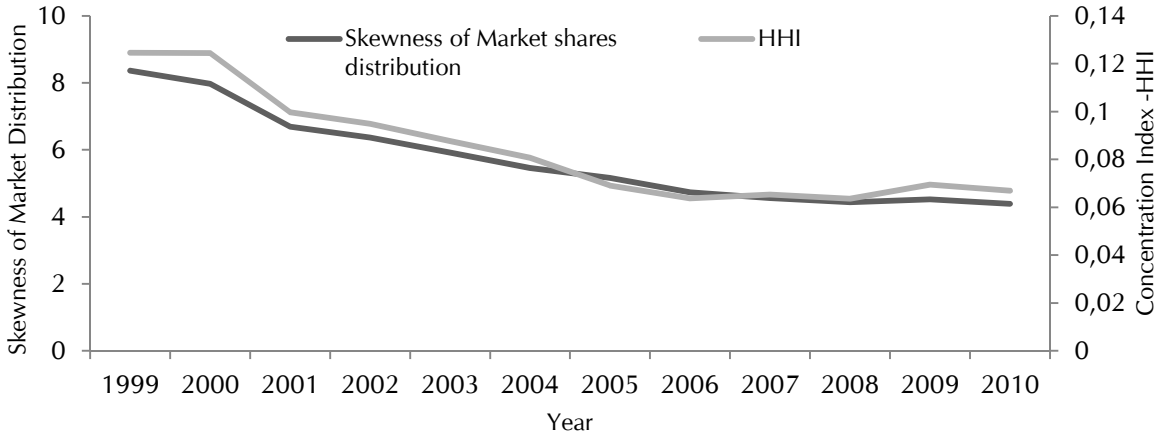
[1] The skewness of the distribution of market shares is calculated by $\frac{n}{(n-1)(n-2)}\sum\left(\frac{x_i-\bar{x}}{s}\right)^3$. Skewness characterizes the degree of asymmetry of a distribution around its means. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values.

enced banking competition at the one per cent confidence level. Figure 4 presents the trend of the competition index of H-statistics and the proportion of the assets of government banks in the Indonesian banking industry.

Table 6 proposes seven models (8 – 15) to explore the relationship between the trend in foreign penetration and the evolution of banking competition. The cointegration tests show that Max-Eigen statistics and Trace statistics rejected the null hypothesis that the models have zero cointegrated rank. Further, when we tested the null hypothesis of one cointegration rank, the Max-Eigen statistics and Trace statistics show that the null hypothesis could not be rejected at the 5 per cent significance level. The result of cointegration tests reveal that in all models, the variables are integrated and they have one cointegrated rank.

The results of models 8, 10, 11 and 15 using the VECM show that foreign penetration was positively related to competition. This means that foreign penetration contributed to enhancing banking competition. However, the test of the significance of the coefficient of foreign penetration implies that the variable did not significantly boost the level of competition. The coefficient of foreign penetration was only significant in model 11 which included the dummy of year 2000 to control for a change in policy with respect to foreign banks entering the market.

Figure 3: Market Concentration Index and the Skewness of Market Share Distribution



