DISENTANGLING INDONESIAN BANKING COMPETITION BASED ON BUKU CLASSIFICATION: IMPLICATIONS ON BANK SOUNDNESS

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ABSTRACT

Competition has long been debated as a vital factor determining banking performance and stability. The broad perspectives are divided into two streams, the 'competition-fragility' and 'competition-stability' view. Banking industry in Indonesia is experiencing consolidation waves as an effort to strengthen capital and enhance intermediation performance. The consolidation, however, inevitably alter the degree of competition. In this study, we propose a detailed assessment of competition effect through disentanglement amongst different bank clusters, particularly with respect to BUKU classification. The separation is done through Fixed Effect Vector Decomposition method, complemented by interaction variables. We found an indication that competition amongst Indonesian banks can be divided into two segments: the first containing BUKU1 and 2, while the latter BUKU3 and 4. Observing 57 banks using monthly data in 2006-2015, our study supports the competition-stability view, suggesting competition has positive influences on bank soundness. Adding more market power to the leader in each segment (BUKU2 and BUKU4, respectively) would have insignificant, if not malign, effect; the opposite for the challenger. Further, aside from competition, we found that interbank interaction promotes soundness.

Keywords: competition; bank soundness; fixed effect vector decomposition

ABSTRAK

Kompetisi telah lama diperdebatkan sebagai faktor penentu performa dan stabilitas perbankan. Terdapat dua pandangan: kompetisi menimbulkan kerentanan (competition-fragility) dan kompetisi membawa stabilitas (competition-stability). Di Indonesia terdapat tren konsolidasi pada industri perbankan sebagai usaha penguatan modal dan peningkatan performa intermediasi. Proses konsolidasi mengubah tingkat kompetisi. Studi ini menganalisis dampak kompetisi dengan mempertimbangkan perbedaan kelompok bank berdasarkan klasifikasi BUKU (Bank Umum Kegiatan Usaha). Pemisahan dimungkinkan melalui metode Fixed Effect Vector Decomposition, disertai pendekatan variabel interaksi. Menggunakan sampel 57 bank dengan periode bulanan dari tahun 2006-2015, kami menemukan indikasi bahwa kompetisi perbankan di Indonesia terbagi menjadi dua segmen: segmen pertama berisi BUKU1 dan BUKU2, sedangkan segmen kedua berisi BUKU3 dan BUKU4. Hasil studi ini mendukung pandangan competition-stability, kompetisi memiliki dampak positif terhadap kesehatan bank. Peningkatan kekuatan pasar pada pemimpin di masing-masing segmen pasar (BUKU2 dan BUKU4) dapat berdampak tidak signifikan, atau bahkan negatif, terhadap kesehatan bank; dan sebaliknya untuk penantang. Lebih lanjut, studi ini mengidentifikasi bahwa interaksi berupa penempatan sumber daya antarbank mendukung kesehatan bank.

Kata kunci: *kompetisi; kesehatan bank; fixed effect vector decomposition*

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1. BACKGROUND

Banking industry hold an important role in mobilizing and allocating saving to productive activities. Their performances are especially vital in developing countries, where, commonly, financial sector is dominated by banks. Through substantive activities of capital allocation and providing payment system, banks foster industrial expansion, spur technological innovation, and promote economic development. Noting the imperative influences, it is essential to identify the competitive environment which would advocates banking soundness and performances.

Recent development has displayed mergers and acquisitions amongst banks in Indonesia. These consolidations are in line with the increasingly tight capital regulation, upheld by Bank Indonesia to endorse banking health and credibility. Not only to guarantee soundness, the regulation is also implemented to shape a slimmer banking structure, with fewer banks in the system, as stated in Indonesian Banking Architecture (API) framework. It intends to cut the number of conventional banks into around 35 to 58 banks and classifies them into 3 clusters, each with different market segments and activity scope. The purpose of strengthening capital is to enhance banks' risk management capabilities, support technological advancement, and boost credit capacity growth. However, aside from the expected benefits, this scheme will have substantial effect on the degree of competition.

Competition has long been accepted as a relevant factor affecting banking stability despite its still disputed implications. In this respect, there are two streams of literature with opposing perspective, the "competition fragility" and "competition stability" view (Berger, Klapper, & Turk-Ariss, 2009). Competition fragility view highlights the importance of franchise value in determining banks' behavior. Increase in competition would deteriorate incumbents' market power, undermining its franchise value, hence stimulate risk taking of banks in order to raise profit or acquire (if not maintain) market share. On the other hand, the latter view suggests that competition would encourage banks' efficiency and prevent overpriced lending. High loan rate bolster moral hazard issue – as it provides incentive for borrowers to undergo riskier projects – and spur adverse selection problem – as higher interest rate requires higher return therefore lead to riskier set of borrowers.

