TECHNICAL EFFICIENCY AND COMPETITION LEVEL OF INDONESIA BANKING IN MICROFINANCE MARKET

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Abstract: The purpose of this study are to find the relationship between SME credit competitions with the technical efficiency of banking. It involves banking statistics data from commercial banks and rural banks. Panzar-Rosse model was applied to measure a level of competition while the efficiency was determined using Data Envelopment Analysis (DEA). Data panel regression was utilized to analyze the Panzar-Rosse model coefficient while the efficiency score was obtained by using linear programming. The relevance of competition and efficiency was explored using the Granger causality test. Research result shows competition among BPRs inside a perfect competition market has an impact on their technical efficiency. A better competition between BPRs in a perfect competition market impact to lower technical efficiency. BPR competition with commercial banks occurred in a monopolistic market. In the monopolistic market, better technical efficiency would lower the competition. Technical efficiency score when commercial banks entered the competition revealed a climb score.

Keywords: competition, DEA, efficiency, Granger causality test, the Panzar-Rosse model.

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Banks as intermediary institutions have the function of financing the business sector. The potential business sector in bank financing is the micro business sector. According to data from the Ministry of Cooperatives and MSMEs of the Republic of Indonesia in 2013, UMKM provided a contribution to Islamic Commercial Bank of 57.94% of Indonesia's Gross Domestic Product (GDP) of 34.73% from micro-enterprises. The micro business unit which reached 98.77% of the 99.99% of the total MSME business units were able to absorb 88.90% of the workforce.

This potential prompted the government to issue Bank Indonesia Regulation (PBI) No. 14/22 / PBI / 2012. PBI No. 14 which requires commercial banks to channel credit to the MSME sector, especially the micro sector, at least 20% of the total credit. The regulation was made to increase the ratio of financing of the micro business sector which initially only reached 14.8% of the total existing business. Banking financing for the micro sector is only 4.1% of the total credit of the banking sector. The high need for micro-business loans is not able to be met by credit supply. One of the causes is the limitations of Rural Banks in providing micro business loans (Bank Indonesia, 2016).

This limitation is partly due to the low number of Third Party Funds from Rural Banks. Based on data from 2006-2016 Third Party Funds From Rural Banks reached 456 billion Rupiah while commercial banks reached 30 Trillion Rupiah (Bank Indonesia, 2016). The total ASSET of commercial banks is 3 trillion rupiah, while Rural Banks are only 48 billion rupiahs and it is estimated that this number will continue to increase. The loan of Rural Banks Non-Performing Ratios is above 5% higher than commercial banks. This means that Rural Banks have a greater risk of bad credit than commercial banks.

Nonetheless, working capital financing by Rural Banks from 2006 to 2016 tended to increase, and the peak reached 35 billion Rupiah while in the same year commercial bank working capital financing tended to fluctuate because it had decreased from 1 trillion to 500 billion in 2011-2012 (Bank Indonesia, 2016). Since 2008 the distribution of Rural Banks working loans has increased accompanied by an increase in the value of Return on Assets which is higher than that of commercial banks. The increase in Return on Assets and the distribution of Rural Banks credit shows the power of Rural Rural competition with commercial banks to finance the micro business sector.

Competition between commercial banks and rural banks is expected to be able to encourage a decrease in microcredit interest rates. Based on the approach to the concept of the credit base rate, the structure of the formation of microcredit interest rates consists of two major components of Cost of Credit Funds and Overhead Cost. The biggest component of forming Cost of Credit Funds is the cost of Third Party Funds that depend on saving/deposit rates. The other component of the interest rate is Overhead Cost. Labor costs influence the biggest component of Overhead Cost

Schaeck and Cihak (2008), stated that the relationship between concentration and efficiency is that the higher the competition between banks will reduce the level of concentration so that it will encourage efficiency. Efficiency is realized because interbank competitiveness creates competitive prices or equals marginal costs in perfect competition markets. Similar studies examine the negative correlation between the level of competition and efficiency in the Competition-Inefficiency Hypothesis. A high competition will reduce concentration but lead to inefficiency because customer loyalty tends to decrease. A high competition encourages increasingly diverse product prices so that the relationship between customers and banks becomes less stable and more short-term