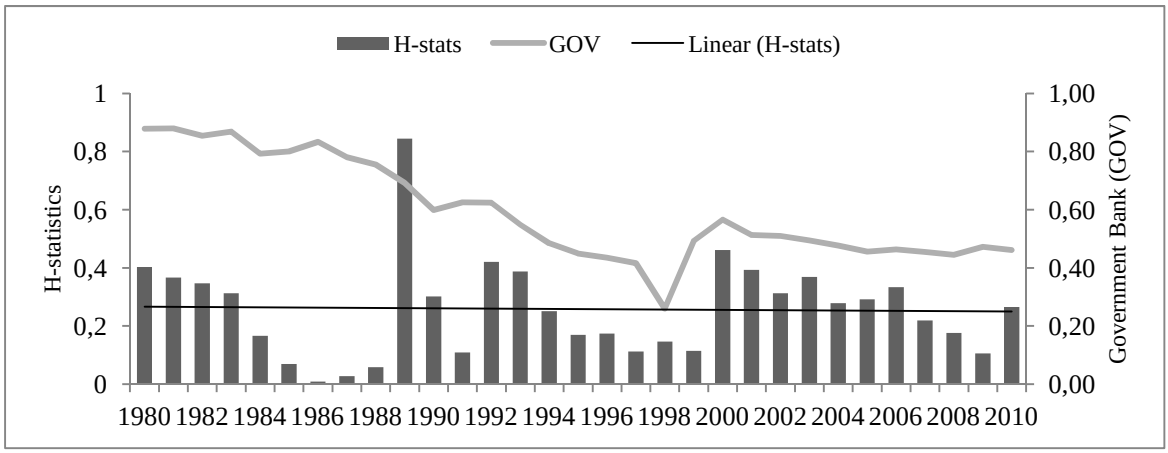


Figure 4: Banking Competition and the Dominance of Government Bank

Table 5: Results of the VECM Model - part 1

Dep. Variable/Independent Vari able	Competition Index (H-statistics)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Concentration (HHI)	-1.50***	-1.83***	-0.19	-0.31**	-0.94	-1.36**	-1.80***
	(0.41)	(0.35)	(0.27)	(0.18)	(0.57)	(0.77)	(0.46)
Foreign penetration (FP)		0.14					
		(0.14)					
Penetration of *de novo* foreign bank			1.00***	1.11***			
(*DE NOVO*)			(0.27)	(0.17)			
Proportion of assets of government banks (GOV)					-1.45**		
					(0.79)		
Per capita GDP (GDP_percapita)						1.10*	
						(0.76)	
Inflation rate (INFLATION)							-2.70
							(0.51)
Constant	-5.33***	6.02			4.89	11.70***	
	(1.04)					(3.32)	
Ho: r = r0							
Max-Eigen Statistics							
ro = 0	21.82**	30.51**	31.33**	28.84***	28.41***	25.17**	25.78**
ro = 1	5.03	11.41	10.06	8.46	14.09	11.41	4.58
Critical Value (5%)							
ro = 0	20.26	21.13	24.28	17.80	21.94	22.30	17.80
ro = 1	9.16	14.26	12.32	11.22	15.89	15.89	11.22
Trace Statistics							
ro = 0	16.78**	42.91***	21.27**	39.46***	50.36***	40.12**	30.88**
ro = 1	5.03	12.40	8.23	10.61	21.94	14.95	5.09
Critical Value (5%)							
ro = 0	15.89	29.80	17.80	24.28	35.19	35.19	24.28
ro = 1	9.16	15.50	11.25	12.32	20.26	20.26	12.32
Number of Cointegration Rank	1	1	1	1	1	1	1
Error Correction Term of the First Cointegration Rank	-0.88	-0.50	-0.58	-0.60	-1.28	-0.45	-0.39
Observation	26	26	27	26	26	27	27
R-squared	0.50	0.50	0.39	0.39	0.67	0.50	0.51
Akaike AIC	2.54	2.91	2.76	3.03	2.43	2.55	2.54
Schwarz SC	2.97	3.58	3.24	3.66	3.06	3.03	3.02
Log likelihood	-23.97	-23.78	-27.30	-26.35	-18.61	-24.40	-24.34
Lag length	4	4	3	4	4	3	3
Akaike AIC	Lag 4: 2.35	Lag 4: 2.46	Lag 3: 1.73	Lag 4: 1.70	Lag 4: -0.26	Lag 3: -2.30	3.03
Schwarz SC	Lag 4: 3.21	Lag 4: 4.33	Lag 3: 3.16	Lag 4: 3.57	Lag 4: 1.61	Lag 3: -0.86	4.47

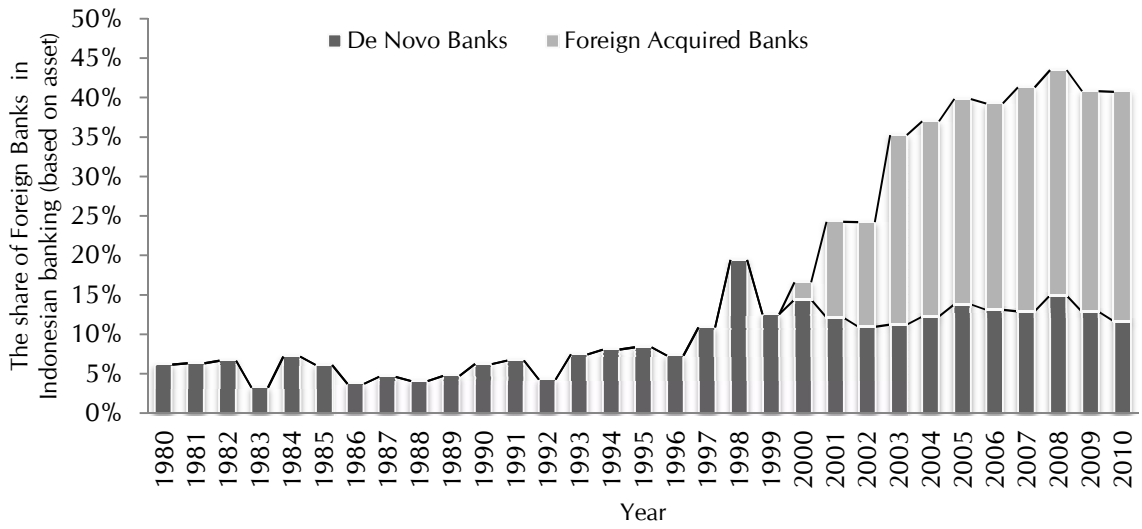


Figure 5: Foreign Penetration in the Indonesian Banking Sector between 1980 and 2010