Noticing the significance of competition, it is essential to identify and assess its particular consequences in Indonesian banking. Though previous studies bring about the general insight, each banking system have different responses on the changing degree of competition. Moreover, to the extent of writers' knowledge, there has not been a study which disentangles the competition amongst banks in Indonesia with different BUKU (*Bank Umum Kegiatan Usaha*) classification by Bank Indonesia[2]. An assessment based on the competition of the whole industry provide us with broad understanding, however it might be misleading as banks in different market segments do not compete with each other directly. The distinction with respect to BUKU comes with two arguments: (1) Banks in different BUKU clusters face different financing capabilities and activity restrictions; (2) We expect that banking market is fragmented and banks with different size naturally have different market segments – hence competing in different market. Further, the separation defines the differences in banks' managerial culture, risk appetite, funding sources, technological capabilities, and product innovation, which would lead to different conduct toward competition.

[2] PBI No. 14/26/2012.

Thus, this research intends to answer: (1) What is the implication of competition on banking soundness in various bank clusters[3]?; (2) How does the competition in each cluster affect the others?; (3) Which cluster would benefit from an increase/reduction in the degree of competition?; (4) To what extent does the increase/reduction of competition might be beneficial? By answering these questions, the research is expected to provide an insight of the desirable environment of banking competition, particularly to support the soundness and stability of Indonesian banking system.

2. LITERATURE REVIEW

Competition is the rivalry act between economic agents on the pursuance of the same object (i.e. market share or productive resources), in the same horizon, and at a relatively equal standing (Shepherd, 1990). Competition brings about pressure amongst productive agents, forcing them to perform optimally in order to achieve their objectives. Effective competition will push forward opportunities, stimulate diversity and efficiency, as well as encourage favorable innovation. Conversely, the lax condition of monopoly provides no incentive for agents to make risky decisions (e.g. innovate) or to perform efficiently (Quiet Life Hypothesis). In the development, however, controverting view arises which argue that monopoly implies greater efficiency, as the 'control over market' itself might be achieved by the superior performance of the dominant agent (Efficient Structure Hypothesis). These views need to be assessed further on banking industry as it deals with heavy asymmetric information issue.

On the context of competition-stability relationship, literatures are divided between two vast paradigms, the 'competition fragility' and 'competition stability' view. The first perspective pointed out that higher competition would deteriorate market power, undermining franchise value, hence stimulate risky decisions by banks in obtaining their objective. Keeley (1990) found that increased competition and deregulation in the United States banking industry in 1980s cut their market power, which later followed by higher asset risk and bank failures. Studying Spanish banking industry, Jimenez, Lopez and Saurina (2013) also found that higher competition, depicted by lesser market power, leads to riskier loan portfolios held by banks. Allen and Gale (2000) suggested that banking system with less competition is more stable, since concentrated market would bring higher profit and that system with few large institutions is easier to be monitored.

The opposing view argue that less competitive environment, depicted by high market power, would expose borrowers to high lending rate. Excessive rate create difficulty for borrowers to repay their loans, directly increasing the probability of default, while also indirectly exacerbate moral hazard and adverse selection problem (Boyd & De Nicolo, 2005). Highly concentrated industry may also induce risk taking on the bank side, since institutions mispresent themselves as too-big-to-fail and therefore believed to be protected by government's financial safety net. Studying banking industry on 70 countries in 1980 to 1997, Beck, Demirgüç-Kunt, and Levine (2003) found that higher competitive environment, in form of lax entry and activity restriction, leads to a more stable banking system. The existence of national institution which encourage competition also support this attainment. Paradoxically, they also found that concentrated banking system are more stable; implying concentration and competition cannot straightforwardly represent each other. Another study by De Nicolo and Loukuianova (2006)

[3] Both asset-wise and activity wise.

find that market concentration in banking industry is positively related with overall bank risk, measured by Z-index. Through literature review, Carletti and Hartman (2003) also concluded that the mainstream proposition of tradeoff between bank competition and stability is not robust. This conclusion is derived from two arguments: (1) there are evidences that higher competition in loan market leads to less risky portfolios and more credible interbank market; (2) policy alternatives can be designed to ensure both competitive and stable banking system at the same time.