Measurement of competition is divided into two approaches, namely structural and non-structural approaches. The structural approach says there is a direct relationship between market structure, corporate behavior, and industrial performance. This approach is based on the traditional approach to structure conduct performance. The Conduct, Performance Structure approach, is built based on a traditional hypothesis. The traditional hypothesis sees concentration as a competition approach measured by market forces. The higher the concentration, the more collusive the company so that the greater the chances of the company to get up to normal profits. But according to Octia, et al. (2013), research that uses a structural approach tends to be irrelevant to current industrial developments.

The second approach is the non-structural approach or commonly called the New Industrial Economics Organization (NEIO) approach. According to NEIO, the source of concentration is efficiency and not market power. Their findings are named the Efficiency Structurehypothesis (structure efficiency). They explained that the difference in efficiency across companies in a market could create a different market share and a high level of concentration. An efficient company can produce the same goods as other companies but at a lower cost. As a result, the market share will be larger and concentrated to increase profits but decreasing competition. Efficient corporate behavior results in a better market share that increases market power even though the market structure tends to be oligopolistic or not. The relationship between competition and efficiency in the micro business credit market examined in this study.

METHOD

This research is a type of quantitative research that involves the financial statements for each type of bank in the form of Indonesian Banking Statistics. The research analysis tool uses a panel data regression. Measurement of SME credit competition levels involves commercial banks, Rural Banks, and Islamic Rural Banks. Commercial bank groups included in this study are only bank groups that provide micro business loans. The bank group is the state bank, Foreign exchange National Private Bank, non-foreign Foreign National Private Bank, Regional Development Bank, mixed bank, Islamic Commercial Bank. The study uses secondary data obtained from Bank Indonesia Statistics from 2010-2014.

The approach used in this study is a non-structural approach. The choice of a non-structural approach is reinforced by the findings of Gelos and Roldos (2002), Claessensand Laeven (2004), and Mulyaningsih and Daly (2011). According to them, the consolidation of banking in the Southeast Asia region had increased concentration but did not increase competition. This means that there is a non-linear relationship between competition and concentration. The non-structural approach has several models, one of which is the Panzar-Rosse model (P-R).

The reason for choosing a model (P-R) is because the use of the Income variable as a dependent variable is easier to observe. Model P-R provides an indicator of competition in the form of a market structure called H-Statistics. The P-R model only focuses on one output. Recent research on the P-R model is carried out by Rozas (2007). The following modification of the P-R model can be seen in equation (1).

$$\begin{aligned}\ln(\text{Income}_{it}) = \alpha_i + (\beta_{1t}\ln(\text{Labor}_{it}) + \beta_{2t}\ln(\text{Fund Charges}_{it}) + \\ \beta_{3t}\ln(\text{Capital Expense}_{it})) + \delta_{1t}\ln(\text{Equity}_{it}) + \delta_{2t}\ln(\text{Amount of Credit}_{it}) + \\ \delta_{3t}\ln(\text{ASSET}_{it}) + \delta_{4t}\ln(\text{CAB}_{it}) + \mu_{it}\end{aligned} \quad (1)$$

Description of operational variables for the equation (1):

- Ln ($Income_{it}$) = Ln Gross interest income is divided by total ASSET.
- ln ($Labor_{it}$)= Ln labor costs are divided by the total ASSET.
- Ln ($Fund\ Charges_{it}$)= Ln interest expense divided by total deposit or Third Party Funds.
- ln ($Capital\ Expense_{it}$)= Ln operational and administrative costs are divided by the total ASSET.
- ln ($Equity_{it}$)= Ln capital ratio divided by the total ASSET.
- Ln ($ASSET_{it}$)= Ln ASSET amount from the bank.
- Ln ($Amount\ of\ Credit_{it}$)= Ln the number of micro business loans is divided by the total ASSET.
- Ln (CAB_{it})= Ln number of branches.
- i state bank i
- t states year t

