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The Impact of Banking Competition on Bank Financial Stability: Evidence from ASEAN 5 Countries

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Abstract
In the era of the global economy, increasing banking competition will encourage an increase in banking transactions and activities. Banking transactions and activities will affect a country's financial stability. The purpose is to obtain the nonlinear effect of banking competition on financial stability at a specific regime. Previous research assumed that this impact applies to every economic regime. The impact of banking competition on financial stability can change at certain regime levels. Nonlinear impact occurs according to the regime. The method is based on a nonlinear threshold regression model. The researchers obtained the data from five ASEAN countries. The findings of this research are in-depth information about the financial system stability model. Analysis of the effect of variance supports the inconsistency of the effects found by several previous researchers. Practical implications are aimed at policymakers to make different decisions at the GDP level, CAR, and Liquidity. The economic regime in each country is different, so this analysis is constructive for policymakers to see the conditions of banking competition and financial system stability at a certain regime level. The originality article systematically offers an analysis that assumes the effect can change at a certain regime level.

Keywords:
banking competition; financial stability; distance to default; threshold regression

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INTRODUCTION

Southeast Asia countries have implemented the ASEAN Economic Community (AEC), which generally encourages competition to promote fair economic development. After the financial crisis, we found that the banking industry in five Southeast Asian Countries increased the number of loans and loan margins and decreased the number of deposits. Because competition in banking can cause different impacts on the loan and deposit market, it is interesting to study this period of economic expansion (Lee & Fukunaga, 2014). The banking industry in Southeast Asian countries has undergone significant changes since the Asian financial crisis occurred in the year 1997, caused by the credit bubble decline of the Thai baht. This condition was followed by the global financial crisis in 2008, started by Mortgage loan bubbles in the United States. Chen & Du (2016) and Kasman & Kasman (2015) discovered that, even after these crisis conditions, the banking industry in Southeast Asia is still prone to moral hazard; the Asian banking industry is experiencing high market power and better capitalization but high capitalization has not solved the moral hazard problem in less competitive markets.

Competition is often viewed as a positive force, but on the other hand, competition can decrease Charter value as the primary source of bank profit (Kabir & Worthington, 2017). Higher market power can increase the credit risk of borrowers as higher interest rates are charged on commercial loans, known as moral hazard issues, as shown by the Lerner index for the loan (Castro, 2013; Chaibi & Ftiti, 2015; Kasman & Kasman, 2015). They argue that the Lerner index for the deposit and loan markets describes different characteristics that must be calculated separately.

Banks with high market power could cause a higher degree of instability among large banks, thus making more ambiguous linkages between competition in banking and financial stability (Yusgiantoro et al., 2019b). Wang (2018) found that competition can diminish the franchise value of a bank, and the result can force banks to pursue riskier loan projects to maintain former banking profits. The Distance to Default provides a forecast for the probability of default of the market value of assets (Anginer et al., 2014). Market power is related to greater systemic fragility. It suggests the importance of guaranteeing a competitive market condition in banking, supporting the competition stability perspective. However, the weakness of this method is that the Distance to Default method needs to consider banking solvency risk from income volatility in banking operations (Castro, 2013).

A competitive market structure has various implications for economic policy; the degree of competition can become imperative for the efficiency of production, increasing demand for products and improving them, fostering the quality of products, improving productivity growth, and generating innovation in many industries (Anginer et al., 2014), however, in the banking industry. Beck et al. (2013) found that the impact of competition was more unclear in theory, and banking competition had good and bad effects on financial stability. The quality of financial products is determined by moral hazards and the degree of competition, which is related to the degree of innovation because banks that compete tend to do a lot of innovation and customer acquisition,

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which may harm financial stability, as competition causes banks to increase their credit and loan allocation and is associated with fragility (Barbosa et al., 2015; Braun et al., 2019; Chaibi & Ftiti, 2015; Ekananda, 2019).

In most industries, competition is considered a positive force Barbosa et al. (2015), but in the banking industry, competition is detrimental to financial stability (Dwumfour, 2017). Banking struggle has good and bad effects on financial stability. The Competition Fragility hypothesis suggests that banking system competition makes the financial system vulnerable to shock (Beck et al., 2013; Kabir & Worthington, 2017; Quijano, 2013). Increased competition could lead to increased lending rates, insolvency risk, and reduced banks' market power. It can be dangerous because competing banks are more willing to increase risk-taking with credit allocation. The Competition Stability hypotheses were studied by (Anginer et al., 2014; Arping, 2019; Diallo, 2015; Dwumfour, 2017; Fu et al., 2014; Kabir & Worthington, 2017; Lu et al., 2022; Mateev et al., 2022). They propose that banking competition can improve financial stability, resulting in higher asset quality, efficiency in banking operations, and reduced likelihood of a crisis. Moreover, the higher competition encourages banks to impose risk-taking incentives, making the banking system more supple to shock.