Before continuing further, it is also essential to put attention on the measurement of banking competition and banking soundness. There are two approaches in computing industrial degree of competition, the structural and non-structural approach. The structural approach stresses on the market structure indicated by the share of each firm. Concentration ratio, Herfindahl-Hirschmann Index (HHI), and market share are measures of this first group. On the other hand, non-structural approach emphasizes on market power – the extent of which firms can set price above their production cost (mark-up). Example of non-structural measures of competition are Panzar-Rosse H-statistic and Lerner Index. The choice of competition measure is of crucial factor determining the analysis result. Note that concentrated market does not equivocally imply that firms have high market power. Adita and Kusuma (2015) empirically compute the degree of competition of Indonesian banking in 2006-2013 with structural and non-structural approaches. They found that, while HHI suggests that the industry is heading toward a more concentrated structure, the banks' capability to set price above marginal cost also diminishes (indicated by Panzar-Rosse H-statistic). Thus, it is necessary to distinguish between concentration and market power as measures of competition.

Another challenge of studying competition is the existence of market fragmentation. While conventional banks are operating in the same industry, not all participants compete to each other directly in the same market. DeYoung, Hunter, and Udell (2004) suggest that smaller banks tend to provide retail financial services to small and local customers, while larger banks focus on wholesale financial services to exclusive clients. Berger, Kashyap and Scalse (1995) found that large banks in the United States have lesser asset proportion allocated to SME lending, compared to smaller banks. Moreover, in doing so, the large banks focus their funding on older, more settled, SMEs with lesser risk and lower rates. Not only the scope of operation, banks in different cluster might also have different competitive advantage. Larger banks are more capable to provide technological-based services and relies on hard quantitative data such as credit-scoring, while smaller banks may have comparative advantage in collecting soft-information and maintaining relationship with small clients (Berger & Udell, 2002).

Berger et al. (2004) also pointed out that institutional ownership might determine how banks compete. Foreign-owned banks, which are commonly part of larger organization, tend to have competitive advantage over domestically-owned banks with regard to capital access, technology usage, and procurement of services to multinational clients. This advantage, however, comes with lesser capabilities in acquiring soft-information of domestic market. State and privately-owned banks also compete differently. While, in some cases, state-owned bank savors subsidies, they carry the objective of government in developing specific sectors or region (tightening the competition in these areas). Studies also found that concentration on state-owned banks have negative consequences related to reduced market discipline and competition (La Porta, Lopez-de-Sinales, & Shleifer, 2002).

Adita and Kusuma (2015) have assessed the competition environment of Indonesian banking using two approaches, the structural and non-structural approach. It is found that

Indonesian banking competition is getting looser, indicated by increasing market concentration in the deposit and loan market. In addition, through Lerner Index distribution Adita and Kusuma found that banking structure in Indonesia tend to be divided into two clusters. Wijaya, Utama, and Kusuma (2017) studied the systemic risk incorporated in Indonesian banking. This study evaluates banking soundness by adapting Altman Z-score. Pursuing further understanding, we disentangle banking to different clusters and analyze the relationship between competition and the banking soundness in each cluster.

3. DATA AND METHOD

The data are obtained from public banking report published by Financial Services Authority of Indonesia or Otoritas Jasa Keuangan (OJK). We employ monthly data of 57 conventional banks from January 2006 to December 2015 (120 months). Only 57 out of 120 conventional banks operating in Indonesia are included since the data in the all series is available. Nonetheless, these 57 banks are considered representative as they contain members from each operational and office network classification as assigned by Bank Indonesia in PBI No. 14/26/2012.

Table 1. Explanation on Variables

Notation	Note	Computation
$zscore$	Altman Z-score T_1 = (current asset - current liabilities)[4] / total asset T_2 = retained earnings / total asset T_3 = earning before interest and tax / total asset T_4 = equity / total liabilities	$zscore = 6.56\,T_1 + 3.26\,T_2 + 6.72\,T_3 + 1.05\,T_4$
a_dep	Asset dependency, measured by the ratio of interbank placement assets to total assets	$a\_dep = \frac{interbank\ placement\ asset}{total\ asset}$
l_dep	Liability dependency, measured by the ratio of interbank placement liabilities to total liabilities	$l\_dep = \frac{interbank\ placement\ liabilities}{total\ liabilities}$
$asset\_power$	Natural logarithm of the ratio of bank assets to total assets in banking industry	$asset\_power = \frac{total\ asset}{total\ industry\ asset}$
$input\_power$	Ratio of the bank deposit to total liabilities of the bank	$input\_power = \frac{total\ deposit}{total\ liabilities}$
D	*Dummy* variable which separates between banks with stationary and non-stationary Z-score	$D = 1$, if Z-score is non-stationary; $D = 0$, if Z-score is stationary

Table 1 show the definition of variables. The health level of bank is measured by Altman

[4] Following Annex 4 of Basel III Liquidity Coverage Ratio guideline, we define current asset and current liabilities as:

Current asset = cash + reserves + 85%(giro as asset+interbank asset)+ 50%stock+ 85%government bond

Current liabilities = 10% deposit + 25% giro as liabilities + other current liabilities

Note: since 2010, stock and government bond are reported as 'securities'. We impose 30% haircut on securities.

