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Market Structure, Bank Conduct and Bank Performance: Evidence from ASEAN nations

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Abstract

Whether banks in a concentrated market increase their profits through monopoly pricing is a question of prime concern for antitrust policies. We explore this question by introducing the role of bank conduct into the structure-performance relationship. We apply Two-step System GMM dynamic panel model to commercial banks in ASEAN countries over the period of 1999-2014. The results indicate that the higher profits in concentrated banking industries are partially attributable to the anti-competitive conduct by the banks. These findings are robust across alternative measures of market structure and bank conduct, and different time horizons. The implications of these findings require regulators to make sure that the consolidation policy for ASEAN is achieving its purpose – i.e. achieving financial stability – and not allowing the banks to earn monopoly rents.

Keywords: Market Structure; Bank conduct; Bank Performance; Structure Conduct Performance Hypothesis; ASEAN

JEL: G01; G21; G28

1. Introduction

The structure conduct performance (SCP) hypothesis predicts that banks in concentrated markets collude to charge higher loan rates, pay lower deposit rates and earn higher profits (Park & Weber, 2006; Webster, 2011; Mirzaei, Moore, & Liu, 2013).[4] Therefore, the policy implications of SCP require that the consolidation activates must be scrutinized/monitored. Nonetheless, the traditional approach to empirically test the SCP hypothesis is flawed and can be misleading (Homma, Tsutsui, & Uchida, 2014). For instance, the traditional tests of SCP ignore the role of bank conduct and directly relate the bank concentration to some measure of bank performance. A

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[4] See also Smirlock, Gilligan, and Marshall (1984), Smirlock (1985) and Berger (1995).

positive relationship between concentration and profitability is considered as an evidence in support of SCP assuming that the concentration leads to higher profitability through monopoly pricing.[5] However, the existence of a positive relationship between bank concentration and profitability is not enough to suggest that higher profitability is a result of monopoly rents.[6]

Accordingly, the policy implications – i.e. monitoring/scrutiny of consolidation activities – based on traditional tests of the SCP hypothesis can be misleading. For example, it is possible that the relationship between concentration and profitability is explained by other factors such as cost efficiency and/or product quality. Consequently, it becomes immensely relevant for antitrust policy to examine whether the monopoly pricing is driving the relationship between bank concentration and profitability. Otherwise, antitrust measures based on traditional tests of SCP can be counterproductive.

The policy implications of SCP are important in context of Association of South East Asian Nations (ASEAN) for ongoing structural changes in its banking industry. Following the Asian financial crisis 1997-1998 and the Global financial crisis 2008-2009, several policy measures – i.e. bank consolidations, international financial integration, privatization, deregulation, and financial reforms – were undertaken by regulatory authorities to ensure the stability of the banking sectors (Yokoi-Arai & Kawana, 2007; Olivero, Li, & Jeon, 2011b, 2011a; Khan, Ahmad, & Gee, 2016a, 2016b). Such deliberate measures have moved the banking industry in ASEAN towards a more concentrated market structure.[7] During the same period, the bank profitability has also increased but the cost efficiency has declined.[8] Apparently, it seems reasonable to have profitable banks, but what if the profits are being earned out of monopoly pricing? This research question has important implications for anti-trust policies. For instance, if

[5] See for example, Smirlock et al. (1984), Smirlock (1985), Berger and Hannan (1989) and Berger (1995).

[6] These arguments are well documented in Demsetz (1973) and Tirole (1988), who suggest that whether the higher profitability is a result of efficiency, collusion or product quality cannot be established by simply correlating the market concentration to rate of return.

[7] For instance, the five-bank concentration ratio (CR5) and Herfindahl Hirschman Index (HHI) increased from 0.55 and 0.11 in 1999 to 0.82 and 0.23 in 2014 respectively.

[8] The average values for return on assets (ROA) and return on equity (ROE) increased from 4% and 9% in 1999 to 17% and 14% respectively in 2014. On the other hand, the average values for overhead to total assets and total cost to total income were 0.05% and 79.5% in 1999, which increased to 2.92% and 87.1% in 2014.

the consolidation activities are motivated by the desire to earn monopoly profits, then they are most likely to hurt the economy by making the intermediation process more costly.[9]

In this study, we incorporate the role of bank conduct in the structure-performance relationship to provide a legitimate test of SCP hypothesis.[10] The SCP paradigm specifies that the market structure influences the conduct of banks, which in turn affects their performance. Therefore, instead of regressing bank performance directly on the market concentration, we use "bank conduct" as the mediating variable between market structure and performance. Our approach may have advantages over those followed by the earlier studies because it considers all three elements in the SCP paradigm – i.e. the structure, the conduct and the performance – and relates them as specified by the SCP hypothesis.

The study contributes to the banking literature in general and to the SCP literature in particular in several important ways. First, the study introduces a very relevant yet neglected piece of the jigsaw puzzle into the SCP paradigm. The resulting approach thus provides legitimate test of the SCP hypothesis for relevant policy implications. Second, the study makes a contribution in terms of the geographic and economic context by examining the banking structure in ASEAN where the competitive conditions have changed substantially over time. To the best of our knowledge, the literature on SCP in the context of ASEAN and/or based on a similar approach is non-existent. Results show that the higher concentration is followed by higher profitability and that this relationship is mediated by the bank conduct as expected under the SCP paradigm. These findings suggest that the policy makers need to ensure that the consolidation policy for ASEAN is achieving its purpose: in other words, achieving financial stability, and not allowing the banks to earn monopoly rents.

The rest of the study is organized as follows: section 2 reviews the related literature, with a focus on methodological issues; section 3 discusses the methodology, development of an empirical model and measures of the variables; section 4 reports on the estimation results and discussion; and, finally, section 5 concludes the study with a discussion on policy implications.

2. Literature Review

[9] On the contrary, bank consolidations are supposed to allow the banks to exploit the scale efficiencies and transfer the efficiency gains to the customers by reducing the cost of credit.

[10] This approach addresses the issues highlighted by earlier studies e.g. Demsetz (1973) and Tirole (1988).

Literature on market structure and its relationship with bank performance with reference to the SCP hypothesis is abundant. However, this section is more focused on the methodological issues.[11] From a methodological perspective, the literature on the structure-performance relationship can be categorized into three groups. First, the studies that directly regress the profitability measures (i.e. profit rates, interest rate margins and Tobin's Q) or prices (i.e. interest rate spread) on the market structure (i.e. concentration ratio or HHI) and market share. These studies assume that the role of efficiency can be captured by the banks' market share. Therefore, a significant coefficient on concentration and an insignificant coefficient on market share supports the SCP hypothesis. On the other hand, if the structure-performance relationship is explained by bank efficiency then the coefficient on market share is significant while the coefficient on concentration becomes insignificant.[12]

The approach used in the above-mentioned studies suffers from some serious drawbacks. For example, it is not clear that the impact of market concentration and market share on profitability does actually support the SCP and efficient structure (ES) hypotheses. According to Demsetz (1973), it cannot be established that higher profitability is the result of efficiency, collusion or product quality (product differentiation) by simply correlating market concentration to industry rate of return. Even if larger firms in concentrated markets earn higher returns, it is difficult to determine whether efficiency or monopoly power is at work. Similarly, Shepherd (1986) asserts that the market share also reflects the market power of the firm, as its squared sum is the Herfindahl Index. If market share has an impact on profit, it is actually supporting the SCP hypothesis instead of the ES. Moreover, Tirole (1988) highlights an identification problem with the classical test of SCP hypothesis: the causal relationship in SCP (from structure to conduct and from conduct to performance) cannot be identified by regressing market performance on market structure. On the other hand, Berger and Hannan (1989) introduce an alternative measure of performance and use interest rate paid on deposits instead of profitability. They find a positive relationship between market concentration and prices which according to them supports the SCP

[11] See Berger, Demirguc-Kunt, Levine, and Haubrich (2004) for a detailed review of studies and the development of the literature.