The evolution of banking competition was better explained by the penetration of *de novo* operations either by establishing joint ventures or branches of foreign banks in the local market. Model 3 and 4 in Table 5 and model 9 and 13 in Table 6 show that penetration of *de novo* banks was positively and significantly related to banking competition at the 1 per cent confidence level. In order to examine the role of *de novo* banks in comparison with the role of foreign acquired banks, we added model 11 in Table 6. In model 11, a dummy variable of the year 2000 onward was employed. The dummy captures the changing pattern of foreign penetration from *de novo* operations prior to 2000 and both *de novo* and merger and acquisition after 2000 as shown in figure 5. The coefficient of this dummy variable was negative but it was not significant. With the aim of better covering the changing pattern of foreign penetration, this study interacted the year dummy 2000 with the proportion of foreign assets in the banking industry in model 11 of Table 6. The coefficient of the interaction variable was also negative, but it was also not significant. The results suggest that having foreign penetration through the acquisition of local private banks in the 2000s did not significantly improve competition in the Indonesian banking industry.

The empirical findings show that *de novo* banks were more likely to put larger competitive pressure on local banks. This empirical finding is consistent with other studies for example Claeys and Hainz (2006) and Jeon, Olivero and Wu (2011). This study argues that *de novo* banks are more competitive because of at least three factors. Firstly, the market entry through the establishment of *de novo* banks reduced market concentration because *de novo* establish a new entity unlike acquired foreign banks. Secondly, *de novo* banks as newly established banks are more willing to charge lower rates to gain market share. The literature suggests that as a new business entity, *de novo* banks are not likely to possess knowledge about the borrowers in the local banking industry. In order to target the transparent segments of the market where banks are able to access information about the borrowers, banks have to charge a lower rate for loans. Regarding foreign acquired banks, they already have a captive market from acquired local banks. By acquiring local existing banks, the foreign banks or investors do not need to behave aggressively by offering much lower lending rates because they already have existing customers.

Table 6: Result of the VECM Model- part 2

Dep. Variable/Independent Variable	Competition Index (H-statistics)							
	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Foreign penetration	0.24		0.75***	0.25	-0.34		0.16	0.18
	(0.19)		(0.07)	(0.30)	(0.38)		(0.35)	(0.31)
Penetration of *de novo* foreign bank		0.66***				0.90***		
		(0.05)				(0.12)		
Proportion of assets of government banks					-4.78***	-1.16***		
					(1.23)	(0.50)		
GDP_per capita (GDP_percapita)							0.33	
							(1.15)	
Inflation rate (INFLATION)								-3.75***
								(1.08)
Exogenous Variable								
Dummy for year 2000 (the cut off of the start of the foreign penetration through the acquisition of local existing banks)			-0.35					
			(0.31)					
Interaction variable, Foreign penetration times Dummy for year 2000				-0.19				
				(0.27)				
Constant	1.48***			1.44		5.12	4.95	5.90***
	(0.50)			(0.84)			(8.07)	(2.55)
Ho: r = r0								
Max-Eigen Statistics								
ro = 0	19.12**	13.12**	19.59**	18.28**	21.89**	19.50**	29.08**	30.35***
ro = 1	4.52	1.40	4.59	3.85	8.59	4.68	10.37	9.57
Critical Value (5%)								
ro = 0	15.89	11.22	17.79	15.89	21.13	17.80	22.30	22.29
ro = 1	9.16	4.13	11.22	9.16	14.26	11.22	15.89	15.89
Trace Statistics								
ro = 0	23.64**	14.52**	25.07**	22.13**	30.84**	24.46**	44.78**	42.36***
ro = 1	4.52	1.40	5.48	3.85	8.95	6.97	15.71	12.02
Critical Value (5%)								
ro = 0	20.26	12.32	24.28	20.26	29.80	24.28	35.19	35.19
ro = 1	9.16	4.13	12.32	9.16	15.49	12.32	20.26	20.26
Number of Cointegration Rank	1	1	1	1	1	1	1	1
Error Correction Term of the First Cointegration Rank	-0.63	-0.95	-0.65	-0.69	-0.32	-0.56	-0.45	-0.23
Observation	27	26	27	27	28	28	27	27
R-squared	0.42	0.47	0.41	0.44	0.34	0.43	0.41	0.43
Akaike AIC	2.48	2.58	2.58	2.51	2.62	2.41	2.73	2.68
Schwarz SC	2.81	3.02	2.96	2.90	3.00	2.74	3.21	3.16
Log likelihood	-26.47	-24.58	-26.82	-25.96	-28.74	-26.68	-26.82	-26.23
Lag length	3	4	3	3	2	2	3	3
Akaike AIC	2.67	2.74	Lag 3: 2.71	Lag 3: 2.73	Lag 2: 2.08	Lag 2: 1.83	Lag 3: -1.26	Lag 3: 4.13
Schwarz SC	3.34	3.61	Lag 3: 3.39	Lag 3: 3.41	Lag 2: 3.10	Lag 2: 2.83	Lag 3: 0.18	Lag 3: 5.75