Finding suitable methods to explain the impact of banking competition on financial stability is essential. We use threshold regression to detail its impact by dividing data by threshold value and analyzing the consistency between Distance to default (DtoD) and Z-score as a proxy for financial stabilities. There are two hypotheses in the literature on competition among financial institutions, explicitly of competition stability and fragility. The competition stability hypothesis studied by several researchers is that banking competition can improve financial stability, as higher competition promotes banks to increase their prudential risk-taking incentives. This condition can result in higher asset quality, increased efficiency in banking operations, and reduced likelihood of a crisis, as well as making the banking system more resistant to shocks (Anginer et al., 2014; Arping, 2019; Diallo, 2015; Dwumfour, 2017; Fu et al., 2014; Kabir & Worthington, 2017; Lu et al., 2022; Mateev et al., 2022).

Two methods can measure competition. The first approach uses the structural method (market concentration) and the structure conduct performance (SCP) versus the efficient structure hypothesis. The following approach included the H-statistic developed by Panzar and Rosse (1987). The Lerner index of market power is known as the new economics of empirical industrial organization (Han et al., 2017).

In the banking industry, there are many ways to measure financial stability. The macro-financial risk can be used for evaluating the risk of banks and financial institutions at different aggregations (Anginer et al., 2014). The famous method is Merton Distance to Default. It measures the Distance between the market value of an asset and the barrier of default. This method indicates the number of standard deviations away from the default obstacle to the market value of assets, and it can be extended into probabilities of default if the circulation of assets is known (Kliestik et al., 2015).

From the competition-fragility perspective, in recent literature, Diallo (2015) has cast off the Z-score to show the positive connection between competition and financial fragility and support the hypothesis. For the Asian banking industry, Souza (2016) used the Z-score to capture bank income volatility, capitalization in banking, and bank insolvency risk to evaluate financial stability. The empirical results indicated that high market power is related to superior capital adequacy. The Lerner index that is more suitable for banking competition is the Monti-Klein model, which separates the Lerner index of market power for loans and deposits as proposed by Van den End (2016). Monti and Klein's model examined banking activities related to collecting deposits and providing customer loan services.

The novelty of this study is as follows. The study divides stability measures according to the Distance to Default from a bank's market value and Z-score measures. Moreover, the size of the competition follows competition in banking, namely from deposit funding and credit development. The study compared two measures of financial stability to determine the difference between the Distance to Default Risk measure of a bank's market value and the Z-score measure of volatility risk income. The study used the Lerner Index for the deposit (LernerD) and lending (LernerL) markets, a more suitable method for measuring banking industry competition. Another novelty is that this research applies threshold regression to obtain analysis results for different economic regimes. The advantage of this method is that researchers obtain a threshold value that is useful for optimally dividing economic conditions into several regimes.

Our research gap is explained as follows. This study examines the relationship between bank competition and financial stability, asking whether competition is feasible or insufficient for financial stability by measuring competition. In the linear model, the estimated effect is the effect that applies to all regimes, data, and situations. This study applies the threshold regression method to look for the non-linear effect of independent variables on financial stability in various economic regimes (Asare et al., 2021).

The contribution of the paper can be explained as follows. This research requires measurement of competition that can consider the competition on banking loans and deposits. We consider the Lerner Monti-Klein index model, which separates the Lerner indices for the loan market and deposit market as proposed by (Bikker et al., 2012). This research applies a non-linear model compared to a linear model, resulting in a broader analysis where the threshold regression model produces a specific effect on a particular regime. Threshold regression can choose a threshold value to separate two or three regimes.

This paper aims to provide future predictions about the banking industry competition for various banking economic and financial regimes. Using this specification can show banking operations that generate income from interest on loans and maintenance costs from interest on deposits. This specification also examines the behavior of monopolistic banks challenged by an elastic demand curve for loans and the supply of deposits (Khan et al., 2018; Kusi et al., 2020). This research aims to open insights into analysis that has assumed a fixed effect in all economic conditions. The effect of each determinant

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of financial stability is different for various regimes. We apply threshold regression to obtain a non-linear erection at the appropriate regime.

METHODS

The samples consist of two large, two medium, and two small banks from the five Southeast Asian countries. The banks' ratings were identified from institution rankings for each country from Orbis Bank Focus database, World Bank, and financial statements from the monetary authority in each country for 2012–2021. We employ this sample following Montes and Carlos (2015) and Ye et al. (2012), in which they use Spanish bank data that can reflect competition between large, medium, and small-sized banks. The result is not robust instead, it is consistent with the expected significant result from panel data.