[12] Studies in this stream of literature include Graddy (1980), Gale and Branch (1982), Smirlock et al. (1984), Smirlock (1985), Rhoades (1985) , Smirlock, Gilligan, and Marshall (1986) , Shepherd (1986), Evanoff and Fortier (1988), Martin (1988) , Berger and Hannan (1989), Bourke (1989), Molyneux and Thornton (1992) and Lloyd-Williams, Molyneux, and Thornton (1994), Christopoulos, Lolos, and Tsionas (2002) and Koutsomanoli-Filippaki, Mamatzakis, and Staikouras (2009).

hypothesis.[13] Use of prices (interest rates), however, can be problematic: for example, an increase in prices may be related to other characteristics of market structure instead of concentration, such as product differentiation and research and development. According to the product differentiation view, firms with well differentiated and high quality products/services may charge higher prices and earn high profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984). Also, the negative relationship between concentration and prices may not be the condition that is needed to support the ES hypothesis because it could be the norm for efficient firms to set lower prices to compete in the market, but in the short run, efficient firms may also set higher prices and enjoy monopoly profits if such firms are unique in superior performance and such competitive performance is not achievable by others (Homma et al., 2014). Another issue with Berger and Hannan (1989) is that they do not control for supply and demand, whereas since price is a function of demand and supply, these two factors have to be controlled in order to observe the sensitivity of price to other variables.[14]

Second, there are studies that criticize the earlier literature for an explicit assumption that the market share represents the efficiency. These studies use direct measures of efficiency (i.e. X-efficiency and Scale-efficiency) along with market concentration and market share to explain banks' profitability. This approach uses two additional equations in which cost efficiency is separately regressed on market share and market concentration. A significant coefficient on concentration is considered as sufficient evidence to support the SCP hypothesis. However, for the ES hypothesis to be valid, the efficiency should be positively related to all three variables (profitability, market share and market concentration). The approach was introduced by Berger (1995) who finds support for the X-efficiency version of the ES hypothesis. He concludes that concentration is usually negatively related to profitability once the other effects are controlled for in the equation and that the profit-concentration relationship is a spurious one, created by

[13] Jackson (1992) argues that the use of a linear model may represent a misspecification of the true price-concentration relationship. However, Berger and Hannan (1992) argue that the SCP hypothesis has no requirement of linearity whatsoever and an implication of the hypothesis is that once concentration is high enough to generate the monopoly price, further increases in concentration have no effect on price.

[14] Nonetheless, Brewer and Jackson (2006) study the price-concentration relationship by considering both demand and supply control variables in their study (as they criticize previous studies for ignoring demand side factors, such as risk). They conclude that if bank specific risk variables are included in the analysis, then the magnitude of the relationship between deposit rates and market concentration decreases to half.

correlations with other variables, particularly market share.[15] A further improvement in methodology comes with the introduction of efficiency estimation by Berger and Hannan (1997) who study the structure-performance relationship by considering all the relevant relationships among market structure, profits and prices, and by explicitly calculating measures of firm efficiency. They find more support for the structure-conduct-performance hypothesis than for the relative-market-power and efficient-structure hypotheses. Some recent studies which use a similar approach to explore the structure-performance relationship include Zhang, Jiang, Qu, and Wang (2013), Mirzaei et al. (2013) and Amidu (2013).

The methodology proposed by Berger (1995) to test the SCP and alternative hypotheses is comparatively better than earlier studies but it has some shortcomings. For instance, it is not clear how the effect of cost efficiency on profitability, concentration and market share supports the ES hypothesis, while the ES hypothesis predicts that efficient firms grow, obtain more market share and as a result market becomes more concentrated (Homma et al., 2014). Besides this, results of cost efficiency on profitability, concentration and market share are not consistent in three regressions. Also, Berger (1995) follows a traditional framework to test the SCP hypothesis. He uses the market share and market concentration as independent variables while taking profitability as a dependent variable. This approach is similar to the one used by Weiss (1974) and Smirlock (1985), and has the same problems as mentioned earlier.

Third, other studies apply non-structural measures of competition[16] and relate them to firm performance. They include studies by Calem and Carlino (1991), Shaffer and DiSalvo (1994), De Bandt and Davis (2000), Bikker and Haaf (2002), Coccorese (2009) and Turk Ariss (2010). Some also address the related issues on market structure such as the consequences of consolidation in banking (Berger, Demsetz, & Strahan, 1999) and market size structure (Berger, Rosen, & Udell, 2007). However, these studies also use the traditional approach of relating bank performance to the market structure measures. Moreover, like the earlier literature, the findings of these studies are also inconsistent.

[15] Studies which use similar approaches include Molyneux and Forbes (1995), Goldberg and Rai (1996), Park and Weber (2006) and Tregenna (2009).

[16] Non-structural measures of competition from the New Empirical Industrial Organization (NEIO) infer the level of competition directly from banks'/firms' conduct. These measures include the Panzar-Rosse H-statistic, Conjectural Variation Model, Lerner Index, etc.

Except for their use of some alternative measure of market structure and/or profitability, almost all of the studies follow the traditional approach. We do not deliberate on measurement issues; however, the traditional approach is flawed as it ignores the role of bank conduct in the structure-performance relationship. Although some studies [see for example (Calem & Carlino, 1991; Shaffer & DiSalvo, 1994; Bikker & Haaf, 2002; Coccorese, 2009)] – relate the market structure to the conduct of the banks, they do not examine the mediating role of conduct as we do in our study. In the present study, we first try to establish a relationship between structure and conduct, and then between conduct and performance.

3. Methodology

We derive our methodology directly from the SCP paradigm. For example, Bain (1951) describes the SCP relationship as "the concentration of output reduces the cost of collusion and promotes tacit/explicit collusion by participating firms, and consequently all firms are able to earn monopoly profits". Similarly, Martin (2002) suggests that 'the observable structural characteristics of a market determine the behavior of firms within that market and this (behavior) determines market performance". The SCP hypothesis has been described in the banking literature as where "the large banks in the concentrated markets collude, charge higher loan rates, and pay lower deposit rates and as a result, earn higher profits" (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013). In this context, it seems more plausible to study the causal relationship from market structure to the bank conduct, and then from their conduct to their performance.

3.1. The Empirical Model

To empirically test the mediating role of bank conduct, the study follows the methodology laid down in Baron and Kenny (1986). According to this approach, if the bank performance is influenced by concentration through the conduct of the banks, then four conditions must be satisfied: (1) the concentration significantly affects the bank conduct, (2) the conduct significantly affects the bank performance, (3) the concentration affects the bank performance in the absence of the conduct and (4) the effect of the concentration on the bank performance is reduced when the conduct variable is also included in the estimation model. These four conditions have been empirically tested with the help of equations 1, 2 and 3.

$$COND_{i,j,t} = \omega_0 + \omega_1 CI_{j,t-1} + \lambda_m \sum_{m=1}^{n} X_{i,j,t} + \tau_k \sum_{k=1}^{n} Z_{j,t} + \varepsilon_{i,j,t} \quad (1)$$

$$PER_{i,j,t} = \omega_0 + \omega_1 CI_{j,t-1} + \lambda_m \sum_{m=1}^{n} X_{i,j,t} + \tau_k \sum_{k=1}^{n} Z_{j,t} + \varepsilon_{i,j,t} \quad (2)$$

$$PER_{i,j,t} = \omega_0 + \omega_1 CI_{j,t-1} + \omega_2 COND_{i,j,t} + \lambda_m \sum_{m=1}^{n} X_{i,j,t} + \tau_k \sum_{k=1}^{n} Z_{j,t} + \varepsilon_{i,j,t} \quad (3)$$

Where $COND_{i,j,t}$ and $PER_{i,j,t}$ respectively refer to the conduct and the performance of bank "i" in country "j" at time "t", $CI_{j,t-1}$ is the concentration index for country "j" at time "t-1", $X_{i,j,t}$ and $Z_{j,t}$ respectively denote the vector of bank and country level control variables and $\epsilon_{i,j,t}$ is the random error term.