β_{1t}, β_{2t},β_{3t},is the coefficient of the independent variable proxy of the price of the production input factor. Another independent variable is the approach of the price of non-production input factors. Amount of coefficient, will produce H-Statistics and E-Statistic values, each of which is used to determine the characteristics of competition and long-term stability. H-statistical and E-statistical interpretations are found in Table 1. E-Statistical measurements were

Table 1 H-statistical and E-statistical interpretations

H-Statistik	Market competition
$H \leq 0$	Collusion oligopoly market
$0 < H < 1$	Monopolistic competition
$H \geq 1$	Perfect competition market
E-Statistik	**Market competition**
$E = 0$	The market is in a balanced condition
$E \neq 0$	The market is in a developing/dynamic condition

obtained from Equation (1) but with the dependent variable in the form of Return on Assets. Here are the H-statistics and E-statistics interpretations.

The use of natural logarithms in the P-R model to eliminate the problem of multicollinearity de Rozas (2007). According to Jacob, et al. (2014), if there is a violation of classic assumptions, then you can use GLS or FGLS estimators. Based on this, the estimation method used in this study is FGLS.

Measurement of efficiency using Data Envelopment Analysis (DEA). DEA efficiency scores range from 0 to 1, the closer to 1, the more efficient the performance of the bank. The following general equations on DEA are:

$$h_s = \frac{\sum_{i=1}^{m} u_{is} y_{is}}{\sum_{j=1}^{n} v_{js} x_{js}} \leq 1 \qquad (2)$$

Information:
h_s : Technical Efficiency bank on-s;
u_{is} : The weight of output i to the bank on-s;
y_{is} : The amount of output i produced by the bank on-s;
v_{js} : Input weight j on bank on-s;
x_{js} : The amount of input j used by the bank on-s.

DEA consists of 2 models namely CRS and VRS models. The DEA CRS model assumes that the internal and external conditions of each are the same or the conditions of all individuals operate optimally. Here is the equation for the DEA CRS model:

$$\max h_s = \sum_{i=1}^{m} u_i y_{is} \; ;$$
$$\text{subject to } \sum_{i=1}^{m} u_{is} y_{is} - \sum_{j=1}^{n} v_{js} x_{js} \leq 0 \qquad (3)$$
$$; r = 1, \ldots, N$$
$$\sum_{j=1}^{n} v_{js} x_{js} = 1 \qquad u_i, v_j \geq 0$$

The second model is a variable return to scale (VRS) model. The VRS model assumes that the internal and external conditions of individuals are not the same or not all individuals operate optimally. The mathematical model with the VRS approach is obtained through modification of the model with the CRS approach. Here is the equation for the DEA VRS model:

$$\max h_s = \sum_{i=1}^{m} u_i y_{is} + U_0 \; ;$$
$$\text{subject to } \sum_{i=1}^{m} u_{is} y_{is} - \sum_{j=1}^{n} v_{js} x_{js} \leq 0 \qquad (4)$$
$$; r = 1, \ldots, N$$
$$\sum_{j=1}^{m} v_{js} x_{js} = 1$$
$$u_i, v_j \geq 0,$$

Mathematically the three efficiency concepts are formulated as:

$$ES = \frac{TE_{CRS}}{TE_{VRS}} \qquad (5)$$

Information:
TE_{CRS} : Technical efficiency CRS;
TE_{VRS} : Technical efficiency VRS;
ES : Efficiency score;

DEA outputs and inputs selected in this study are based on banking approaches as intermediary institutions. The DEA output is the volume of micro-credit, operating income while the inputs are labor costs and the volume of Third Party Funds.

The Granger causality test will analyze the relationship between competition and efficiency.