Thirdly, in terms of assets, *de novo* banks were small banks with assets of 43,431 million Rupiah between 2000 and 2010. While foreign acquired banks are the larger banks with assets of 192, 100 million Rupiah on average between 2000 and 2010. Foreign acquired banks are mostly the bail-out banks which divested from 2003 onwards. Most of the bail-out banks were formerly large banks with a 28.6 per cent share of assets of the Indonesia banking industry in 2009. As large and existing banks, the foreign acquired banks already have captive markets and loyal customers. Thus, foreign acquired banks generate less pressure on competition in the local banking market.

To conclude, in regard to their role in creating a contestable market, *de novo* banks are willing to behave more aggressively by cutting their interest margins. Therefore as indicated by the literature, they put pressure on the local market to lower the overall costs, lower the intermediation costs, lower the overhead costs, improve loan quality and reduce accounting profit. Another finding related to the level of development of the Indonesian economy is consistent with the literature. The influence of foreign banks on the competition was also affected by the level of development. Model 14 was estimated to assess the role of foreign penetration by controlling for the level of development in the Indonesian economy. The level of development is measured by per capita Gross Domestic Product. Both the coefficients of foreign penetration and the level of development are positive. The Indonesian economy benefits from the penetration of the foreign banks because this emerging economy receives a spill-over impact from the presence of foreign banks. Finally, the macroeconomic environment represented by the rate of inflation, contributed to a competitive banking industry. The estimation results of model 7 and 15 suggest that unfavorable macroeconomic condition, for example that high inflation rates may put constraints on enhancing the competition in the banking industry. Under high inflation, prices of financial services, for example interest rates, will be less informative.

Conclusion

This study explored the role of market structure and foreign penetration in creating a competitive banking industry. The weak exogeneity test of market structure, which is measured by market concentration, and banking competition, shows that both variables are endogenous to the system. It favours the New Industrial Organization approach that market structure is not exogenous; rather it is determined by variables in the system, for example the freedom of entry and exit, market restrictions and foreign penetration.

The cointegration tests of the series of three variables, market concentration, the evolution of competition, and the trend of foreign penetration, show that they are jointly integrated using first differences. It implies that the three variables have a long-run relationship. As the variables are integrated in the long-run and the model has an endogeneity issue, the VECM is appropriate to estimate the long-run relationship between market concentration, the evolution of competition and the trend of foreign penetration

The empirical results of seven models suggest that market concentration as a measure of market structure has a negative relationship with competition. The banking industry is more competitive if the market is less concentrated. A market with a lower concentration level may have a large number of banks or a more equal market share for banks. The larger number of banks increases the cost of collusion. Thus, a smaller number of banks are more favourable to uncompetitive behaviour. In regards to the distribution of market share, a smaller number of large banks contribute to create a highly concentrated market even though overall the number of banks is large. In contrast, a

handful of banks with a relatively equal distribution of market share contribute to create a less concentrated market. This finding implies that the structural approach also provides a valid prediction of the relationship between market structure and bank behaviour by recognizing the endogeneity issue between those two variables.

Banking deregulation and liberalization in the late 1980s and 1990s were effective in lowering market concentration because they widened access for private local and foreign banks to penetrate the local banking market. The freedom of entry facilitated the establishment of new banks and increased the number of market players. A larger number of banks increased the cost of collusion and pushed banks to be more competitive. Banking consolidation in the 2000s also lowered the market concentration compared to the crisis period between 1997 and 2000. Mergers of small private banks in the 2000s reduced the skewness of the market share distribution. A more equal-distribution of market share facilitates a more balanced capacity of banks to compete. Nevertheless, the merger of state banks following the 1997 crisis and the introduction of barriers to enter the market in the 2000s negatively influenced competition. The implementation of the Indonesian Banking Architecture in the 2000s posed barriers to enter the market. In addition, the Survey of Banking Regulation and Supervision by the World Bank revealed that in the 2000s there were no applications by local investors to establish a bank. However, there were at least fourteen applications received from foreign banks to acquire the local existing banks. All fourteen applications for foreign acquired banks were accepted by the Central Bank.