Additionally, the study employs the methods introduced by Goodman (1960), Sobel (1982), MacKinnon and Dwyer (1993) and MacKinnon, Warsi, and Dwyer (1995) to verify the indirect effect of market structure on bank performance. These methods require computation of test score (z-value) to check the significance/insignificance of indirect (mediation) relationship. The test scores are calculated as follows:

Sobel Statistics $$z = \alpha * \beta / SQRT\left(\beta^2 * SE_\alpha^2 + \alpha^2 * SE_\beta^2\right) \quad (4)$$

Aroian Statistics $$z = \alpha * \beta / SQRT\left(\beta^2 * SE_\alpha^2 + \alpha^2 * SE_\beta^2 + SE_\alpha^2 * SE_\beta^2\right) \quad (5)$$

Goodman Statistics $$z = \alpha * \beta / SQRT\left(\beta^2 * SE_\alpha^2 + \alpha^2 * SE_\beta^2 - SE_\alpha^2 * SE_\beta^2\right) \quad (6)$$

Where, α is the coefficient on market structure (independent variables) when the bank conduct (mediating variable) is regressed on the market structure, SEα is the standard error of α. The β is the coefficient on bank conduct (mediating variable) when the bank performance (dependent variable) is regressed on both market structure (independent variables) and bank conduct (mediating variable), while SEβ is the standard error of β. The null hypothesis underlying each test is that the indirect effect of market structure on bank performance is not significantly different from zero.

3.2. Variables of the Study

3.2.1. Bank Performance

The bank performance has been measured through two profitability ratios i.e. return on average assets (ROAA) and return on average equity (ROAE). Almost all of the studies in the structure-performance domain use ROAE and ROAA as the measure of firm/bank performance. As compared to other measures of performance, the ROAE is considered to be more appropriate because it is most closely related to the shareholders' wealth which owners aim to maximize (Weiss, 1974). On other hand, ROAA is more popular in banking studies because it provides a more consistent and the strongest relationship with concentration in banking studies (Heggestad, 1979). For reasons such as appropriateness of measures and robustness checks, we use both ROAA and ROAE in our analysis.

3.2.2. Market Structure

The market structure refers to the level of competition in an industry which has been assessed through the concentration indices based on the structural approach. The level of concentration demonstrates the extent to which the largest firms/banks contribute to the output in an industry. The higher level of concentration implies more market power and less competition. Following previous studies i.e. Goldberg and Rai (1996) and Mirzaei et al. (2013) among others, we use the five bank concentration ratio (CR5), the three bank concentration ratio (CR3) and the Hirschman Herfindahl Index (HHI) based on assets, loans and deposits. The degree of concentration in a market is expected to exert a negative influence on competition in the market; hence it is likely to raise the banks' profits. Therefore, both concentration ratios and the HHI are expected to have positive relationship with banks' profitability.

3.2.3. Bank conduct

To assess the bank conduct, we follow Bikker and Haaf (2002) who use the Panzar-Rosse H-statistic (PRH) to estimate the competitive or noncompetitive conduct of the banks. Alternatively, we also use the price-cost margin (PCM) based on the adjusted Lerner Index and the net interest margin (NIM) for robustness checks. NIM has been used following Goldberg and Rai (1996), who suggest that it represents the pricing ability of the banks. According to Berger and Hannan (1989), if the SCP hypothesis reflects anti-competitive pricing, then banks will be able to charge lower deposit rates and/or charge higher loan rates. If banks are able to price their products anti-competitively, then the NIM will be higher because it indicates an ability to charge lower deposit rates and higher loan rates. NIM is measured as the difference between the interest

income generated by banks and the amount of interest paid out to their lenders divided by interest earning assets.

The Panzar-Rosse model (Rosse & Panzar, 1977; Panzar & Rosse, 1982; Panzar & Rosse, 1987) captures the transfer of changes in input prices to the revenues. Higher transmission implies more competition and lower values suggest more market power in pricing. The sum of the elasticities of the revenue with respect to all input prices is referred to as the Panzar-Rosse H-statistic (PRH statistic). In a profit maximization setting, PRH equals unity (PRH=1) under perfect competition, less than equal to zero (PRH $\leq$ 0) under monopoly, and between 0 and 1 (0 > PRH > 1) for oligopolistic competition.

We follow Bikker, Shaffer, and Spierdijk (2012) and use unscaled revenue equation to estimate the PRH-statistics as below:

$$\ln TI_{i,t} = \alpha_i + \beta_1 \ln W_{1,i,t} + \beta_2 \ln W_{2.i,t} + \beta_3 \ln W_{3,i,t} + \gamma_j \sum_{j=1}^{n} X_{i,t} + \varepsilon_{i,t} \qquad (7)$$

Where, $TI_{i,t}$ represents the total revenue of bank "*i*" in time "*t*"; W_1 , W_2, W_3 are input prices; $X_{i,t}$ is the vector of bank level controls; and $\varepsilon_{i,t}$ is random error. The sum of coefficients on inputs W_1, W_2 and W_3 i.e. $\beta_1 + \beta_2 + \beta_3$, gives the PRH statistic.

According to Bikker et al. (2012), the standalone values of PRH are not sufficient for inferences about the competitive conduct of the banks. Therefore, we also perform the revenue test using banks' return on assets (ROA) as dependent variable and input prices along with bank level control variables as independent variables.

$$\ln ROA_{i,t} = \alpha_i + \beta_1 \ln W_{1,i,t} + \beta_2 \ln W_{2.i,t} + \beta_3 \ln W_{3,i,t} + \gamma_j \sum_{j=1}^{n} X_{i,t} + \varepsilon_{i,t} \qquad (8)$$

We adopt intermediation approach for choice of inputs and output. Accordingly, the output is the natural logarithm of total income which includes interest and non-interest income. We use the ratio of personnel expenses to total assets as cost of labor (W_1), the ratio of other non-interest expenses to fixed assets as cost of physical capital (W_2), and the ratio of interest expenses to total funding as cost of funds (W_3). Following earlier literature, we include several variables to control banks-specific characteristics. For instance, the ratio of customer loans to total assets, the ratio of

non-earning assets to total assets, the ratio of customer deposits to total funding, and ratio of total equity to total assets are included in the estimation to control the credit risk, asset composition, funding mix and leverage respectively. To control the unobservable heterogeneity across banks, we use fixed effect model with corrected standard errors clustered at bank level. We apply the Wald test to evaluate the estimation results from Equation 7 and 8. For each country in the sample, we reject $\beta_1+\beta_2+\beta_3=0$ and $\beta_1+\beta_2+\beta_3<0$ in case of Equation 7. Similarly, we reject $\beta_1+\beta_2+\beta_3=0$ in favor of $\beta_1+\beta_2+\beta_3>0$ in case of Equation 8. According to Bikker et al. (2012), these findings are consistent with oligopolistic competition. The average values of PRH-statics for each sample country are presented in Table 2.

The Lerner Index (Lerner, 1934), shows the ratio of mark up (difference between output price and marginal cost) to output price i.e. *L = (P-MC)/MC*, where *"P"* and *"MC"* refer to the price of the output and the marginal cost of producing an additional unit of output respectively. The difference between a firm's/bank's price and marginal cost gives the extent of market power a firms/bank may possess. In a perfectly competitive market, the price and marginal cost are equal; however, the divergence between price and cost will be higher in a less competitive environment. The Lerner Index "ranges from 0 in a situation of perfect competition to the inverse of price elasticity of demand in a situation of monopoly or collusion". Therefore higher values of Lerner indicate more market power and less competitive conditions. The total assets represent the output of a banking firm, thus the price of total assets is equal to total revenue divided by the total assets. The marginal cost is derived from the translog cost function, as follows:

$$\begin{aligned}\ln Cost_{i,t} &= \beta_0+\beta_1\ln Q_{i,t}+\frac{\beta_2}{2}\ln Q_{it}^2+\sum_{k=1}^{3}\gamma_{k,t}\ln W_{k,i,t}+\sum_{k=1}^{3}\phi_k\ln Q_{i,t}\ln W_{k,i,t}\\ &+\frac{1}{2}\sum_{k=1}^{3}\sum_{j=1}^{3}\delta_{i,j}\ln W_{k,i,t}\ln W_{j,i,t}+\sum_{k=1}^{2}\eta_k trend^k\\ &+\sum_{i=1}^{3}\omega_i\ln W_{j,i,t}trend+v\ln Q_{t,j}trend+\varepsilon_i\end{aligned} \tag{9}$$