Table 2 Interpretation of DEA efficiency scores

Measure efficiency			Efficiency performance
$\mathbf{TE_{CRS}=1}$	$TE_{VRS}=1$	ES=1	Constant Return to Scale (CRTS)
$\mathbf{TE_{CRS} \neq TE_{VRS}}$	$TE_{VRS} \neq TE_{CRS}$	ES ≠ 1	Increasing Return to Scale (IRTS)
$\mathbf{TE_{CRS} < 1}$ **and** $\mathbf{TE_{CRS} = TE_{VRS}}$	$TE_{VRS} < 1$ and $TE_{VRS} = TE_{CRS}$	ES=1	Decreasing Return to Scale (DRTS)

Granger causality test is a common approach used to detect relationships and direction of influence between two variables. Granger causality test investigates whether competition (C) results in efficiency (E) :($C \rightarrow E$) or efficiency results in competition ($E \rightarrow C$) or both influence each other ($C \leftrightarrow E$). Granger Causality is denoted as follows (Arrawatia, et al., 2014):

$$C_{i,t} = \sum_{j=1}^{n} \alpha_j E_{i,t-j} + \sum_{k=i}^{n} \beta_k C_{i,t-k} + U_{i,t} \quad (6)$$

$$E_{i,t} = \sum_{k=1}^{n} \lambda_k E_{i,t-k} + \sum_{j=1}^{n} \delta_j C_{i,t-j} + U_{i,t} \quad (7)$$

Information:

$E_{i.t}$ = level of efficiency of bank i at time t, where DEA is a proxy for efficiency.

$C_{i.t}$ = level of competition from bank i at time t, where the P-R model is a proxy of the level of competition.

Significant determinant on Granger test using F-Statistic (simultaneous test). With the following output:

- Jika $\sum_{j=1}^{n} \alpha_j \neq 0$ in the equation (6) and $\sum_{j=1}^{n} \delta_j = 0$ in the equation (7) meaning that competition causes efficiency and not vice versa. This condition is called Unidirectional Causality.
- Jika $\sum_{j=1}^{n} \alpha_j = 0$ in the equation (6) and $\sum_{j=1}^{n} \delta_j \neq 0$ in the equation (7) meaning that efficiency causes competition and not vice versa. This condition is also called Unidirectional causality
- If $\sum_{j=1}^{n} \alpha_j \neq 0$ in the equation (6) and $\sum_{j=1}^{n} \delta_j \neq 0$ in the equation (7) meaning that competition causes efficiency to influence each other. This condition is called Feedback / bilateral causality.
- If $\sum_{j=1}^{n} \alpha_j = 0$ in the equation (6) and $\sum_{j=1}^{n} \delta_j = 0$ in the equation (7) meaning that competition and efficiency do not affect each other or are mutually independent.

RESULT

The results of the measurement of competition are divided into twoconditions, namely condition 1 involving the group of rural banks banks andcondition 2 involves the group of commercial banks and Rural Banks. The fixed effect model is chosen to estimate the level of competition and long-term balance. Long-term equilibrium test results show condition 1 andcondition 2 pass the long-term balance test. This means that individuals in the bank group have grown steadily in the microcredit market. If there are individuals who do not pass the long-term balance test, it shows that the banking industry is in the stage of developing dynamically during the year of observation (Fansuri, 2016). The next measurement is measuring the level of competition and market form. The results of the level of competition measurement are found in Table 3.

Measurement results show the effect of each independent variable on the dependent variable. Each independent variable shows a significant effect on the dependent variable if the probability value is less than 0.05. Based on the probability test in condition 1 andcondition 2 show the variables of Equity do not significantly affect income. The significance of the influence of independent variables in a model can be seen from the Prob (F-statistic) value. If the Prob (F-statistics) value is less than 0.05, the independent variable variables simultaneously have a significant effect on the dependent variable.