Foreign penetration also contributed to improve competition in the banking industry; however, the influence was not statistically significant. The Indonesian economy enjoyed benefits from the presence of foreign banks. As a developing country, Indonesia receives a spill-over impact from the presence of foreign banks. In regard to the modes of entry, the empirical results show that the establishment of joint ventures and branches of foreign banks were crucial to enhance competition in the local market. The establishment of *de novo* operations increased the number of banks in the market and thus contributed to the creation of a less concentrated market. Further, *de novo* banks had a role in creating a contestable market as *de novo* banks were willing to behave more aggressively by cutting their interest margins. D*e novo* banks put pressure on the local market to lower overall costs, lower intermediation costs, lower overhead costs, improve loan quality and reduce accounting profit. In contrast, foreign penetration through the acquisition of local private banks did not increase the number of banks. Further, foreign acquired banks were likely to behave less aggressively compared to *de novo* banks, particularly as acquisitions took place among large banks which had a captive market and loyal consumers.

This study also finds that the reduction of the domination of government banks was crucial to foster competition. Government banks were perceived to behave in a less competitive way compared to their private counterparts. Their uncompetitive behaviour was related to the market power originating from captive funding from other state-owned companies and a long hierarchical organization. Finally, the unfavourable macroeconomic conditions, for example high inflation rates, may have put constraints on enhancing competition in the banking industry. Under high inflation, prices of financial services, for example interest rates, are less informative. The estimation result suggests that the macroeconomic environment, represented by the rate of inflation, contributed to create a competitive banking industry.

The above findings highlight some policy recommendations. Current consoli-

dation following the 1997 economic crisis increased the degree of market concentration due to bank closures, bank mergers and barriers to enter the industry. At the introduction of barriers to enter the market, in the 2000s, foreign penetration was in the form of acquisition of local existing banks rather than the establishment of *de novo* banks. The empirical findings suggest that *de novo* banks put more pressure on competition in the local banking market. The series of bank closures, mergers of state banks and barriers to enter the market show that the current policy of banking consolidation did not promote competition. Furthermore, the policy has weakened competition because, in fact, Indonesian banking is "under banked" (Rosengard and Prasetyantoko, 2011). The current banking system has not been able to effectively meet demand, particularly from the medium and small sized borrowers. Restrictions on the establishment of new banks, by both local and foreign banks, inhibited the role of new entrants in creating a contestable market. The changing trend of foreign penetration from the establishment of *de novo* banks to the acquisition of local existing banks also posed concern about the reduction of the supply of loans to small scale borrowers. The data shows that *de novo* banks are mostly small banks, and foreign acquired banks are mostly large banks. The literature suggests that small banks lend proportionally more to small enterprises (Rosengard and Prasetyantoko, 2011). There was a reduction in the supply of loans to small and medium enterprises during the consolidation period. The portfolio of assets of banks, particularly the large banks, was mostly corporate loans, the investment of Bank Indonesia certificates (SBIs) and government bonds.

References

Bain, J.S. (1951) "Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940", *The Quarterly Journal of Economics, 65*(3), 293-324.

Barajas, A. , Roberto, S. and Salazar, N. (2000) "The impact of liberalization and foreign investment in Colombia's financial sector", *Journal of Development Economics, 63(1),* 157-196.

Baumol, W. J. (1982) "Contestable Markets: An Upraising in the Theory of Industry Structure", *The American Economic Review, 72*(1), 1-15.

Berger, A.N., Buch, C. M., DeLong, G.. and DeYoung, R.. (2004) Exporting financial institutions management via foreign direct investment mergers and acquisitions. *Journal of International Money and Finance, 23*(3), 333-366. doi: http://dx.doi.org/10.1016/j.jimonfin.2004.01.002

Berger, A. N. and Hannan, T.H. (1989) "The price-concentration relationship in banking", *The Review of Economics and Statistics, 71*(2), 291-299.

Berger, A. N., Kashyap, A. K.. and Scalise, J. M. . (1995) "The Transformation of the U.S. Banking Industry: What a Long, Strange Trip It's Been", *Brookings Papers on Economic Activity, 26*(2), 55-218.

Berger, A. N. and Udell, G. F. (1995) "Universal Banking and the Future of Small Business Lending", *NYU Working Paper 009*, 1-62.