Using the panel data approach, we can examine the connection between bank competition, capital adequacy and GDP to the systemic risk Distance to Default in the banking industry in five Southeast Asian countries (Model I). We employ this approach because there are numerous advantages to using this econometric specification. First, there is the ability to concede time variation and cross-sectional discrepancy in our model. Second, this method permits us to avoid several biases among cross-country regressions. Third, there is the likelihood that using influential variables will reduce bias, such as in the model by Fu et al. (2014).

$$DtoD_{it} = \alpha + \beta_2 LernerL_{it} + \beta_3 LernerD_{it} + \beta_4 gGDP_{it} + \beta_5 CAR_{it} + \beta_6 Liq_{it} + \varepsilon_{it} \quad (1)$$

In theory, we expect $\beta_2 < 0, \beta_3 > 0, \beta_4 < 0, \beta_5 < 0$ *and* $\beta_6 < 0$. The empirical model that examines the connection between bank competition, capital adequacy and GDP to the financial stability of the Z-score in the banking industry is as follows (Model II):

$$ZCO_{it} = \alpha + \delta_2 LernerL_{it} + \delta_5 LernerD_{it} + \delta_3 gGDP_{it} + \delta_4 CAR_{it} + \delta_6 Liq_{it} + \mu_{it} \quad (2)$$

where the independent variable includes the market power for loans (LernerL) and market power for deposits (LernerD), macroeconomic variable GDP growth to account for country revenue, capital adequacy ratio as variable to control the degree of competition, Liquidity as variable that reflects operational risk, and the error term. In theory, we expect $\delta_2 > 0, \delta_3 < 0, \delta_4 > 0, \delta_5 > 0$ *and* $\delta_6 < 0$. Model I was developed to the Threshold Regression Panel Data, where gGDP is specific for each regime while the bank variables are the same. This model applies gGDP as a threshold (Model III)).

$$\begin{aligned} DtoD_{it} = {} & (\tau_i + \tau_2 LernerL_{it} + \tau_3 LernerD_{it} + \tau_4 gGDP_{it} + \tau_5 CAR_{it} + \\ & \tau_6 Liq_{it}) \mathbb{I}\left(gGDP_{it} \leq \tilde{k}\right) + (\lambda_i + \lambda_2 LernerL_{it} + \lambda_3 LernerD_{it} + \\ & \lambda_4 gGDP_{it} + \lambda_5 CAR_{it} + \lambda_6 Liq_{it}) \mathbb{I}\left(gGDP_{it} > \tilde{k}\right) + \varepsilon_{3it} \end{aligned} \quad (3)$$

The specific impact of gGDP is expected to be positive for all levels of gGDP. Model IV was developed with the Threshold Regression Panel, where gGDP is specific for each regime during the same bank variables and the same dummy bank for each regime. This model determines gGDP as the threshold (Model IV).

$$ZCO_{it} = (\omega_i + \omega_2 LernerL_{it} + \omega_3 LernerD_{it} + \omega_4 gGDP_{it} + \omega_5 CAR_{it} + \omega_6 Liq_{it})\mathbb{I}(gGDP_{it} \leq \tilde{k}) + (\gamma_i + \gamma_2 LernerL_{it} + \gamma_3 LernerD_{it} + \gamma_4 gGDP_{it} + \gamma_5 CAR_{it} + \gamma_6 Liq_{it})\mathbb{I}(gGDP_{it} > \tilde{k}) + \varepsilon_{4it} \quad (4)$$

This study applies threshold regression because of the assumption that the effect of the variables is not linear at the level of GDP, CAR and Liquidity (Model III and Model IV). Threshold regression is as follows. Parameters γ_j and βj are estimated according to the same least squares procedure used for the standard STAR or SETAR. The operationalization of the dependent variable is as follows. We follow the Merton Distance to Default model based on Castro (2013) and Anginer et al. (2014). Default occurs when the company asset values fall below the default point (d*).

$$d^* = short\ term\ debt + \frac{1}{2}\ x\ long\ term\ debt \quad (5)$$

We use Distance to Default follow Black–Scholes (BSM) option pricing model (Kliestik et al., 2015).

$$Distance\ to\ Default\ (DtoD) = \frac{E(F(t)) - d*}{\sigma_F} \quad (6)$$

Where: E is the Equity, F(t) is the current market value of the company asset, d* is the value of debt also called default point, σ_F is the annualized market value of the company asset with calculation (market value of asset x volatility of market value asset) , T is the time until debt matures. A higher distance to default implies higher financial stability in the distance between market value of banks to the default risk (Kliestik et al., 2015).

Second measurement by Z-score natural logarithm method. This measurement is based on Return on Average Assets (ROAA), which can capture bank income volatility, capitalization and insolvency risk (Anginer et al., 2014).

$$ZCO_{it} = \frac{ROAA_{i,t} + EQTA_{i,t}}{SDROAA_{i,t}}, \quad (7)$$

Where ROAA is the return on average assets, SDROAA is the standard deviation of the bank return on average assets, and EQTA is the total equity to total asset ratio originally used as a measure of bank leverage. High volatility predicts uncertainty in banking operation can reflect that bank is on the brink of bankruptcy, while low volatility reflects bank economic condition is steadier. A higher ZROAA implies lower financial stability.