Where $Cost_{i,t}$ and $Q_{i,t}$ represent the total cost and output for bank "i" in time "t" respectively, and W_1, W_2 and W_3 are the input prices of deposit funds, labor and capital.[17] Using bank level panel data, the fixed effect model is applied to Equation 9. The introduction of fixed assets

[17] Calculations of these variables are shown in Table 11 (Appendix)

ensures that the bank specific factors are accounted for in the estimation. The marginal cost is the first derivative of the cost function with respect to the level of output. The marginal cost is given by Equation 10:

$$MC_{i,t} = \frac{Cost_{i,t}}{Q_{i,t}}\left[\beta_1 + \beta_2 \ln Q_{i,t} + \sum_{k=1}^{3} \theta_k \ln W_{k,i,t} + \delta_3 Trend_{i,t}\right] \quad (10)$$

Once the marginal cost is estimated, it is used to calculate the Lerner Index for individual banks through the formula *L = (P-MC)/MC.* However, the conventional approach to calculate the Lerner Index has been criticized for its profit and cost efficiency assumptions. Therefore, the Lerner Index under the traditional approach may not reflect the actual market power enjoyed by the banks. We follow the procedure of Koetter, Kolari, and Spierdijk (2012) to adjust the Lerner Index using Equation 11.[18]

$$Lerner(Adjusted) = \frac{\pi_i + tc_i - mc_i * q_i}{\pi_i + tc_i} \quad (11)$$

Where π_i, tc_i, mc_i and q_i represent the profit, total cost, marginal cost and output of bank "i". The value of the adjusted Lerner Index also ranges between 0 and 1 (like the conventional Lerner) with higher values implying more market power.

3.2.4. Other Variables

Several bank and country specific variables have been used in the estimation model to account for the differences in banks' profitability. Prior studies suggests that the banks with high quality products are able to charge higher prices and earn higher profits; such banks have a higher market share.[19] Therefore, the market share is included to capture the effect of product differentiation and it is expected to have a positive relationship with profitability. The ratio of overheads to total assets is included in the model as a raw proxy for X-efficiency. Conventionally, the overheads are expected to have a negative relationship with the profitability. However, the overheads can positively affect the profitability if high profits earned by firms are attributed to high salaries paid to productive human capital (Molyneux & Thornton, 1992).

[18] Issues with the conventional approach to calculate the Lerner Index and the calculation of the efficiency adjusted Lerner Index are discussed in detail in Koetter et al. (2012).
[19] Smirlock (1985), Mueller (1983) and Ravenscraft (1983).

The log of total assets is included in the estimation model to account for the differences in profitability attributable to the size of the banks' operations. The banks' size can affect the profitability in both directions i.e. positive or negative.[20] Bank capitalization represents the banks' ability to stand against adverse economic shocks and absorb losses, thus it can influence banks' profitability.[21] We employ the ratio of equity to total assets as a measure of capital strength. A priori relationship between capitalization and profitability is not clear.[22] Additionally, we include bank level Z-score in the analysis to account for the probability of bank failure. The value of Z-core increases with increase in profitability and capitalization levels, and decreases with unstable earnings reflected by a higher standard deviation of return on assets (Berger, Klapper, & Turk-Ariss, 2009). The off-balance-sheet activities have been recognized in the literature as affecting banks' profitability. The findings of any empirical study would be biased if conducted without consideration of off-balance sheet activities (Casu & Girardone, 2005). Therefore, we use the ratio of the off-balance sheet activities to total assets in the estimation model.

Banks' ownership structure (foreign versus domestic) can be one of the reasons for differences in performance. For instance, domestic banks in industrialized countries are more profitable than their counterparts in developing countries. However, the opposite is the true for foreign banks in emerging economies (Drakos, 2003; Bonin, Hasan, & Wachtel, 2005; Micco, Panizza, & Yanez, 2007). We include a dummy variable to control the differences in profitability due to ownership structure.[23]

[20] For instance, banks with higher assets benefit from economies of scale; moreover, they (large banks) may take advantage of their market powers to earn supernormal profits (Goddard, Molyneux, & Wilson, 2004; Mirzaei et al., 2013). Nevertheless, extremely large sized banks might show a negative relationship with profitability due to agency costs, the overhead cost of bureaucratic processes and other costs related to managing large banks (Mirzaei et al., 2013).

[21] All banks are subject to capital requirements in accordance with the Basel II capital adequacy regulations, where capitalization is seen as the main source to cover loan losses. The banks are required to hold at least 8% of capital against their risk weighted assets.

[22] Well-capitalized banks increase the banks' creditworthiness, reduce the costs of funding and lower the risk of bankruptcy. Also, a bank can benefit from holding capital in excess of the regulatory minimum. For example, it can possibly increase its portfolio of highly profitable assets, because the accompanying potential risk can be insulated by holding adequate capital. Also, see Honda (2004) and Pasiouras and Kosmidou (2007) among others.

[23] Following Micco et al. (2007) and Claessens and Van Horen (2012) we define a bank as a foreign bank if at least 50% of the bank's shares are held in foreign hands.

The demand and supply conditions are also important determinants of banks' profitability. Therefore, the ratio of total loans to total deposits has been used to account for effects of demand for and supply of loans. Development of financial markets can also influence the operations of the banks. For example, efficient capital markets disclose more information about companies, thus the banks can benefit by reducing adverse selection and moral hazard risks, thereby improving their profitability (Beck & Levine, 2004; Mirzaei et al., 2013). We use stock market turnover ratio as a measure of stock market development.

Almost all of the studies on structure-performance relationship use real GDP growth and inflation rate to control the macroeconomic environment in which the banks operate. Economic growth has a positive effect on banks' profitability, possibly due to an increase in lending rates with less probability of a default rate. However, if the supply of deposits declines due to a rise in consumption in line with GDP growth, the sign on the GDP coefficient may become negative (Athanasoglou, Brissimis, & Delis, 2008). Similarly, in inflationary environments the banks have wider margins and greater profits. The impact of inflation on profitability depends on whether future inflation is perfectly predicted or not. If bank managers fully anticipate inflation, then they increase lending rates more than deposit rates, maintaining the level of inflation-indexed real profits (Bourke, 1989; Molyneux & Thornton, 1992; Demirgüç-Kunt & Huizinga, 1999; Wang, 2016).

Moreover, we also account for countries' institutional characteristics and regulatory framework, following Demirguc-Kunt, Laeven, and Levine (2003), Shen and Huang (2003) and Chan, Koh, Zainir, and Yong (2015). Institutional characteristics are based on the index of financial freedom and foreign ownership. The regulatory framework is represented by the accumulative index of government effectiveness, rule of law, political stability and regulatory quality. The source of the individual indices is the World Governance Indicators, provided by Kaufmann, Kraay, and Mastruzzi (2015). The accumulative index ranges from approximately -10 to +10 with higher values indicating effective governance, better enforcement of laws, political stability and a higher quality of regulation formation and implementation, which are expected to have a positive influence on bank performance.

3.3. Sample and Data

We apply the proposed methodology to commercial banks in five countries (Malaysia, Indonesia, Singapore, Philippines and Thailand) from ASEAN.[24] The bank level data has been collected from financial statements provided by BankScope. The sources of country level variables include Global Financial Development Database (GFDD), Word Bank, Heritage Foundation and Fraser Institute. Following Turk Ariss (2010), we filter the original sample by excluding banks with less than three consecutive yearly observations, and banks for which data on the main variables are not available (such as loans or total assets). The filtering criteria leave us with an unbalanced panel of 173 banks.

4. Results and Discussion

As discussed in section 3.1, we specify four conditions for the validity of the SCP hypothesis: (1) the concentration significantly affects the bank conduct, (2) the conduct affects the bank performance, (3) the concentration affects the bank performance in the absence of the conduct and (4) the effect of the concentration on bank performance is reduced when the conduct variable is also included in the estimation model. The estimation results of each condition are presented in the sections that follow.