Z-score (Altman, 2005)[5], a proxy proved to be effective in predicting financial institution distress. Following Altman, we compute Z-score based on four aspects which are liquidity, cumulative profitability, rentability, and capitalization. However, our interpretation does not adhere to the rigorous classification proposed by Altman, which established the zone of bankruptcy (Z-score < 1.21), grey area ($1.23 \leq$ Z-score ≤ 2.90), and the zone of non-bankruptcy (Z-score > 2.90). Instead, since Z-score has not empirically been proven as an effective predictor of bank bankruptcy in Indonesia, our analysis is limited only to capturing the idea that higher Z-score indicates higher level of overall health. The variables *a_dep* and *l_dep* represents interconnectedness on two different standings. Furthermore, *a_dep* refers to interbank placement on the asset side, defined as the interbank deposits of the reporting bank which is placed on another bank(s). On the other hand, *l_dep* refers to interbank placement on the liability side, defined as the amount of all interbank deposits (from one or many other banks) that are placed in the reporting bank. High interconnectedness might spur systemic risk, particularly in the cross-section dimension, since the stress in one bank might be easily transmitted to the other. In example, a liquidity shock on bank with high amount of interbank deposit as asset might as well deter its bank partners' liquidity because of potential interbank deposit withdrawals. On the other hand, a failure on banks with high interbank as liabilities might directly hamper their partners' balance sheet and generate adverse effect on its liquid capability. Nevertheless, interconnectedness also demonstrate efficiency as it facilitates quick and low-cost payment system. Partnerships also demonstrate reliability of the bank, which, perhaps, might act as a competitive advantage in securing power in the input and output market.

The role of market power is of paramount to banking soundness since it determines the conduct and performance of each bank. Note that its effect might differ in each region, or even in each bank, with its differing business environment and institution. To address for market power, we incorporate the concentration level in output and input market, represented by *asset_power* and *input_power*. *asset_power* reflects the bank's ability to secure its portion of assets in the industry, while *input_power* in the deposit market subject to its liability structure. Higher proportion of asset and deposit held by a bank indicates its capability to influence the market direction, as well as to gain technical efficiency from economies of scale, but the growing assets and liabilities must be followed by compliance to the monitoring and capital adequacy regulations. As stated in the literature review, having high market power might bring about greater franchise value, however it potentially aggravates moral hazard and adverse selection problem that undermine banking soundness.

We divide our analysis into two parts. The first is the stationarity test for individual bank's Z-Score to divide the observed bank into two groups, the stationary and non-stationary of Z-score of the banks. Stationary group characterizes its members to have consistent mean and variance of health level overtime. However, the non-stationary defines characterizes its members to have un-consistent mean and variance of health level overtime. Assuming business as usual, stationary health level nuances a stable banking soundness overtime (no innovation). However, the feature does not palpably exemplify that they have higher level of soundness, either in average or overtime.

The second subsection applies Fixed Effect Vector Decomposition (FEVD) method of Plümper and Troeger (2007) to analyses the factors determining banking health level. FEVD procedure allows us to capture the influence of time-invariant variables (in this case, the stationarity trait) while still accounting for unit fixed-effects. The unit fixed-effects are

[5] See also Altman et. al, 1995.

considered essential since it reflects differing endowment for each bank non-randomly.

To identify the order of integration of each variable, panel unit root test is undergone with 4 different methods. The unit root tests strongly deny the existence of unit root on panel Z-score, Interbank placements, Deposit, and Input power variables. We construct a model which states factors affecting the health level of banks. The model is composed as follows:

$$zscore_{it} = \alpha_0 + \beta_1 a\_dep_{it} + \beta_2 l\_dep_{it} + \beta_3 asset\_power_{it} + \beta_4 input\_power_{it} + \alpha_1 D_i + F_i + V_t + \varepsilon_{it} \quad (1)$$

Where $zscore$ is the dependent variable representing bank health level. Subscript i and t consecutively states the cross-sectional and time unit, while F_i and V_t the cross-section fixed effects and trend. Period fixed effects are not included since our data is wide in time periods. Estimating them would exhaust the degree of freedom and create inefficient estimates. Instead, to account for period effects, we impose a trend variable V_t which identifies the long run development of banking industry soundness. D_i is the idiosyncratic behavior of Z-score, which is time invariant and only depend on the cross-section unit.