In the introduction, there is a debate about the existence of diverse, inconsistent, insignificant, and variable effects (Kusi et al., 2020). The varying effects are caused because the estimated data consist of various regimes with particular economic behavior (Anginer et al., 2014). The effect is insignificant because in linear regression, the effect is the average of all the times and countries involved. Variable effects due to changes in periods and units of analysis are not robust, caused by outliers at various positions. To start the analysis using nonlinear methods, we must ensure the presence

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of linearity in the model. Following the background and literature, we state the hypothesis as follows:

H1 : There are non-linearity influences of banking competition on financial stability

Under the purpose of the study, we use deposit funding and credit development as the real banking competition. The study used the Lerner Index for the deposit (LernerD) and loan (LernerL) markets. Second, banking competition affects the Distance to Default risk measure of the bank's market value and the Z-score measure. Theoretically, both Lerner indices affect financial stability in linear models and threshold regression. This study expects that analysis with threshold regression displays the same and more profound results than linear regression. Hypotheses are proposed in research to prove the compatibility between theory and empirical studies. The hypothesis is given as follows.

H2 : The increase in banking competition of deposits influences the decrease in financial stability.

H3 : The increase in banking competition for loan influence the increase in financial stability

H4 : The increase in economic growth influences the decrease in financial stability.

The discussion of the research results starts with an explanation of the data description and continues with data testing and model selection. The steps for model selection are presented as follows—first, the panel data co-integration test, second, Wald test to choose an individual effect, third, linearly test, robust test and model evaluation for hypothesis Statistical hypotheses to answer the research hypothesis are as follows. Proof of the hypothesis by testing the t statistic as follows. We prove the H2 where the financial stability is the DtoD by testing the significance of β_2, τ_2 or λ_2. We prove the H1 where the financial stability is the ZCO by testing the significance of δ_2, ω_2 or γ_2. In the same way, we do on the H3 and H4.

RESULT AND DISCUSSION

Next, we examine the relationship between our model for the five Southeast Asian countries' banking industries. Table 1 shows the Distance to Default calculation for six banks in each country. We calculate the weighted average Distance to Default using the Merton Distance to Default model, the data obtained monthly for each bank (Kliestik et al., 2015).

Table 1. Distance to Default Result

	DD	2015	2016	2017	2018
INA	Mandiri	4396,82	5447,74	2811,13	2978,08
	BRI	3047,82	3938,25	2056,99	2259,58
	BNI	5417,20	6265,39	2652,77	2799,81
	BTN	3805,72	4952,32	2049,92	2263,30
	BJB	2416,17	926,62	907,09	989,20
	Bukopin	13454,47	9775,11	7870,67	4730,13

	DD	2015	2016	2017	2018
MAL	Maybank	5379,14	4893,98	5091,32	6572,97
	CIMB	2167,13	1881,70	2340,91	4307,63
	Public bank	1916,83	2559,71	3892,05	4285,09
	RHB	14722,41	22562,57	23765,51	17806,61
	Affin bank	2903,97	2654,62	3824,18	5329,29
	Alliance bank	2229,43	1984,19	2122,58	5512,76
PHI	BDO	2016,63	3158,13	1879,53	2446,30
	Metropolitan	4915,17	14069,12	6263,71	8552,00
	BPI	2252,20	6740,58	5802,65	8716,60
	Security bank	2979,42	3383,97	2176,92	2649,38
	East west	10380,19	9756,11	5115,47	4738,53
	BOC	2756,73	2671,46	3368,90	2888,23
THA	Bangkok bank	7390,04	6557,24	7942,64	7635,28
	Siam bank	2536,97	2906,52	4158,38	4526,82
	Kasikorn	14294,27	18765,61	19159,15	22582,94
	Krung Thai	4341,44	6250,25	7348,21	8212,53
	Thanachart	5476,67	6582,71	6736,09	7606,09
	Tisco	6571,87	4796,55	1826,67	1861,91
SIN	DBS	4445,02	7767,69	5479,90	5121,26
	OCBC	6361,76	10368,18	6178,13	6523,68
	UOB	4933,95	7543,62	6579,04	6541,45
	Hong Leong	5478,31	12733,78	7275,79	4101,15
	Singapura	16753,29	16802,38	14507,02	16309,89
	Gk Goh	21410,26	19284,47	20196,52	22764,12

A higher distance to default implies higher financial stability in the distance between market value of banks to the default risk. In contrast, a high degree of Lerner index implies the higher market power of banks and low market competition level. There are several root unit testing methods in the STATA and Eviews, in this study, the test used was ADF - Fisher Chi-square, where Fisher's test is possible for unbalanced panel data (Ekananda & Suryanto, 2021; Greene, 2018). The Fisher Chi-square ADF test is used with lag (1), with the results of testing all stationary variables at the level with a significant level of 1% (Table 2).

Table 2. Panel Unit Root Test Levin, Lin & Chu t

Variable	Statistic	P-Val	Variable	Statistic	P-Val
DtoD	-8.17092	0.0000	CAR	-1.12422	0.0000
ZCO	-179.983	0.0000	LernerD	-62.043	0.0000
LernerL	-63.8299	0.0000	Liquidity	-10.9411	0.0000
gGDP	-14.1528	0.0000			

To ensure the selection of our best models, we applied Redundant Fixed Effects Tests. The common effect Model assumes no heterogeneity of corporate credit share by

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country. On the contrary, the random effect model assumes no corporate credit share heterogeneity by country. Greene (2018) explains that in the analysis of panel data models, we can use the Fixed Effect Model (FEM) regression model or the Random Effect Model (REM). The Hausman test can be performed if we find a suitable regression model. Ho shows the model using REM, while if H_0 is rejected. The result is that FEM will be used (Table 3). Model I and III used Country as ID. Model II and IV used bank as ID.