Based on H-statistic value,the level of competition condition 1 which is in perfect competition (refer to Table 1). In perfect competitive market conditions, the prices of production factors are positively related to income. This positive relationship can be seen in Table 5 condition 1. Banks in the perfectly competitive market that are in a zero profit condition, free entry and free exit will drive income

Table 3 Results of measuring the level of competition of the P-R model

Bank Indonesia Statistics	Condition 1		Condition 2	
	Dependent variable: Income			
	Coefficient	Prob.	Coefficient	Prob.
Labor	0.285547	0.0006	-0.25621	0.0041
Fund Charges	0.421297	0	0.55167	0
Capital Expense	0.303138	0.0008	0.48019	0.0267
Equity	-0.02753	0.2224	0.16155	0.1747
Amount of Credit	0.145192	0.0284	0.15853	0.0021
Total Assets	0.153841	0.0378	0.18824	0.0005
Number of branches	0.108271	0.0314	0.08997	0.0054
C	1.247245	0.0356	2.31624	0.0098
R-squared	0.96132	0.945756		
Adjusted R-squared	0.9714	0.935701		
F-statistics	97.27179	95.03735		
Prob (F-statistic)	0	0		
H-statistics	1.009982	0.77566		
Market structure	perfect competition		monopoly competition	

changes proportionally without disturbing the optimal level of output if there is an increase in prices of production factors.Note Table 3, in condition 1 a 1% increase in Fund Expenses will increase the output/financing price by 0.421297%. Price increase of 1% Labor variable will increase output / financing price by 0.285547% and increase 1% Capital expense will increase output / financingprice by 0.303138%. The entry of new competitors in condition 2 changes the market conditions to a monopoly competition market (refer to Table 1). The new competitor is a commercial bank.Every an increasingbanks income in monopoly competition marketis an increase in the prices of production input factors.But this increase is not as high as the increase in production factor prices.

In condition 2, a 1% increase in Fund Charges will increase the output/financing price by 0.55167%. The price increase of 1% of the workforce will decrease output/financing price by 0.25621% and increase by 1%. The capital expenditures will increase the output/finance price by 0.48019%. The independent variable with the greatest elasticity is the variable Fund charges.Variables Fund charges proxied by the cost of Third Party Funds.It means that financing price most determinde by cost of third party funds.Cost third party funds related to saving rate. Higher saving/deposits rate spent by bank impact to increasing cost of third party funds. Higher cost of third party funds impact to more expensive price of micro financing.

Commercial bank participation turn market structure into monopoly competition. This changing turn the relationship efficiency and competition. The competition of rural bank does not enough to decreasing rate of financing interest. According to Octia, et al. (2013), the changing of rate of financing interestdescibedan technical efficiency. Therefore, it is necessary to measure Technical Efficiency in response to competition between banks. Following the results of the efficiency score for commercial banks dan Rural Banks.

In condition 1 in 2010-2011almost efficiency score in every bank is decline. The competition among rural bank in perfect competition doen not decrease the rate of financing. Thus result shows higher rate of financing means lower efficiency score. In condition 1 the increasing level of competiton impact to decline score efficiency which contrary with SCP theory. SCP theory state that more competitive market impact to more efficiency. The best Technical Efficiency value is owned by