Bikker, J. A.. and Haaf, K.. (2002) "Competition, concentration and their relationship: An empirical analysis of the banking industry", *Journal of Banking & Finance, 26*(11), 2191-2214. doi: http://dx.doi.org/10.1016/S0378-4266(02)00205-4

Boyd, J. H., De Nicolò, G. and Jalal, AM. (2006) "Bank Risk-Taking and Competition Revisited: New Theory and New Evidence", *IMF Working Paper, 06* (297).

Caminal, R. and Matutes, C. (2002) "Market Power and Banking Failure", *International Journal of Industrial Organization, 20(9),* 1341-1361.

Cho, K. R. (1990) "Foreign Banks Presence and Banking Market Concentration: The Case of Indonesia", *Journal of Development Studies, 27*(1), 98-110.

Claessens, S., Demirgüç-Kunt, A. and Huizinga, H. (1998) "How does foreign entry affect the domestic banking market?", *The World Bank Policy Research Paper, 1918*.

Claessens, S. and Laeven, L. (2004) "What Drives Bank Competition? Some International Evidence", *Journal of Money, Credit & Banking (Ohio State University Press), 36*(3), 563-583.

Claeys, S. and Hainz, C. (2006) "Acquisition versus Greenfield: The Impact of the Mode of Foreign Bank Entry on Information and Bank Lending Rates", *Working Paper Series European Central Bank, 653*.

Clarke, G. R. G., Cull, R., Martinez P., Maria S. and Sanchez, S.M. (2001) "Foreign Bank Entry: Experience, Implications for Developing Countries, and Agenda for Further Research", *Policy Research Working Paper World Bank, 2698*. doi: 10.1596/1813-9450-2698

Cole, R. A., Goldberg, L. G. and White, L. J. (2004) "Cookie Cutter vs. Character: The Micro Structure of Small Business Lending by Large and Small Banks", *The Journal of Financial and Quantitative Analysis, 39*(2), 227-251. doi: 10.2307/30031854

Davis, K. (1995) "Bank deregulation, supervision and agency problem", *Australian Economic Review, 28*(3), 43-54.

Dell'Ariccia, G. and Marquez, R. (2004) "Information and Bank Credit Allocation", *Journal of Financial Economics, 72*(1), 185-214. doi: http://dx.doi.org/10.1016/S0304-405X(03)00210-1

Demsetz, H. (1973) Industry Sructure, Market Rivalry, and Public Policy. *Law and Economics, 26*(1), 1-9.

Fane, G. and McLeod, R.H. (2002) "Banking collapse and restructuring in Indonesia, 1997-2001", *Cato Journal, 22*(2), 277-295.

Jeon, B. N., Olivero, M. P. and Wu, J. (2011) "Do foreign banks increase competition? Evidence from emerging Asian and Latin American banking markets", *Journal of Banking & Finance, 35*(4), 856-875. doi: http://dx.doi.org/10.1016/j.jbankfin.2010.10.012

Jiménez, G., Lopez, J. A. and Saurina, J. (2007) "How does competition impact bank risk-taking?", *Working Paper of Federal Reserve Bank of San Fransisco, 23*, 1-37.

Johansen, S\. (1995) *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. New York: Oxford University Press.

Keeley, M.C. (1990) "Deposit Insurance, Risk, and Market Power in Banking", *The American Economic Review, 80*(5), 1183-1200. doi: 10.2307/2006769

Keeton, W.R. . (1995) "Multi-office bank lending to small businesses: Some new evidence", *Federal Reserve*

Bank of Kansas City Economic Review, *80*(2), 45-57.

Lehner, M. (2009) "Entry mode choice of multinational banks", *Journal of Banking & Finance*, *33*(10), 1781-1792. doi: http://dx.doi.org/10.1016/j.jbankfin.2009.03.009

Lensink, R. and Hermes, N. (2004) "The short-term effects of foreign bank entry on domestic bank behaviour: Does economic development matter?", *Journal of Banking & Finance*, *28*(3), 553-568. doi: http://dx.doi.org/10.1016/S0378-4266(02)00393-X

Lipezynski, J., Wilson, J. and Goddard, J. (2005) *Industrial Organization: Competition, Strategy, Policy*. Essex: Pearson Education Limited.

Lutkepohl, H. and Kratzig, M. (2004) *Applied Time Series Econometrics*: Cambridge Books, Cambridge University Press.

Manlagñit, M. C. V. (2011) "The Economic Effects of Foreign Bank Presence: Evidence From The Philippines", *Journal of International Money and Finance*, *30*(6), 1180-1194. doi: http://dx.doi.org/10.1016/j.jimonfin.2011.06.015

Martinez P., Maria S. , and Mody, A. (2004) "How Foreign Participation and Market Concentration Impact Bank Spreads: Evidence from Latin America", *Journal of Money, Credit & Banking (Ohio State University Press)*, *36*(3), 511-537.