Tabel 3. Test Random Effect

ID	Equation	CEM vs FEM			FEM vs REM	
		d.f.	F-stat	Prob	F-stat	Prob.
Country	Model I	(4,230)	4.46	0.00	21.05	0.0008
	Model II	(4,230)	4.44	0.00	21.99	0.0005
Bank	Model III	(29,205)	17.88	0.00	101.50	0.0000
	Model IV	(29,205)	4.34	0.00	16.58	0.0134

We use Terasvirta Sequential Tests. Tests are based on the third order. In the Taylor expansion alternatives equation: $b_0 + b_1*S[+ b_2*S^2 + b_3*S^3 + b_4*S^4]$. The Null Hypothesis H_{03}: $b_1=b_2=b_3=0$. We define GDP, CAR and Liquidity as the threshold variables. The results of the linearity test are shown in Table 4. Table 4 explains that the application of the threshold can be made. The test results of all threshold variables indicate that the linear model is rejected. If we use a linear equation, the coefficients show a nonlinear impact. Nonlinear impact (threshold regression) can be interpreted as the independent variable's impact is not the same for all data conditions. The threshold application can be made to explore the impact of changes in the condition of the threshold variable. Table 4 proves the H1: There are non-linearity influences of banking competition on financial stability. Further studies can be seen in the research by (Ekananda & Suryanto, 2021). The proper method will produce more efficient estimated econometric equations. The size of the sum square of residual (SSR) is used to determine a more efficient method (Mahjus Ekananda & Suryanto, 2021 and Greene, 2018). Table 4 and Table 6 summarize the SSR values of the various methods used in the study.

Table 4. Linearity Tests

Threshold	Model III			Model IV		
	CAR	GDP	Liq	CAR	GDP	Liq
F	2.76	5.12	3.71	4.79	8.30	3.27
d.f.	(10, 300)	(10, 300)	(10, 300)	(10, 300)	(10, 300)	(10, 300)
p-value	0.00	0.00	0.00	0.00	0.00	0.00
Linear	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected

*) Original model is rejected at the 5% level using H03. +)at the 5% level using H03.

Model I was a Fixed Effect model with five country effects. Regression uses the Eviews application, which applies the Cross-section SUR (PCSE) standard errors &

covariance (d.f. corrected) and Linear estimation after a one-step weighting matrix. Model I (Table 5) assumed that each country has its different nature. A higher distance to default implies higher financial stability in the distance between market value of banks to the default risk. An increase in GDP growth results in a decrease in financial stability. The higher market power of banks on loans (lower market competition of banks on loans), resulted in a decline in financial stability. Likewise, the higher market power of banks on deposits (lower market competition of banks on deposits) has resulted in increased financial stability (Barbosa et al., 2015).

Table 5. Fixed Effect for Bank and Country

Dependent		Ln(DtoD) : Model I for country			Ln(ZCO) : Model II for bank	
Indep	**sign**	**Coef**	**t-Stat**	**Sign**	**Coef**	**t-Stat**
C		9.642	21.877		3.959	15.261
LERNERL	-	-4.391	-4.9998	+	-1.512	-2.905
LERNERD	+	0.647	3.055	-	-0.439	-1.714
GDP	-	-0.075	-2.027	+	0.022	1.393
CAR	-	-0.057	-1.738	+	0.040	1.635
LIQUIDITY	+	0.002	1.240	-	-0.006	-2.044
AdjR2		0.280			0.372	
F-stat		13.947			6.211	
SSR		140.119			101.708	

In model II (Table 5), financial stability was measured by Ln(ZCO), showing that higher ZCO implies lower financial stability. The increase in GDP growth increased the ZCO index (the lower financial stability). The higher market power of banks on loans (lower market competition of banks on loans), increased the ZCO index (lower financial stability). Regression results show parameters that are not significant. Expected direction of influence is not proven. Likewise, the higher market power of banks on deposits (lower market competition of banks on deposits), resulted in a decrease in the ZCO index (increased financial stability). This result follows the Barbosa et al. (2015) research.

The link between competition and financial stability in financial institutions has been a subject of academic arguments; many researchers have aimed to determine the influence of banking competition following a series of events, such as economic regulation, on financial stability. This paper used the sample of two large banking firms, two medium-sized firms, and two small firms in each Southeast Asian country to represent banking competition from 2012 to 2021.

Models I and II do not consider the differences in GDP, CAR and liquidity regimes. In the following analysis, we apply threshold regression to produce complete analysis. Table 6 illustrates the general regression relationship between the Distance to Default, previous Distance to Default, Lerner index, GDP growth, and capital adequacy ratio. The threshold regression was used for panel data (1) regression with

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the full set of the model (2) regression with Lerner index only for loans with another complete variable (3) regression with Lerner index only for deposits with another complete variable.