4.1.1. Relationship Between Market Structure and Bank Conduct

The first condition for validity of the SCP hypothesis requires that the market structure significantly affects the bank conduct. The estimation results of Equation 1 are reported in Table 1. Bank conduct is represented by the PRH statistic and PCM in panels A and B respectively. The coefficients on market structure measures are highly significant with a negative sign in panel A. Since the higher values of the PRH statistic (values closer to 1) represent more competitive conduct, the negative coefficients on market structure measures imply that higher concentration leads to less competitive conduct by the banks. This is in agreement with Bikker and Haaf (2002), who also find the higher concentration in the banking industry to be related to anti-competitive conduct by the banks. On the other hand, the coefficients on market structure measures are significant with a positive sign in panel B. The higher values of the PCM imply anti-competitive pricing by the banks, and therefore the positive coefficients on market structure measures suggest that the conduct of banks becomes less competitive when bank concentration

[24] The complete coverage of ASEAN countries is limited by availability of bank level data.

increases. Among other control variables, the bank size, the bank capitalization and merger activities are related to the anti-competitive behavior by the banks. Alternatively, we also use net interest margin (NIM) as a proxy for anti-competitive pricing. According to Berger and Hannan (1989), if the SCP hypothesis reflects anti-competitive pricing, then the banks will be able to charge lower deposit rates and/or charge higher loan rates. The NIM captures the pricing ability of banks for services, deposits and loans (Goldberg & Rai, 1996). Although not reported in the article, to save space, the relationship between bank concentration and NIM is significantly positive, which reinforces the earlier findings. Our findings for concentration and NIM are in contrast to earlier studies which use net interest margin as a measure of banks' pricing strategy i.e. Goldberg and Rai (1996) and Seelanatha (2010).

4.1.2. Relationship Between Market Structure and Performance

The third condition for the validity of SCP requires the market structure to influence the bank performance independently of the bank conduct. The estimation results of Equation 3 are displayed in panel A of Table 2, the dependent variables are ROA and ROE. The coefficients on all measures of market structure are consistently significant with positive signs in both panels A and B. These results are concurrent with some of the earlier studies which use similar measures of concentration and profitability [see for example Martin (1988); Molyneux and Thornton (1992); Lloyd-Williams et al. (1994); Berger (1995); Al-Muharrami and Matthews (2009); Tregenna (2009)]. However, these studies consider positive concentration-profitability relationship as sufficient evidence in favor of the SCP hypothesis.

With respect to control variables, market share is consistently positive and significant. This is in line with the findings of Mueller (1983) and Ravenscraft (1983), who argue that the market share captures the effects of product differentiation. For instance, banks with higher quality products are able to charge higher prices and earn higher profits so these banks have a higher market share. Other control variables for which an a priori relationship was expected (for example equity total assets, overhead to total assets, loan to deposit ratio and stock market turnover) are significant with expected signs. We find consistently positive coefficient on total assets supporting the argument that the banks with higher assets benefit from economies of scale. Moreover, it is possible that the large banks take advantage of their market powers to earn higher profits (Goddard et al., 2004). Real GDP growth is consistently significant with a positive sign, thus supporting the assertion that GDP growth has a positive effect on banks' profitability,

possibly due to an increase in lending rates with less probability of a default rate (Athanasoglou et al., 2008). The coefficients on the ownership structure are also significant with a positive sign, indicating that banks with foreign ownership perform better in terms of profitability. Stock market turnover is consistently positive, which supports the argument that efficient capital markets disclose more information about companies, thus banks can benefit by reducing adverse selection and moral hazard risks, and thereby improving their profitability (Beck & Levine, 2004; Mirzaei et al., 2013). Inflation is consistently negative in all estimations, which is in contrast to the findings of earlier studies (Bourke, 1989; Molyneux & Thornton, 1992; Demirgüç-Kunt & Huizinga, 1999). However, the impact of inflation on profitability depends on whether future inflation is perfectly predicted or not. If bank managers fully anticipate inflation, they increase lending rates more than the deposit rates, maintaining the level of inflation-indexed real profits. However, inflation may affect the profits negatively if managers cannot fully anticipate it. The coefficients on merged banks are consistently positive, thus demonstrating that the profitability of merged banks is higher than that of the other banks. The coefficients on institutional characteristics and regulatory framework are positive, suggesting that banks in more open and sound business environments are more profitable. Among the time dummies, the coefficients on years 2007, 2008 and 2009 (not reported, for the sake of brevity) are significantly negative, implying that the global financial crisis 2007-2009 had a depressing effect on the banks' profitability.

4.1.3. The Mediating Role of Bank Conduct

The second and fourth conditions for the validity of the SCP hypothesis require that the effect of the market structure on bank performance reduces in magnitude or becomes zero when the conduct variable is also included in the model. The mediating effect is referred to as "the perfect mediation" if the coefficient on the market structure becomes insignificant while the coefficient on the conduct variable is still significant. However, if the coefficient on the market structure is still significant but reduces in magnitude, then it is a case of partial mediation. The estimation results of Equation 4 are shown in panel B of Table 2, the dependent variables are the ROA and ROE. The bank conduct is represented by PRH statistic.

The coefficients on the market structure are still significantly positive, while the bank conduct is also significant in all specifications. However, the magnitude of the coefficients on the market

structure has decreased. Thus, the bank conduct partially mediates the relationship between market structure and the bank performance. So far, the estimation results have supported all the conditions specified for the validity of the SCP hypothesis. For example, the market structure affects the conduct of the banks; the bank conduct independently influences the bank performance; the market structure affects the bank performance independently of the bank conduct; and the effect of the market structure decreases in magnitude when the bank conduct is incorporated in the estimation model.

To further verify the indirect relationship between market structure and bank performance – i.e. from market structure to bank conduct and then from bank conduct to bank performance – the study follows a procedure introduced by Goodman (1960), Sobel (1982), MacKinnon and Dwyer (1993) and MacKinnon et al. (1995). This procedure involves calculation of test statics using equation 4, 5 and 6. The results of the mediation analysis are reported in Table 3. The comparison of the coefficients on the market structure variables in the first and second row of the table clearly indicates that inclusion of the bank conduct in the estimation model decreases the impact of the market structure on the bank performance. The last three rows provide further evidence of the reduction of the market structure coefficients. Rejection of the null hypothesis under the Sobel, Aroian and Goodman tests suggests that the mediation effect is present in the structure-performance relationship. However, the effect of the market structure on the bank performance is still significant, and therefore this is a case of partial mediation.

From these results, we infer that the SCP hypothesis seems to be a valid explanation for the positive relationship between market structure and bank performance in ASEAN economies. However, the SCP hypothesis may not be the only explanation for the structure-performance relationship because there is a partial mediation through the bank conduct from market structure to bank performance. Other possible explanations may include bank efficiency and/or product differentiation. Policy implications of these findings are that banks in concentrated markets earn higher profits partially through anticompetitive behavior. Therefore, the consolidation activities must be monitored/scrutinized to prevent banks from creating market power.