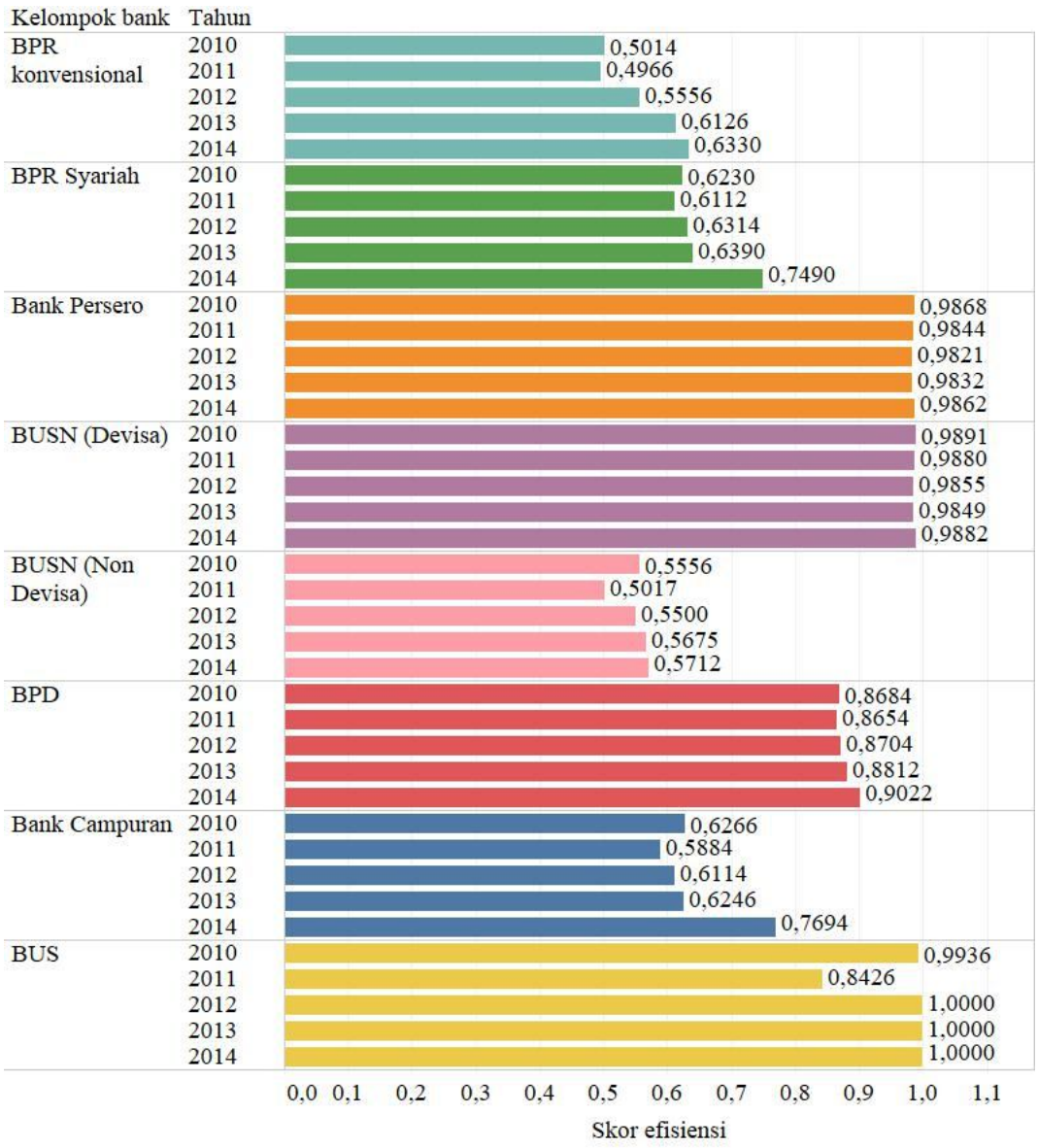

Figure 1 Scores of technical banking efficiency

the Islamic Commercial Bank group, bank persero andBUSN non devisa. Islamic Commercial Banks have efficiency score equal to 1 called Constant Return to Scale (CRTS). The efficiency of Islamic Commercial Bank results is well supported by Karimah's research (2016). Karimah (2016), examines the level of the Technical Efficiency Islamic Commercial Bank and its influence factors. The result is that during the research period Islamic Commercial Bank has reached CRTS conditions. In the CRTS condition, every increase in input (labor costs, the volume of Third Party Funds) of 1% will produce output (volume of micro-credit, other operating income) exactly 1%. An increase in operating income accompanied the increase in microcredit lending. This explains that although entering

micro-business credit into total working credit, the efficiency performance of the two banks is well maintained.