The model proposes two main elements determining banking health level which are the interconnectedness and market power. Interconnectedness is depicted by interbank placements, both in its asset and liability forms. Having liquid characteristic, these instruments directly demonstrate the exposure of each bank to the other. The second element considers market power as the determinant of z-score. This includes the bank market power in output (asset) and their capability to secure deposit as input. Market power has long been suggested as the cause influencing banking health level, both individually and as an industry, however with ambiguous result amongst researches.

A problem occurs when we try to estimate the effect of time-invariant variable while simultaneously accounting for individual fixed effects. Since fixed effect model relies only on within variances (not considering between variances), it cannot accommodate the estimation of time-invariant variables, or even rarely changing variables. However, in our context, inclusion of these variables might hold critical roles. Having found two clusters of banking based on their health process behavior, it is important to identify the nature of each group. One group might have higher average level of health (endowment), however with differing responses to changes in other variables. The conventional bank classification (PBI No. 14/26/2012) might also characterizes banking soundness, since it defines the scope of operations and asset allocation which could be undertaken by the bank.

To tackle the estimation problem, we adopt the three-stage FEVD model. The model decomposes fixed effects into two parts, the part which is explained by time-invariant variables and the part which is not. By utilizing the latter part, it allows the inclusion of fixed effects within a panel model with time-invariant variable. The procedures are as follows:

i) Firstly, we estimate the normal fixed effect model without the time-invariant variable(s). The process starts by constructing the within mean relations:

$$\overline{zscore}_i = \alpha_0 + \beta_1 \overline{a\_dep}_i + \beta_2 \overline{l\_dep}_i + \beta_3 \overline{asset\_power}_i + \beta_4 \overline{input\_power}_i + \alpha_1 D_i + F_i + \overline{V} + \overline{\varepsilon}_i \quad (2)$$

When we subtract equation (2) to equation (1), D_i and F_i are cancelled since they do not have within variance (the value of these variables does not change overtime). We get the fixed effect estimator as shown in (3).

$$\ddot{zscore}_{it} = \beta_1 \ddot{a\_dep}_{it} + \beta_2 \ddot{l\_dep}_{it} + \beta_3 \ddot{asset\_power}_{it} + \beta_4 \ddot{input\_power}_{it} + \ddot{V}_t + \ddot{\varepsilon}_{it} \quad (3)$$

where variables with double dots accent represent the subtraction between each variable with its own within mean, i.e. $\ddot{zscore}_{it} = zscore_{it} - \overline{zscore}_i$, $\ddot{a\_dep}_{it} = a\_dep_{it} - \overline{a\_dep}_i$, etc. The regression result provides us with unit specific effect estimates $\hat{F}_i$. This fixed effects still incorporate the observed unit specific effects (since D_i is excluded from the estimation) and unobserved unit specific effects, along with the unit means of residuals and time varying variables.

ii) In order to extract the unobserved unit specific effects, we regress the time-invariant variable, D_i, to $\hat{F}_i$.

$$\hat{F}_i = \gamma D_i + f_i \quad (4)$$

where f_i is the residual, that is, the unobserved unit effects which cannot be explained by the time-invariant variable. This unexplained part will be carry on to the next step.

iii) The last stage rerun the full model with some adjustments. Instead of including the whole unit effects, F_i, we incorporate only the unobserved unit effects, f_i, in the estimation. By construction, f_i has no correlation with time-invariant variable D_i thus we can include both in the model. The estimation is undergone in pooled OLS model as in equation (5) below.

$$zscore_{it} = \alpha_0 + \beta_1 a\_dep_{it} + \beta_2 l\_dep_{it} + \beta_3 asset\_power_{it} + \beta_4 input\_power_{it} + \alpha_1 D_i + f_i + V_t + \varepsilon_{it} \quad (5)$$

Note that it is essential to make corrections on the standard errors of this last estimation process, since the pooled OLS model is run on a fixed setup. There is a difference in the degree of freedom between the estimation in step (i) (where unit effects are estimated) and the pooled OLS. In step one we reduce the degree of freedom by (N-1) more than in the pooled OLS estimation[6]. Adjustment in the degree of freedom is needed to prevent underestimation in standard error.

4. RESULT AND DISCUSSION

4.1. Stability Test of Individual Bank's Z-score

The stationarity test is used to find whether the individual Z-score of banks are stable or unstable. We classify the banks into two categories, banks with stationary z-score (stable) and non-stationary z-score (unpredictable). Table 2 show the stationary test, Augmented Dickey-Fuller test, which indicated 34 banks have non-stationary and 23 stationary.