Table 1: Relationship between Market Structure and Bank Conduct

	Panel A: PRH statistic			Panel B: PCM		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Market Structure (Concentration)	-0.238***	-0.218***	-0.226***	0.171***	0.148***	0.185***
	(0.076)	(0.073)	(0.081)	(0.052)	(0.049)	(0.062)
Bank Capitalization	-0.099**	-0.078**	-0.089**	0.163***	0.143**	0.149**
	(0.047)	(0.038)	(0.046)	(0.054)	(0.077)	(0.079)
Bank Size	-0.168**	-0.143**	-0.133*	0.107**	0.111**	0.129**
	(0.083)	(0.071)	(0.065)	(0.052)	(0.055)	(0.063)
Bank Overhead	0.024*	0.027	0.035	0.018	0.023*	0.025
	(0.013)	(0.022)	(0.053)	(0.092)	(0.026)	(0.038)
Off Balance Sheet Activity	0.041	0.031	0.043	0.067	0.021	0.029
	(0.071)	(0.026)	(0.025)	(0.046)	(0.027)	(0.024)
Loan Demand/Supply	-0.008	0.014	0.019*	-0.015	0.022	0.011
	(0.032)	(0.061)	(0.010)	(0.030)	(0.038)	(0.014)
Number of Banks	0.014	0.011	0.008	0.012	0.016	0.007
	(0.021)	(0.043)	(0.006)	(0.021)	(0.015)	(0.009)
Economic Growth	-0.29	-0.041*	-0.043**	0.034**	0.045	0.043*
	(0.017)	(0.022)	(0.019)	(0.015)	(0.033)	(0.022)
Stok Market Development	-0.021**	-0.015*	-0.063	0.011	0.015*	0.074
	(0.010)	(0.008)	(0.074)	(0.013)	(0.008)	(0.051)
Ownership Structure	0.031**	0.030*	0.035*	-0.069	-0.072**	-0.065*
	(0.012)	(0.014)	(0.018)	(0.063)	(0.035)	(0.033)
Inflation	0.019*	0.017**	0.016**	-0.023**	-0.029*	-0.025*
	(0.010)	(0.008)	(0.007)	(0.011)	(0.014)	(0.013)
Dummy (Merger)	0.017**	0.015**	0.021*	-0.018**	-0.015**	-0.012*
	(0.008)	(0.007)	(0.010)	(0.008)	(0.008)	(0.009)
Institutional Characteristics	0.152*	0.163*	0.124	-0.149*	-0.147	-0.167
	(0.079)	(0.082)	(0.114)	(0.075)	(0.134)	(0.116)
Regulatory Framework	0.120*	0.116*	0.132	-0.128*	-0.137**	-0.124*
	(0.061)	(0.059)	(0.093)	(0.065)	(0.067)	(0.063)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.029	0.017	0.020	0.012	0.027	0.017
AR(2)	0.134	0.133	0.186	0.081	0.150	0.120
Sargan/Hensen	0.215	0.259	0.172	0.221	0.199	0.216
No. of Instruments	129	129	129	131	131	131
No. of Groups	173	173	173	173	173	173

Note: The table reports the estimation results for the structure-conduct relationship. The dependent variables are PRH statistic (penal: A) and PCM (Penal: B). Market Structure measures include CR5 (column1 and 4), CR3 (column 2 and 5) and HHI (column 3 and 6) bases on Total Assets. Other variables include, Market Share = Bank's share in Assets; Bank Capitalization = Equity to Total Assets; Bank Size = Log of Total Assets; Bank Overhead = Overhead to Total Assets; Off Balance Sheet activity= Off Balance Sheet Items to Total Assets; Loan demand/supply= Total Loan to Total Deposits; Number of Banks; Economic Growth= Real GDP Growth; Stock Market Development= Stock Market Turnover; Ownership Structure= Dummy variable for foreign/domestic Ownership; Inflation=change in CPI; Dummy (merger) = Dummy variable for merged banks; Institutional Characteristics = Financial Freedom and Foreign Ownership; and the Regulatory Framework = Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability. Results have been estimated through application of Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. Corrected standard errors are reported in the parenthesis. Significant values of AR (1) indicate that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is insignificant indicating that error terms in level regressions are not correlated. Values of Sargan/Hensen are insignificant indicating that instruments are valid. Results of AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Subscripts ***, **, * denote the significance of relationships at 1%, 5% and 10% levels respectively.

Table 2: Market Structure and Bank Performance with and without Bank Conduct

Variables	Panel A: Structure-Performance				Panel B: Structure-Conduct-Performance			
	ROA		ROE		ROA		ROE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure	0.326***	0.298***	0.334**	0.351**	0.115**	0.108**	0.162**	0.157**
	(0.081)	(0.102)	(0.0.098)	(0.121)	(0.057)	(0.053)	(0.079)	(0.058)
Bank Conduct	-	-	-	-	-0.064***	-0.058***	-0.089**	-0.067**
	-	-	-	-	(0.021)	(0.019)	(0.044)	(0.033)
Market Share	0.025**	0.021**	0.015*	0.018*	0.022**	0.018**	0.011*	0.017*
	(0.012)	(0.009)	(0.008)	(0.008)	(0.010)	(0.008)	(0.006)	(0.009)
Bank Capitalization	0.077**	0.056***	0.071**	0.074*	0.068**	0.047**	0.062**	0.065*
	(0.037)	(0.018)	(0.034)	(0.038)	(0.032)	(0.023)	(0.031)	(0.033)
Bank Size	0.091**	0.103***	0.099*	0.084**	0.088**	0.099**	0.096*	0.081**
	(0.044)	(0.050)	(0.051)	(0.041)	(0.043)	(0.049)	(0.047)	(0.040)
Bank Overhead	-0.267**	-0.263**	-0.269**	-0.238**	-0.245**	-0.241**	-0.247**	-0.219**
	(0.133)	(0.131)	(0.134)	(0.118)	(0.122)	(0.119)	(0.123)	(0.109)
Off Balance Sheet Activity	0.022*	-0.031	0.020	0.019*	0.023**	-0.029	0.021	0.018*
	(0.012)	(0.038)	(0.016)	(0.011)	(0.011)	(0.028)	(0.017)	(0.010)
Loan Demand/Supply	0.024*	0.021*	0.029*	0.023**	0.021*	0.019*	0.026*	0.025**
	(0.013)	(0.011)	(0.015)	(0.011)	(0.011)	(0.010)	(0.014)	(0.012)
Z-Score	0.032**	0.013**	0.025**	0.014**	0.011*	0.012**	0.014**	0.013**
	(0.014)	(0.006)	(0.013)	(0.006)	(0.006)	(0.005)	(0.006)	(0.004)
Number of Banks	-0.013	-0.011*	-0.014	-0.012	-0.024	-0.022	-0.025*	-0.021*
	(0.011)	(0.006)	(0.012)	(0.013)	(0.021)	(0.019)	(0.013)	(0.011)
Economic Growth	0.033**	0.028**	0.031**	0.025**	0.029**	0.024**	0.027**	0.020**
	(0.016)	(0.013)	(0.015)	(0.012)	(0.014)	(0.012)	(0.013)	(0.009)
Stok Market Development	0.031**	0.028**	0.035**	0.033**	0.028**	0.033**	0.031**	0.032**
	(0.015)	(0.013)	(0.017)	(0.016)	(0.013)	(0.016)	(0.015)	(0.015)
Ownership Structure	0.018**	0.021**	0.017*	0.020*	0.016**	0.018**	0.013*	0.023*
	(0.008)	(0.009)	(0.009)	(0.011)	(0.007)	(0.008)	(0.007)	(0.012)
Inflation	-0.026**	-0.018**	-0.024*	-0.019**	-0.024**	-0.019**	-0.021*	-0.017**
	(0.012)	(0.008)	(0.013)	(0.009)	(0.011)	(0.009)	(0.011)	(0.008)
Dummy (Merger)	0.123**	0.111**	0.131**	0.134**	0.118**	0.107**	0.127**	0.130**
	(0.061)	(0.054)	(0.064)	(0.066)	(0.058)	(0.052)	(0.063)	(0.064)
Institutional Characteristics	0.083**	0.078**	0.087**	0.085**	0.078**	0.073**	0.081**	0.079**
	(0.040)	(0.038)	(0.043)	(0.041)	(0.038)	(0.036)	(0.040)	(0.039)
Regulatory Framework	0.133**	0.131**	0.162**	0.147**	0.129**	0.127**	0.158**	0.145**
	(0.066)	(0.064)	(0.080)	(0.072)	(0.064)	(0.063)	(0.078)	(0.072)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.031	0.021	0.015	0.013	0.034	0.023	0.014	0.009
AR(2)	0.137	0.189	0.083	0.123	0.146	0.202	0.088	0.131
Sargan/Hensen	0.219	0.176	0.226	0.221	0.233	0.187	0.240	0.235
No. of Instruments	129	129	131	131	129	129	131	131
No. of Groups	173	173	173	173	173	173	173	173

Note: The table reports the estimation results for the structure-performance relationship in the presence of the conduct variable. Dependent variables are ROAA (Panel A) and ROAE (Panel B). Market Structure measures include CR5 (column1 and 4), CR3 (column 2 and 5) and HHI (column 3 and 6) bases on Total Assets. Bank conduct has been measured by PRH statistic. Other variables include, Market Share = Bank's share in Assets; Bank Capitalization = Equity to Total Assets; Bank Size = Log of Total Assets; Bank Overhead = Overhead to Total Assets; Off Balance Sheet activity= Off Balance Sheet Items to Total Assets; Loan demand/supply= Total Loan to Total Deposits; Banks' Z-score; Number of Banks; Economic Growth= Real GDP Growth; Stock Market Development= Stock Market Turnover; Ownership Structure= Dummy variable for foreign/domestic Ownership; Inflation=change in CPI; Dummy (merger) = Dummy variable for merged banks; Institutional Characteristics = Financial Freedom and Foreign Ownership; and the Regulatory Framework = Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability. Results have been estimated through application of Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. Corrected standard errors are reported in the parenthesis. Significant values of AR (1) indicate that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is insignificant indicating that error terms in level regressions are not correlated. Values of Sargan/Hensen are insignificant indicating that instruments are valid. Results of AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Subscripts ***, **, * denote the significance of relationships at 1%, 5% and 10% levels respectively.