Model III (Table 6) explains the regression results where the equation is divided at a certain threshold. Specifically for Model III, the dependent variable is Ln(DtoD). A higher distance to default implies higher financial stability in the distance between market value of banks to the default risk. An increase in GDP growth results in a decrease in financial stability. The higher market power of banks on loans (lower market competition of banks on loans), resulted in a decline in financial stability. Table 5 and Table 6 prove hypothesis H2: the increase in banking competition of deposits commonly influences the decrease in financial stability.

Table 6. Threshold regression (Model III)

Ln(DtoD)		GDP < 6.03 -- 222 obs		6.03 <= GDP -- 78 obs		CAR < 12.76 -- 252 obs		12.76 <= CAR -- 48 obs		LIQ < 17.73 -- 169 obs		17.73 <= LIQ -- 131 obs	
		1	2	3	4	5	6	7	8	9	10	11	12
		Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
LERNERL	-	-4.32	-4.55	-3.45	-1.34	-5.63	-6.03	2.57	0.99	-4.87	-4.50	-2.88	-2.35
LERNERD	+	0.79	3.66	-0.18	-0.24	0.90	3.90	0.62	1.44	0.32	0.95	1.06	4.09
GDP	-	-0.11	-2.04	0.16	1.88	-0.08	-2.09	-0.14	-0.65	-0.09	-2.07	-0.07	-1.67
CAR	-	-0.06	-1.54	-0.20	-2.92	-0.12	-3.01	-0.03	-0.45	-0.07	-1.99	-0.13	-3.40
LIQUIDITY	+	0.00	1.57	-0.01	-0.85	0.01	1.34	-0.06	-2.48	0.01	0.83	0.00	2.37
AdjR2		0.30				0.32				0.32			
SSR		134.82				130.78				130.67			

N of observations= 30 Period included T = 10, N of balanced panel observations= 300

Likewise, the higher market power of banks on deposits (lower market competition of banks on deposits), resulted in increased financial stability. Table 5 and Table 6 prove hypothesis H3: Commonly, The increase in banking competition for loan influence the increase in financial stability. This result follows the Barbosa et al. (2015) research. The effect of market competition on loans and deposits occurs evenly at all levels of GDP, CAR and liquidity. The low significance level of GDP and CAR in Table 5 has been explained in Table 6. The effects of GDP and CAR are not uniform for several regimes.

Table 7 shows the general regression relationship between Z-score, previous Z-score, Lerner index, GDP growth, and capital adequacy ratio using the threshold method of panel data. (1) regression with full set of the model (2) regression with Lerner index only for loan with another variable complete (3) regression with Lerner index only for deposit with another variable complete. A higher Z-score implies a high degree of financial fragility, greater bank income volatility, and high risk of bank capitalization. In contrast, a high Lerner index score implies a high bank market power with low competition level. The table's capital adequacy ratio shows each country's capital burden.

Table 7. Threshold regression (Model III)

Ln(ZCO)		GDP < 4.91 138 -- obs		4.91 <= GDP -- 162 obs		CAR < 12.61 -- 245 obs		12.61 <= CAR -- 54 obs		LIQ -- 300 obs	
		1	2	3	4	5	6	7	8	9	10
	Sign	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
LERNERL	+	2.95	2.03	-2.74	-1.85	0.90	0.72	2.79	1.05	0.21	0.13
LERNERD	-	-0.69	-2.13	-0.36	-1.02	-0.85	-2.68	-1.38	-3.24	-0.62	-1.64
GDP	+	-0.02	-0.24	0.35	7.02	0.11	3.51	0.70	3.78	0.13	3.88
CAR	+	0.27	10.03	0.13	6.30	0.28	12.45	0.03	0.52	0.23	11.66
LIQUIDITY	-	-0.01	-2.72	-0.01	-2.15	-0.01	-3.26	-0.01	-0.27	-0.01	-2.41
AdjR2		0.34				0.330329				0.262	
SSR		105.01				106.8351				86.23	

N of observations= 30 Period included T = 10, N of balanced panel observations= 300

Model IV (Table 7) describes the regression results in dividing the equation into two regimes. Specifically for Model IV, the dependent variable is financial stability measured by Ln(ZCO), showing higher ZCO implying lower financial stability. The increase in GDP growth increased the ROAA (the lower financial stability) index. Table 7 proves the hypothesis H4: The increase in economic growth influences the decrease in financial stability.

The higher market power of banks on Loans (lower market competition of banks on Loans/ LernerL), resulted in an increase in the ZCO (the lower financial stability) index at a low GDP level. In the CAR and Liquidity regime, the effect is not significant and is not in the expected direction. If we look at Table 5, it appears that the LernerL Impact does not match the expected sign. Table 7 proves the hypothesis H2: commonly, the increase in banking competition of deposits influences the decrease in financial stability (ZCO). Likewise, The higher market power of banks on deposits (lower market competition of banks on deposits), resulted in increased financial stability. Table 7 proves the hypothesis H3: The increase in banking competition for loan commonly influences the increase in financial stability (ZCO).