[6] Where N is the number of cross-section individuals.

Table 2. Individual Unit Root Testing

Bank code	t-stat	Bank code	t-stat	Bank code	t-stat	Bank code	t-stat
002	-2.8439*	048	-2.5628	128	-4.0934***	494	-3.4603**
008	-1.4390	061	-2.4059	129	-1.9306	498	-2.3163
009	-1.5894	076	-1.0153	132	-0.0593	520	-4.6948***
011	-1.8782	087	-1.1093	145	-1.4841	526	-2.0959
013	-3.6771***	089	-1.5785	151	-3.3394**	542	-3.2752**
014	-1.0171	110	-1.6718	152	-1.8557	548	-2.7084*
016	-2.1468	112	-1.3744	153	-4.9684***	558	-2.5823*
019	-2.1132	114	-0.8617	161	-4.0448***	562	-4.4345***
022	-3.5252***	116	-1.6807	164	-1.8680	564	-2.3206
028	-3.0314**	118	-2.0556	200	-4.2915***	567	-3.0242**
036	-2.4962	119	-1.2866	213	-3.4897***	949	-3.0696**
037	-3.2203**	120	-1.5395	426	-2.1196	950	-2.1374
045	-3.1399**	124	-0.8955	466	-2.3046		
046	-2.9110**	125	-1.4199	484	-3.4449**		
047	-2.7829*	127	-2.5371	485	-1.7183		

Test critical values: -3.4861 for 1%(***); -2.8859 for 5%(**); -2.5798 for 10%(*).

Table 3 give descriptive statistic of fist group (stationary Z-score) and second group of banks (non-stationary Z-score). The test of mean difference show Z-statistic test that indicate the significance difference mean between these groups.

Table 3. Descriptive Statistics

Variable: z-score	Stationary	Non-stationary
Mean	1.2331	1.8354
Median	1.2089	1.6285
Maximum	4.8357	5.2662
Minimum	-1.9844	-0.5208
Std. Dev.	0.5509	0.8998
Skewness	0.6222	0.8758
Kurtosis	5.7558	3.3883
Mean Difference Z-statistic Test		
Null Hypothesis: Z-Score Mean (Non-stasioner) – Z-score mean (stationer) = 0		
	Value	Probability
Z-Statistic:	-35.15888	0.0000

The mean difference indicates the average health of two groups are significantly difference. The median and mean reveals the tendency the second group of banks are healthier than those first group of banks. Observing the descriptive statistic, the maximum and minimum level for healthier class are also greater than the contestant, though withholding greater standard deviation.

4.2. Panel Regression Estimation

We use panel regression analysis to identify the factor which effected the health of the bank. The variable used in regression must stationer to ensure unbiased result of the regression. Table 4 show the five methods, Im, Pesaran, Shin (IPS); Fisher – ADF; Fisher – PP, to test whether the variable stationery or non-stationery. The result in table 4 show all variable are stationery.

Table 4. Panel Unit Root Testing

	LLC	IPS	ADF Fisher	PP Fisher
Z-score	-5.6337***	-9.4542***	334.002***	326.172***
Asset dependency	-22.1093***	-26.3589***	999.327***	993.812***
Liabilities dependency	-14.2471***	-17.2249***	613.101***	575.111***
Asset power	-6.77501***	-0.8765	154.464***	143.815**
Input power	-1.67189**	-2.5166***	219.0850***	197.576***

Significant at: α: 1%(***); 5%(**); and 10%(*).

The result of running the procedures of panel regression is depicted in Table 5. It is shown that banks from differing groups (either distinct by BUKU or stationarity) have contrasting intercepts. Banks with non-stationary z-score tend to have higher endowment, however they suffer negative long term trend. The result demonstrates that their health level tends to diminish overtime, specifically by 0.0116 z-score per month. It indicates the need of exclusive attention on this cluster, particularly on the cause of this negative trend. The stationary group, on the other hand, does not have any trend-like behavior. The BUKU classification also suggests diverse intercepts, with BUKU1 having the highest intercept, followed by BUKU3 and BUKU4 in similar level, and BUKU2 the lowest. The outcome vaguely suggests that moderate banks faces a more challenging prospect than the smaller and bigger clusters.