Table 3: Mediation Analysis based on Sobel, Aroian and Goodman Tests

The Indirect Role of Bank Conduct between Market Structure and Bank Performance				
	1	2	3	4
Coefficients on Market Structure from Panel A of Table 2	0.326***	0.298***	0.334**	0.351**
	(0.081)	(0.102)	(0.098)	(0.121)
Coefficients on Market Structure from Panel B of Table 2	0.115**	0.108**	0.162**	0.157**
	(0.057)	(0.053)	(0.079)	(0.058)
Coefficients on Market Structure from Table 1	-0.238***	-0.226***	0.171***	0.185***
	(0.076)	(0.081)	(0.052)	(0.062)
Coefficient on Bank Conduct from Panel B of Table 2	-0.064***	-0.058***	0.055***	0.067***
	(0.021)	(0.019)	(0.017)	(0.021)
Sobel Test	2.184**	2.077**	2.306**	2.179**
	(0.0069)	(0.0071)	(0.0041)	(0.0056)
Aroian Test	2.129**	2.020**	2.253**	2.124**
	(0.0071)	(0.0062)	(0.0041)	(0.0058)
Goodman Test	2.543**	2.139**	2.362**	2.238**
	(0.0067)	(0.0059)	(0.0040)	(0.0055)

Note: The Table reports the mediation analysis based on Sobel, Aroian and Goodman tests. First two rows compare the results based on equation 2 and 3. Third row shows the estimation results based on equation 1. In the fourth row, the coefficients on conduct variables are shown based on equation 3. For the 4th row, the conduct variable in columns 1 and 2 is the PRH statistic, while in columns 4 and 5, the conduct variable is the PCM (not reported in the article to conserve space). The coefficients on structure variables (row 3) and the conduct variable (row 4) are used to calculate the z statistics which are reported in the last three rows. The null hypothesis underlying each test is no indirect role of bank conduct between concentration and profitability. Rejection of null hypothesis thus indicates to the presence of mediation effect. Standard errors are reported in the parenthesis. Subscripts ***, **, * denote the significance of relationships at 1%, 5% and 10% levels respectively.

4.2. Robustness Check

The relationships specified for the validity of the SCP hypothesis are consistently significant across alternative proxies of the market structure, the bank conduct and the performance. However, we also performed the analysis with six alternative measures of the market structure i.e. CR5, CR3 and HHI, based on total deposits and total loans[25]. The findings from this analysis are similar to the main results. As additional robustness tests, we repeat the analysis for the SCP hypothesis across different sample periods and different bank sizes.

4.2.1. The Global Financial Crisis

Although the fluctuations in the bank conduct and performance have been accounted for by introducing country and time dummies, we also perform the analysis on different sample periods i.e. pre-financial crisis period (1999-2006), financial crisis period (2007-2009) and post-financial crisis period (2010-2014), as additional robustness checks. The sample has been divided into three groups on the basis of (i) insights from earlier studies – i.e. Spence (2009), Khan et al.

[25] These results are not reported in the article, to conserve space, however, they can be provided upon request.

(2016a), Khan et al. (2016b), and (ii) the coefficients on time dummies for the years 2007, 2008 and 2009.[26]

The estimation results and subsequent mediation analysis are reported in Table 4.[27] The first row reports the estimation results based on Equation 1, the dependent variables are the PRH statistic (column 1, 3, and 5) and the PCM (columns 2, 4, and 6), while the structure variable is CR5. The coefficients on the market structure are consistently significant for all three samples, implying that higher concentration is positively related to anti-competitive conduct across all sample periods. The second and third rows report the estimation results based on Equations 2 and 3 respectively, the performance measure is ROAA, while the structure variables are CR5 (columns 1, 3, and 5) and HHI (columns 2, 4, and 6). For each sample period, the coefficients on market structure are significant; however, the magnitude of the coefficients reduces when bank conduct is present in the estimation model. The fourth row reports the coefficients on conduct variables from estimation of Equation 3, and the conduct variables are the PRH statistic (in column 1, 3, and 5) and the PCM (columns 2, 4, and 6). The results in each case are estimated by Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. All models have been estimated with control variables, country dummies and time dummies.[28] The coefficients on the structure variables (row 1) and the conduct variable (row 5) are used to calculate the z statistics which are reported in the last three rows. In all cases, the test statistics under the Sobel, Aroian and Goodman tests are rejected, indicating that the mediation effect is robust for all the sample periods.

[26] Although not reported in the Tables for brevity, the coefficients on these years are significantly negative, indicating that the bank performance has been lower during the financial crisis.

[27] The analysis has been performed using all measures of the market structure, the conduct and the performance; however, we only report results from CR5 (assets), to conserve space (results from other measures are qualitatively similar to the overall results).

[28] The coefficients on control and dummy variables are excluded to make the results more presentable.

Table 4: SCP Hypothesis and the Global Financial Crisis

SCP Hypothesis across Different Sample Groups						
Coefficients/Relationships	**Sample 1999-2006**		**Sample 2007-2009**		**Sample 2010-2014**	
	(1)	(2)	(3)	(4)	(5)	(6)
Structure-Conduct Relationship	-0.163**	0.125***	-0.112*	0.109**	-0.289**	0.253**
	(0.067)	(0.041)	(0.057)	(0.053)	(0.122)	(0.106)
Structure-Performance (without Conduct)	0.177**	0.208**	0.126*	0.235**	-0.329**	0.292**
	(0.086)	(0.102)	(0.064)	(0.115)	(0.162)	(0.141)
Structure-Performance (with Conduct)	0.073**	0.096*	0.057**	0.112**	-0.136**	0.199**
	(0.056)	(0.049)	(0.028)	(0.053)	(0.066)	(0.096)
Coefficient on Conduct (in S-C-P Model)	-0.038***	0.046***	-0.032*	0.039**	-0.042***	0.063***
	(0.012)	(0.015)	(0.017)	(0.015)	(0.011)	(0.015)
Sobel Test	2.130**	2.162**	1.359	1.612	2.012**	2.075**
	(0.0034)	(0.0026)	(0.0026)	(0.0026)	(0.0060)	(0.0076)
Aroian Test	2.075**	2.106**	1.275	1.544	1.961*	2.032**
	(0.0035)	(0.0027)	(0.0028)	(0.0027)	(0.0061)	(0.0078)
Goodman Test	2.191**	2.222**	1.461	1.691	2.064**	2.121**
	(0.0033)	(0.0025)	(0.0024)	(0.0025)	(0.0058)	(0.0075)

Note: The table reports the estimation results for different sample periods i.e. pre-global financial crisis period (1999-2006), the global financial crisis period (2007-2009) and the post-global financial crisis period. The results in each case are estimated through the Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. All models have been estimated with control variables, country dummies and time dummies (the coefficients on control and dummy variables are excluded to make the results more presentable). The coefficients on the structure variables (row 1) and the conduct variable (row 5) are used to calculate the z statistics which are reported in the last three rows. The null hypothesis underlying each test is no indirect role of bank conduct between concentration and profitability. Rejection of null hypothesis thus indicates to the presence of mediation effect. Standard errors are reported in the parenthesis. Subscripts ***, **, * denote the significance of relationships at 1%, 5% and 10% levels respectively.