The higher market power of banks on deposits (lower market competition of banks on deposits/ LernerD), decreased the ZCO index (increased financial stability). The direction of change occurs in almost all applied regimes. These results support Table 5 where the effect of LernerD is negative but insignificant. Significant results only occur in certain economic regimes, namely at low GDP and CAR levels. This result follows the Barbosa et al. (2015) and Van den End (2016) research.

The effect of market competition on loans and deposits occurs evenly at all levels of GDP, CAR and liquidity. The low significance level of GDP and CAR in Table 5 has been described in Table 6. The effects of GDP and CAR are uneven across several regimes. The Z-score is positively linked with previous Z-scores. The Lerner index of market power had a significant connection with Z-score only in loan market, it shows support for competition-stability hypothesis. While in deposit market show support for

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competition-fragility hypothesis our result is the same as Kabir & Worthington (2017) and Kanga et al. (2021). Bank competition-fragility portion in deposit increased in degree of competition makes bank not stable in deposit market. Bank with higher market power in loan market tend to increase bank income volatility, which suggests Charter value hypothesis exist bank with higher market power tend to make it harder to repay loan, bank with high market power are not stable in loan market competition but stable in deposit market competition. This result follows the Barbosa et al. (2015) and Van den End (2016) research.

Table 8 presents the data distribution smaller than the GDP, CAR and LIQ thresholds. This analysis is also by (Ekananda, 2019). We can combine Table 8 with Table 6. The coefficients obtained in Table 6, GDP < 4.69 (Table 6, columns 1 & 2) are from the countries mentioned in row 1, in Table 8. 90 observations are from Malaysia and Singapore. Regression results for CAR < 11.61 (Table 6, columns 5 & 6) are from Malaysia, Thailand, Philippines and Singapore. Regression results for Liq < 17.73 (Table 6, columns 9 & 10) are equally distributed across countries. Table 8 explains the impact of banking competition variables on financial stability in more detail. The regression results are detailed because the sample is divided into two according to the threshold value. This threshold value can be examined further by looking at the countries of origin of these banks. Further analysis can deepen the relationship between financial stability and the country's economy. The country's economy through GDP.

Table 8. Distribution of data below the threshold

	Model III	INA	MAL	THA	PHI	SIN	TOTAL	%
1	GDP < $\tilde{k}$	0	6	42	6	36	90	37.5
2	CAR < $\tilde{k}$	6	42	42	42	48	180	75.0
3	LIQ < $\tilde{k}$	30	28	21	39	18	136	56.67

Table 9 describes data distribution smaller than the GDP, CAR and LIQ thresholds. We can combine Table 9 with Table 7. The coefficient obtained for GDP < 4.69 (Table 7, columns 1 & 2) is from the countries mentioned in row 1, Table 9. 108 observations are from Malaysia and Singapore. Regression results for CAR < 11.61 (Table 7, columns 5 & 6) are from Malaysia, Thailand, Philippines and Singapore. Regression results for Liq < 17.73 (Table 7, columns 9 & 10) are equally distributed across countries. The distribution of country data in Table 9 is similar to Table 8.

Table 9. Distribution of data below the threshold

	Model IV	INA	MAL	THA	PHI	SIN	TOTAL	% data
1	GDP < $\tilde{k}$	6	18	42	6	36	108	44
2	CAR < $\tilde{k}$	18	48	48	48	48	210	86.0
3	LIQ < $\tilde{k}$	8	19	2	29	9	67	28.02

Table 10 shows the Payoff matrix of impact banking competition on financial stability using two competition measurements and two financial stability measurements. Our results show a reason and benefit for separating the sample from the threshold criteria to obtain a more specific impact (Models III and IV) than the general impact (Models I and II). We have chosen the FE model to consider heterogeneity between countries and banks in these four models.

Table 10. Payoff Matrix of Impact Banking Competition to Financial Stability

Model	Financial Stability	LernerL	LernerD	GDP
Model I	DtoD	(-)	(+)	(-)
Model II	ZCO		(-)	(+)
Model III	DtoD	(-)	(+)	(-)
Model IV	ZCO	(+)	(-)	(+)

Specifically, the result from our calculation can be summarized as matrix, higher Lerner index means higher monopoly power low degree of competition, and vice versa lower score Lerner index means the degree competition is higher. The higher Distance to Default means banks are far from the risk of becoming default. While Zscore ROAA is a measure of bank income volatility positive relationships mean there is a disruption of banking solvency from banking operations (Kasman & Kasman, 2015).

From the findings above, it can be stated that banking competition has various impacts on bank stability. Each bank can have advantages in different variables. This diversity will have an impact on bank competition, competitiveness, and stability. The Lerner Index calculates the existence of market power by comparing the price difference and marginal cost and dividing it by price. The higher the Lerner Index value, the greater the market power, which means that the bank can set prices above its marginal cost. When this happens, industry competition will decrease.