Mason, E. S. (1939) "Price and Production Policies of Large-Scale Enterprise", *The American Economic Review*, *29*(1), 61-74.

Matutes, C. and Vives, Xr. (2000) "Imperfect Competition, Risk Taking, and Regulation in Banking", *European Economic Review*, *44*(1), 1-34. doi: http://dx.doi.org/10.1016/S0014-2921(98)00057-9

McLeod, R. H. (1999) "Control and competition: Banking deregulation and re-regulation in Indonesia", *Journal of the Asia Pacific Economy*, *4*(2), 258-297. doi: 10.1080/13547869908724682

Mishkin, F. S. (1996) "Understanding financial crises: A developing country perspective", *NBER Working Paper Series*, *5600*, 1-49.

Molyneux, P., Thornton, John. and Llyod-Williams, D.M. (1996) "Competition and market contestability in Japanese commercial banking", *Journal of Economics and Business*, *48*(1), 33-45. doi: http://dx.doi.org/10.1016/0148-6195(95)00047-X

Montgomery, H. (2003) "The Role of Foreign Banks in Post-Crisis Asia: The Importance of Method of Entry", *Research Paper Series ADB Institute 51*, 1-29.

Nakamura, L. (1993) Commercial Bank Information: Implications for the Structure of Banking. In M. Klausner & L. J. White (Eds.), *Structural Change in Banking*: Business One Irwin.

Neumark, D. and Sharpe, S. A. (1992) "Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits",*The Quarterly Journal of Economics*, *107*(2), 657-680.

Peek, J. and Rosengren, E. S. (1996) "Small Business Credit Availability: How Important is Size of Lender? In A. Saunders & I. Walter (Eds.)", *Financial System Design: The Case for Universal Banking*: Irwin Publishing.

Peltzman, S. (1977) "The Gains and Losses from Industrial Concentration", *Law and Economics, 20*(2), 229-263.

Rosengard, J. K.. and Prasetyantoko, A. (2011) "If the Banks are Doing So Well, Why Can't I Get a Loan? Regulatory Constraints to Financial Inclusion in Indonesia", *Asian Economic Policy Review, 6*(2), 273-296. doi: 10.1111/j.1748-3131.2011.01205.x

Schaeck, K. and Cihak, M. (2007) "Banking Competition and Capital Ratios", *Working Paper of International Monetary Fund, 07*(216), 1-42.

Schaeck, K., Cihak, M., and Wolfe, S. (2006) "Are More Competitive Banking Systems More Stable?", *Working Paper of International Monetary Fund, 06*(143), 1-37.

Sengupta, R. (2007) "Foreign entry and bank competition", *Journal of Financial Economics, 84*(2), 502-528. doi: http://dx.doi.org/10.1016/j.jfineco.2006.04.002

Smirlock, M. (1985) "Evidence on the (Non) Relationship between Concentration and Profitability if Banking', *Journal of Money, Credit and Banking, 17*(1), 69-82.

Smirlock, M., Gilligan, T., and William, M. (1984) "Tobin's q and the Structure-Performance Relationship", *The American Economic Review, 74*(5), 1051-1060.

Soedarmono, W., Machrouh, F., and Tarazi, Amine. (2011) "Bank market power, economic growth and financial stability: Evidence from Asian banks", *Journal of Asian Economics, 22*(6), 460-470. doi: http://dx.doi.org/10.1016/j.asieco.2011.08.003

Strahan, P. E. and Weston, J. P. . (1996) "Small Business Lending and Bank Consolidation: Is There Cause for Concern?", *Federal Reserve Bank of New York Current Issues in Economics and Finance, 2*, 1-6.

The Department of Justice and Federal Trade Comission of the United States. (2010) *The horizontal merger guidelines of 2010* US: Retrieved from http://www.justice.gov/atr/public/guidelines/hhi.html.

Unite, A. A. and Sullivan, M. J. (2003) "The Effect of Foreign Entry and Ownership Structure on The Philippine Domestic Banking Market", *Journal of Banking & Finance, 27*(12), 2323-2345. doi: http://dx.doi.org/10.1016/S0378-4266(02)00330-8

Williamson, O.E. (1967) "Hierarchical Control and Optimum Firm Size", *Journal of Political Economy, 75*(2), 123-138. doi: 10.2307/1829822

Yeyati, E. L. and Micco, A. (2003) "Concentration and Foreign Penetration in Latin American Banking Sectors: Impact on Competition and Risk", *Inter-American Development Bank, Research Department Working Paper, 499*, 1-38.