4.2.2. The Bank Size

The SCP hypothesis suggests that the large banks in a concentrated market are likely to collude and earn monopoly rents (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013).[29] The bank size effect has explicitly been captured in the estimation model; however, as an additional robustness check, we also perform the analysis separately for large and small size banks.[30] A bank is categorized as a "large" bank if its assets (in a particular year) are on or above the 75th percentile of banking assets in a country (in a year), whereas a bank whose assets are below the 75th percentile is categorized as a "small" bank. Table 5 displays the estimation results for the sample of large banks (panel A) and small banks (panel B). The coefficients on market structure are still significant for both the samples when the bank conduct is introduced into the estimation

[29] Also see Smirlock et al. (1984), Smirlock (1985) and Berger (1995).
[30] We are grateful to an anonymous referee for the suggestion.

model. Moreover, the null hypothesis of no mediation effect under the Sobel, Aroian and Goodman tests is also rejected for both samples. Accordingly, the implications are that the positive relationship between bank concentration and profitability is partially explained by the anti-competitive conduct of the banks. These findings suggest that the anti-competitive conduct – e.g. monopoly pricing – in the concentrated markets is not specific only to the larger banks.[31] On the surface, these findings seem contrary to the premise of the SCP hypothesis, but in some ways they are related to the existence of the SCP. For instance, Demsetz (1973) argues that if both large and small firms in a concentrated industry earn monopoly rents, then the SCP hypothesis is supported. However, if only larger firms are able to earn monopoly rents, then the SCP hypothesis cannot be supported because smaller firms are receiving no benefits from concentration.[32]

Table 5: SCP Hypothesis and Bank Size

SCP Hypothesis across Different Bank Sizes				
Coefficients/Relationships	**Panel A: Large Banks**		**Panel B: Small Banks**	
	(1)	**(2)**	**(3)**	**(4)**
Structure-Performance Relationship without Conduct	0.175**	0.193**	0.113**	0.124**
	(0.076)	(0.087)	(0.049)	(0.053)
Structure-Performance Relationship with Conduct	0.105**	0.093**	0.087**	0.098**
	(0.045)	(0.039)	(0.037)	(0.044)
Structure-Conduct Relationship	-0.127***	-0.109**	-0.068***	-0.079***
	(0.039)	(0.046)	(0.019)	(0.023)
Coefficient on Conduct Variable	-0.047***	-0.056***	-0.033***	-0.039***
	(0.013)	(0.018)	(0.011)	(0.013)
Sobel Test	2.419**	2.058**	2.299**	2.259**
	(0.0024)	(0.0076)	(0.0097)	(0.0013)
Aroian Test	2.370**	2.011**	2.248**	2.207**
	(0.0025)	(0.0077)	(0.0099)	(0.0014)
Goodman Test	2.472**	2.110**	2.353**	2.315**
	(0.0024)	(0.0074)	(0.0095)	(0.0012)

Note: The table reports the estimation results for the sample of Large Banks (Panel A) and Small Banks (Panel B). First and second rows report the estimation results based on equation 2 and 3 respectively. The performance measures are ROA (column 1 and 3) and ROE (column 2 and 4), while the structure variables are CR5 (columns 1 and 3) and HHI (columns 2 and 4) for these two rows. Third row reports the estimation results based on equation 1, the conduct variable is PRH statistic, while the structure variables are CR5 (column 1 and 3) and HHI (column 2 and 4). Fourth row reports the coefficients on conduct variable from estimation of equation 3. The coefficients on the structure variables (row 1) and the conduct variable (row 5) are used to calculate the z statistics which are reported in the last three rows. The null hypothesis underlying each test is no indirect role of bank conduct between concentration and profitability. Rejection of null hypothesis thus indicates the presence of mediation effect. Corrected standard errors are reported in the parenthesis. Subscripts ***, **, * denote the significance of relationships at 1%, 5% and 10% levels respectively.

[31] We also perform a similar analysis based on the banks' market share; these results are qualitatively similar to those for the sample of large and small banks – i.e. anti-competitive conduct in the concentrated markets cannot be attributed only to the banks with a larger market share.

[32] According to Demsetz (1973), if only larger firms achieve the rents, then the efficient structure hypothesis is supported.

5. Conclusion

The policy implications of the SCP hypothesis require that the consolidations activities should be monitored because concentration eliminates competition from the market and leads to market inefficiency i.e. monopoly profits. The implications of the SCP are important for banking industry in ASEAN for ongoing shift towards a more concentrated market structure. Moreover, there has also been an increase in banks' profitability and a decrease in cost efficiency. These facts are alarming for antitrust policies if the banks in ASEAN are profitable through monopoly pricing. However, the traditional test of the SCP hypothesis may not be useful for analyzing the situation, owing to the identification issues.

In this study, we apply a different approach to test the SCP hypothesis that overcomes the issues with traditional methodology. Instead of relating market structure directly to the performance, we introduce the bank conduct as an intermediating variable between market structure and performance. We follow the procedure introduced by Baron and Kenny (1986) to examine the mediating effect of bank conduct. Accordingly, four conditions have been specified for the existence of a mediation effect: i) bank concentration influences the conduct of the banks, ii) the bank conduct affects the performance of the banks, iii) bank concentration affects the bank performance in absence of the bank conduct, and (iv) the impact of the bank concentration on the bank performance reduces with the inclusion of bank conduct in the estimation model. Additionally, the study employs an alternative procedure laid down in Goodman (1960), Sobel (1982), and MacKinnon et al. (1995) to test the indirect relationship between market structure and bank performance through bank conduct.

We find empirical support for all the relationships specified for the validity of the SCP hypothesis. For example, bank concentration leads to anti-competitive conduct by the banks; the anti-competitive conduct leads to higher profitability; the bank concentration is related to higher profitability; and the effect of bank concentration on profitability diminishes when the conduct variable is included in the estimation. These findings are robust across alternative measures of market structure, bank conduct and different time horizons. Thus, the validity of the SCP hypothesis is supported for the ASEAN banking industry. Nevertheless, it is important to note

that there is a partial mediation from market structure to bank performance through the bank conduct. Accordingly, it is possible that the banks are profitable partially through collusion or monopoly rents. However, the higher profitability cannot be entirely attributed to these factors. Other possible reasons for higher profitability may include bank efficiency and/or product differentiation. An investigation of other possible reasons behind the concentration-profitability relationship can be a good avenue for future research.

5.1. Policy Implications

Based on its findings, the study provides important implications for anti-trust policies. For example, in the aftermath of the Asian financial crisis 1997-98 and the global financial crisis 2008-09, there has been an unprecedented increase in bank consolidations. In some countries, governments have even encouraged banking organizations to merge. Such moves were targeted to strengthen the financial institutions in the event of a financial downturn. However, this study shows that a concentrated banking industry may prove to be counterproductive for economic activities.

For instance, the SCP hypothesis implies that the concentration reduces the cost of collusion and promotes either tacit or explicit collusion; consequently all firms are able to earn monopoly profits. In other words, concentration eliminates competition (through collusion) from the market and leads to market inefficiency. Therefore, the SCP hypothesis proposes a careful analysis of consolidation activities. However, if alternative hypotheses – i.e. efficient structure (ES) and relative market power (RMP) – are true, then the anti-concentration policies might bring inefficiency into the economy. This study provides partial evidence in favor of the SCP hypothesis, but it is possible that other theories such as ES or RMP hypotheses may also be coexisting in ASEAN.

Keeping the findings of this study in view, it is imperative to analyze the consequences of a consolidation policy. Several questions may be asked in order to analyze such policies. For example, is the banking industry becoming more concentrated as a result of the consolidation activities? Does a higher level of concentration imply more market power for the leading market players? Does a concentrated banking industry allow these leading players to exercise market power and earn abnormal profits? The consolidation policies must be pursued after considering

all such important questions. Finally, the regulatory authorities need to ensure that the consolidation policy for ASEAN is serving its purpose and not allowing the banks to earn monopoly rents.

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