This study analyzes the impact of banking competition in the ASEAN region on bank stability, indicating competition stability or fragility. This research is consistent with the research penelitian (Anginer et al., 2014; Berger et al., 2009; Chu, 2015; Davis et al., 2020; Dwumfour, 2017; Fu et al., 2014; Köhler, 2015; Yusgiantoro et al., 2019a). This study also uses the distance-to-default method to measure banking stability using a market approach (Anginer et al., 2014; Chan-lau & Sy, 2007).

High competitiveness in the ASEAN region will also impact banking stability. Competition to compete for market share that is not accompanied by the principle of prudence will have a negative impact on banking stability. Increased competition between banks in the market will force banks to make efficient (Jeon et al., 2011). Inefficient banks will be unable to compete with more efficient banks. If an inefficient bank is not immediately merged/acquired, it will cause the bank to collapse. Banks have a systemic impact if banks compete with each other and cause a collapse, the

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effect will spread to other banks terbuka (Lee & Fukunaga, 2014; Weill, 2009). This condition is undoubtedly a dangerous condition for the economy as a whole. Each ASEAN-5 country, especially Indonesia, must anticipate the high competition that occurs in ASEAN-5 banking (Severe, 2016).

In current developments, several banks in the ASEAN region are carrying out a product diversification strategy by selling products or services through consulting services, investment banking, multi-finance or bancassurance, and other non-bank services (Dang, 2020). One of the factors that can encourage ASEAN banking competition is the ASEAN Economic Community (AEC). Economic liberalization and integration through the AEC have made the market within ASEAN more open (Lee & Fukunaga, 2014; Weill, 2009).The enactment of the ASEAN Economic Community (AEC), where banking in ASEAN is integrated, makes the ASEAN-5 banking competition more competitive (Severe, 2016).

Competition does not only occur between large foreign banks and local banks but also between large banks in ASEAN, which compete with each other for markets outside their own countries. Large banks, especially in ASEAN-5 countries, are implementing several strategies to compete with each other for control of the regional market. With the integration of the ASEAN economy, which aims to create a single market, it will be very profitable for a bank if it can dominate the regional market with a broader market reach. The formation of the ASEAN Economic Community (AEC) led to policies related to banking in ASEAN-5 (Chan et al., 2016). One of these policy frameworks is the ASEAN Banking Integration Framework (ABIF) which is an ASEAN initiative to facilitate ASEAN banking integration, namely by increasing the role of ASEAN banks in the ASEAN region through providing convenience in terms of market access and flexibility to operate in ASEAN member countries (De Jesus & Torres, 2017). The banking integration process within ABIF uses the mechanism for determining Qualified ASEAN Banks (QAB). QAB is one of the requirements for banks to operate fully in other ASEAN countries. The application of ABIF will provide opportunities and potential for banks to expand into the ASEAN market and gain market access and broader business activities in the ASEAN region. This activity will encourage intense competition between domestic and foreign banks from the ASEAN region (De Jesus & Torres, 2017).

CONCLUSION

The results of our research have proven the H1 hypothesis, where the increase in banking competition of deposits influences the decrease in financial stability. The proof uses models I and III, where the Distance to default is the stability. The proof uses Model I and Model III, where the Z Score measures stability. The nonlinear method succeeded in proving and developing the results of the linear model analysis. Insignificant impacts on the linear model can be broken down and explained using a nonlinear model divided according to a specific threshold value. Market forces'

impact on loans and deposits can be more clearly seen using a nonlinear model. Our results show that the Competition-Fragility hypothesis occurs in the Distance to default measurement. The market power of loans and deposits can stabilize the financial system. This evidence can be seen from the regression Model I and Mel III results. While the Lerner index for loans and deposits shows a different relationship on the ROAA Z-score, the Stability of Competition hypothesis only occurs in the loan market.

For this reason, each local bank must anticipate the entry of ASEAN regional banks into the country so that local banks will not lose competitiveness with foreign banks. Banking is required to increase its efficiency by optimizing the use of its inputs and outputs so that the profit generated is higher. In addition, banks must also anticipate ABIF by raising capital, quality of human resources, and information technology. Digital banking penetration in Asia is growing from time to time. The strategy that can be carried out is to strengthen the banking structure, which can be started by increasing bank capital to increase banks' ability to manage business and risk through mergers and consolidation. However, large banks with sufficiently good capital use a strategy by opening direct branches in other countries of interest to penetrate a broader market. Big banks can also make acquisitions to increase their market share. The management of banking risk management must also be continuously improved. Credit risk management can be carried out by monitoring various efforts to maintain NPLs in all bank business segments. Operational risk management is carried out by implementing Good Corporate Governance (transparency, accountability, responsibility, independence, and fairness) and monitoring compliance with prudential provisions set by the central banks of each country.

The recommended policy to control the level of competition is to set the capital adequacy ratio at an optimal level that can withstand the volatility risk of bank income. We find evidence for the competition fragility hypothesis and the competition stability hypothesis affecting ASEAN countries in 2012-2021. Future research should consider studying the evolution of financial market problems in terms of the level of banking competition for the loan and deposit market with a sample of other countries.

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