Digging deeper into the difference between each cluster, we found that each BUKU has different responses to the increase in market power. A percentage increase in asset market power is most effective to raise the health level for banks in BUKU3 (0.1395 z-score/percent), followed by BUKU1 (0.0967 z-score/percent). On the other hand, we found an indication that raising market power for banks in BUKU4 might yield unimportant implication (0.0048 z-score/percent)[7] and even deterring the health level of BUKU2 banks (-0.0975 z-score/percent). Note that this percentage increase is based on each bank's initial condition. Larger banks might need higher amount of assets compared to smaller banks to increase one percent of its already high market power. The result suggests that asset increasing efforts, such as consolidations or capital injections, would be more appropriate to be directed on banks in BUKU1 and BUKU3 clusters (or also, to move the banks in BUKU2 to BUKU3).

[7] Though the coefficient is statistically insignificant, it might stand as an indication that market power does not bring relevant positive effects on BUKU4's health level.

Table 5. Regression on Bank Soundness

Variables	Coefficient	t-Statistic
a_dep	1.6646***	16.5721
l_dep	1.4039***	31.1705
$asset\_power$	0.0967***	6.8365
$input\_power$	-0.3449***	-6.9845
$trend$	0.0002	0.8174
$D * trend$	-0.0116***	-34.3579
D	1.2329***	50.5902
$BUKU2$	-1.4526***	-12.2164
$BUKU3$	-0.5416***	-4.5637
$BUKU4$	-0.5949***	-2.9832
$BUKU2 * asset\_power$	-0.1942***	-10.6865
$BUKU3 * asset\_power$	0.0428*	1.9089
$BUKU4 * asset\_power$	-0.0919	-0.9604
f	1.0000***	71.4398
$Constant$	2.0038***	16.4081

Intercept and Slope Calculations Based on Bank Cluster

Cluster	BUKU1	BUKU2	BUKU3	BUKU4	Trend
Stationary (Intercept)	2.0038	0.5512	1.4622	1.4089	no trend
Non-stationary (Intercept)	3.2367	1.7841	2.6951	2.6418	-0.0116
Response (Slope) to increase in asset	0.0967	-0.0975	0.1395	0.0048*	
Average market power (% per bank)	0.1000	0.6500	3.3600	17.7700	

It also reveals that nor full monopolist, neither perfect competition, might ensure banking soundness in Indonesia. Instead, there is an upper threshold or limit of market power that should not be surpassed to ensure optimum health level (adding market power to those banks on the limit might not bring positive consequences). Benign effects of market power on BUKU1 and BUKU3 – while having negative and indecisive effects on BUKU2 and BUKU4 consecutively – indicates the separation of market segments between smaller banks (BUKU1 and BUKU2) and bigger banks (BUKU3 and BUKU4) and, also, supports the proposition that higher competition leads to healthier banking system.

Allocating higher market power to the leader in each segment might have insignificant or event deteriorate banking health level, while equalizing the market power might improve banking soundness. Increase in market power for BUKU1 would benefit the banks in this group since they obtain a more comparable position compared to banks in BUKU2. Escalation of competition pressure in the smaller banks segment forces banking efficiency, which leads to healthier banks. Other reasoning might be that banks in BUKU1 are sensitive to technical efficiency issue, where higher market proportion given to them would deliver economies of scale advantages. The same goes for banks in BUKU3, who would gain a better competing position by gaining market power on the large banks segment.

Contrarily, gaining market power for BUKU4 does not have valuable effects. Higher concern goes to the phenomenon in BUKU2, which mostly consists of Regional Development Bank (Bank Pembangunan Daerah). Larger market power given to BUKU2, would deteriorate their health level. This might be caused by the incompetence of banks in cluster two to allocate their assets productively or that higher market power leads to moral hazard and adverse

selection problem in small banks segment[8]. These issues tend to be milder in BUKU4 because of its better capabilities in collecting information and managing connections with bigger, hence safer[9].

Moving to another aspect, we found that interconnectivity promotes banking soundness. Interbank placement as assets, *a_dep*, and interbank liabilities, *l_dep*, all have significant positive effect on z-score. A percentage increase of interbank asset proportion would increase the z-score by 0.0166. On the liabilities side, one percent increase of interbank liabilities would raise the z-score by 0.0140 while the same proportion increase in deposit would curb z-score by 0.0034. It suggests that interbank deposit is a more stable instrument as current funding source compared to deposit. This might be due to the higher liquidity risk inherent to third party deposit. Overall positive implications by interbank placements suggests that direct relationship amongst financial institution generates benevolent implications. Close relationships between banks ensure tighter cooperation and information sharing, which would ease the process of making more profitable, and less risky, decisions.