Yeyati, E. L., and Micco, A. (2007) "Concentration and Foreign Penetration in Latin American Banking Sectors: Impact on Competition And Risk", *Journal of Banking & Finance, 31*(6), 1633-1647. doi: http://dx.doi.org/10.1016/j.jbankfin.2006.11.003

Appendix

1. Panzar-Rosse (P-R) method

Panzar-Rosse (P-R) method assesses the competitive behaviour of banks based on the properties of reduced-form revenue equations at the bank level, and the data on revenues and factor prices. The P-R method calculates the sum of elasticity of the reduced form revenues with respect to changes in factor prices. This sum of elasticity is given by H-statistics. The value of elasticity provides information about banks competitive behaviour. The assumption underlying this method is that the market power of banks is measured by the extent to which changes in factor prices (unit costs) are reflected in revenue earned (Vesala, 1995). If the industry is competitive, the elasticity will be high otherwise the elasticity will be low or even negative in the case of monopoly and collusive oligopoly. The properties of H-statistics allow us to distinguish empirically between common imperfect competition theories of price formation as characterizations of the competitive behaviour of Indonesia's banks whether monopoly or perfect collusion in the oligopoly market, monopolistic competition or perfect competition(Vesala, 1995).

The following are empirical models to estimate the competitive environment in the Indonesian banking industry between 1980 and 2010. This empirical model is developed based on some studies in banking competition (Bikker and Haaf, 2002).

$$\mathbf{LnTR_{it}} = \alpha_0 + \left(\sum_{i=1}^{3} \boldsymbol{\beta}_j \ln\left(w_{jit} \,\middle|\, \textit{with t E year} = \mathbf{1}\right)\right) + \boldsymbol{\gamma_1}\,\mathbf{lnEQ_{it}} + \boldsymbol{\gamma_2}\,\mathbf{lnDEP_{it}} + \boldsymbol{\gamma_3}\mathbf{LnOI_{it}} + \boldsymbol{\gamma_4}\,\mathbf{lnDDC_{it}} + \boldsymbol{\sigma_i} + \boldsymbol{\varepsilon_{i,t}}$$

$$\ln\left(\mathbf{w_{jit}} \,\middle|\, \mathbf{with\ t\ E\ year} = \mathbf{1}\right) = \mathbf{ln(w_{jit})\ if\ t\ is\ in\ year} = \mathbf{1},\ \mathbf{otherwise} = \mathbf{0} \qquad (3)$$

The Fixed-Effect (FE) approach of panel data was employed to estimate the competitive behaviour of banks. This approach allows the difference in the factor markets as it observes each bank across different points of time, produces a more reliable estimate of the H-statistics as it examines the behaviour of banks over time, produces more efficient estimators as it has a greater number of observations from pooling the time series data of all banks, and captures the non time-varying determinants of banks revenues. In estimating the yearly-value of the H-statistics, this study divided the panel based on the break in the number of banks by breaking the panel based on the year where there is a significant change in the number of banks. Splitting the panel based on the break in the number of banks has a number of advantages. Firstly, this split method creates a more balanced panel. Secondly, the break of the number of banks is aligned with the structural changes in the banking industry because policy changes alter the competitive environment. The evolution of elasticity of the reduced form of revenues with respect to factor prices was calculated by summing up the coefficient of the interaction variables. The interaction variables are the multiplication of input prices variables and years dummies.

2. Specification of Variables of Competitive Environment Test

Variable	Variable Specification
i	is the index for bank
t	is the index for year between 1980 and 2010
n	is the index for three input price variables which are w_1, w_2, w_3
TR_{it}	is banks' revenue measured by the values of total revenue or interest income of banks *i* and time *t*
w_{1it}	is funding rate measured by the ratio of annual interest expenses to total deposits of bank *i* and time *t*
w_{2it}	is wage rate/personnel expenses measured by the ratio of annual wage and salary expenses to total deposits plus total loans of bank *i* and time *t*
w_{3it}	is capital rate measured by the ratio of other expenses to fixed assets of bank *i* and time *t*
OI_{it}	is the proportion of non-interest income measured by the ratio of non-interest income to interest income of bank *i* and time *t*
EQ_{it}	is capital risk measured by the ratio of equity to total assets of bank *i* and time *t*
DEP_{it}	is deposit mix measured by the ratio of total deposits on total assets of bank *i* and time *t*
DDC_{it}	is deposits mix measured by the ratio of demand deposits to total deposit of bank *i* and time *t*
σ	is the bank fixed effect (unobserved heterogeneity)
ε	is a white-noise error term that includes errors in the competition measure