In other bank groups, the efficiency performance operates on the condition of Increase Return to Scale. This shows that every increase in input (labor costs, cost of Third Party Funds) of 1% will result in an increase in output greater than 1%. In general, bank groups in this study have IRTS and CRTS efficiency. Based on Figure 1 we see that rural bank (shariah and conventional) have a lowest efficiency score eventhough the efficiency score is increase. In condition 2, commercial bank dominated almost micro finance market although have higher cost of third party fund. This founding means even has higher cost of third party fund as input, commercial bank has greater operational income and micro financing as output. More expenses that commercial bank spent for micro financing impact to greater income. The market structure transformation change the relationship between level competition and technical efficiency.Therefore it, it will be analyzed the relationship between the level of competition and the Technical Efficiency using the Granger causality test. In this Test, the competition variable is proxied by the H-Statistics value (C) while the efficiency is proxied by a Technical Efficiency score (E). The following are the results of the Granger causality test in Table 4.

business credit financing is accelarate Technical Efficiency of micro financing. The high cost of Third Party Funds of these banks are disrupting the Tech-

Table 4 Granger test results

Object of research	Maks lag	Chi-sq	Prob	Result
Condition 1	2	5.275012	0.0364	C does Granger Cause E
		3.034122	0.2032	E does not Granger Cause C
Condition 2	2	2.467233	0.4307	C does not Granger Cause E
		2.503143	0.0033	E does Granger Cause C

According Tabel 4, in condition 1 the level of competition caused technical efficiency not vice versa. According previous result when competition in rural bank increasing into perfect market but efficiency score get lower. This founding has been proved by Granger causality test.The entrance of commercial bank transform the relationship between competition and tecnical efficiency. In Table 4 shows that technical efficiency caused the competition not vice versa. It means more efficient market will generate the company who concentrated market. Concentrated market will make lower level competition. The result in condition 1 consistent with Competition-Inefficiency Hypothesis while condition 2 consistent with Efficiency Strcure Hypothesis.

Similar previous research is a thesis by Fansuri (2016). His research regarding the competition analysis of the ten largest banks in Indonesia in the period before and after the Indonesian banking architecture policy (2005-2009). Measurement of the level of competition is measured by the modified P-R model from De Rozas (2007).The research method is a panel data regression with quantitative research. The results showed that the long-term balance testing of 10 competing banks was in a stable condition both before and after the banking architecture policy. Fansuri (2016), found that corroborates the journal's results that the condition of Indonesian banking is seen from the financing of micro business loans before and after the architecture is in a balanced condition. Similar results were also seen in banking competition after the banking architecture policy involved ten commercial banks. The results show that competitive market conditions are increasingly leading to a perfect competition market.

DISCUSSION

Based on the results of the study, the policy that encourages commercial banks to enter micro-

nical Efficiency of micro business loan distribution. In other hand higher cost of third party fund impact to higher financing price. The interesting is technical efficiency of shaariah bank keep robust even in different market structure. Suggestionfor next research is find and analysis why did shariah bank keep robustin micro financing event in different structure market. Associate it with relationship and technical efficiency among sharias bank.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Competition of rural bank is in perfect market competition. In condition 1 competiton impact to technical efficiency not vice versa. They have contrary relationship. More competitive market generate less technical efficiency. Tecnical efficiency score can be captured by rate financing movement. Higher technical efficiency score impact to lower rate financing. In condition 2, technical efficiency impact to level of competiton not vice versa. The most effective bank can lead market to concentrated. Increasingly concentrated create lower level competition. If cost of third party fund rose up then saving/deposits rate will increase. Increasingly cost of third party fund generate more expensive price of financing. More expensive price of financing reflected by increasing financing rate and followed by decreasing technical efficiency score.

Recommendation

PBI 14/22/ PBI/2012is quite helpful in ensuring the availability of micro financing but does not counter the problem of rural bank. This regulation just make commercial bank getting bigger than rural bank. Researcher recommended that rural bank provide loans with no colateral, easy requirement with mutual trust. This product can take over customers who do not get financing from commercial banks because they are not bankable. This product differentiation makes rural bank able to compete with commercial banks.

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