5. CONCLUSION

The result can be summarized into three main findings. Firstly, we found that in term of health development, banking in Indonesia can be divided into two clusters – those with stationary and non-stationary process. While non-stationary banks have a higher average health level, they face negative long-term trend, suggesting a need of identification and close monitoring for this unfavorable movement. Note also that the higher average level of health is not credible, since the mean of non-stationary process is changing over time. Further, through logistic regression we found that neither BUKU classification nor market power and deposit-liabilities ratio can explain the stationarity feature. Thus, till now we can only interpret that the stationarity character is engendered randomly for each bank.

Secondly, we found that competition enhances banking soundness in Indonesia. The result indicates that Indonesian banking industry can be divided into two market segments, the small (BUKU1 and BUKU2) and the large (BUKU3 and BUKU4) segment. Adding market power to the challenger in each segment (BUKU1 and BUKU3) would enhance banking soundness while, on the contrary, giving them to the leader (BUKU2 and BUKU4) would deter or have invaluable implications on banking soundness. This finding suggests that banking consolidations or capital injections would be more effective to be undertaken on banks in BUKU1 and BUKU3. Particular attention needs to be directed on BUKU2, where increase in market power deteriorate their health level. It reflects incompetence to manage productive assets, or severe asymmetric information problem suffered by the members of this group.

Lastly, interconnectedness is found to have positive influences on banking health level. Both interbank placements, as assets and as liabilities, significantly promote banking soundness. Banking interconnectedness boosts efficiency by providing banks with a quicker and more reliable payment system amongst each other. This favorable relationship also encourages cooperation and information generation amongst banks, enforcing security and profitability in their business decisions. Moreover, we found that, in liabilities structure, higher proportion of

[8] See Boyd and De Nicolo (2005) for arguments regarding 'competition stability'.
[9] Shepherd (1990) argues that the largest banks have favorable mutual relations with major players in the real industries, creating a safer and more profitable lending channel for them.

interbank liabilities is beneficial for banking soundness while market power in third party deposit has undermining effect. Interbank liabilities are more favorable compared to third party liabilities since it carries lower liquidity risk and its withdrawal pattern is more predictable compared to the latter. Note however, that this result only shows the direct implications. The model in this study is not capable of capturing the negative externalities generated by banking interconnectedness. While it brings mutual benefits, interconnectedness also builds up systemic risk. A shock on banks with high interconnections would create disturbances on other financial institutions, which potentially causes detrimental effect on the financial system as a whole. Further study is needed to identify and model this externality.

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APPENDIX

Table 4. Fixed Effect for Each Bank

Bank Code	BUKU	Stationarity	Fixed Effect	Bank Code	BUKU	Stationarity	Fixed Effect
002	4	stationary	0.1686	127	1	non-stationary	-0.5873
008	4	non-stationary	-0.0424	128	1	stationary	-0.5499
009	4	non-stationary	-0.3466	129	2	non-stationary	-0.6826
011	3	non-stationary	-0.0969	132	2	non-stationary	0.2855
013	3	stationary	-0.3182	145	2	non-stationary	0.0432
014	4	non-stationary	0.2204	151	2	stationary	0.5558
016	3	non-stationary	-0.2319	152	1	non-stationary	1.7440
019	3	non-stationary	-0.2062	153	2	stationary	0.3800
022	3	stationary	-0.1453	161	1	stationary	-0.4440
028	3	stationary	0.4302	164	2	non-stationary	0.2272
036	2	non-stationary	-0.2522	200	3	stationary	-0.2957
037	2	stationary	-0.0899	213	3	stationary	0.8710
045	2	stationary	-0.1087	426	3	non-stationary	0.5358
046	2	stationary	0.2081	466	1	non-stationary	-0.3966
047	2	stationary	-0.1669	484	2	stationary	0.0532
048	3	non-stationary	-0.3126	485	2	non-stationary	-0.8047
061	3	non-stationary	-0.0087	494	1	stationary	-0.2278
076	1	non-stationary	0.3758	498	1	non-stationary	0.1439
087	2	non-stationary	0.4027	520	1	stationary	-0.3431
089	2	non-stationary	-0.6162	526	1	non-stationary	1.3378
110	3	non-stationary	-0.2214	542	1	stationary	0.6508
112	2	non-stationary	0.0633	548	1	stationary	0.4888
114	2	non-stationary	0.1717	558	1	stationary	-0.5980
116	2	non-stationary	-0.1296	562	1	stationary	0.4457
118	2	non-stationary	-0.6731	564	1	non-stationary	-0.1390
119	2	non-stationary	0.0078	567	1	stationary	0.0378
120	2	non-stationary	-0.1618	949	2	stationary	0.8171
124	2	non-stationary	0.4028	950	2	non-stationary	0.0670
125	1	non-stationary	-0.1195				

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