

# **Bank competition and financial stability: the case of vietnamese commercial banks**

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*Abstract - The main purpose of this research is to investigate the influence of bank competition on financial stability in Vietnamese commercial banks over the period 2006 – 2016. The Lerner indicator is employed to measure competition while banks' probability of failure (Z-score), non-performing loan (hereafter, NPL) ratio and capital adequacy ratio (CAR) are proxies for financial stability. The estimation results from System Generalized Method of Moments (SGMM) and robustness checks (ordinary least squares (OLS), Fixed-effect (FE) and Random effect (RE) regression) indicate that bank competition is positively related to Z-score and CAR, supported by the "competition - stability" initial view. Conversely, Lerner index impacts positively the probability of loan non-payment which documents that expanding lending products enhances the capability of riskier loan portfolio, supported by the "competition – risk" prevalent view. Otherwise, we further find strong evidence that the relationship between bank competition and financial stability is non-linear with U-shape.*

*Keyword: competition, banking risk, bank stability, commercial bank.*

## 1 Introduction

A separate but growing body of literature has highlighted that one of the most important roles of competition is to enhance operational quality for the ultimate purpose of value maximization (e.g Porter M.E, 1985). However, we should not conclude that a competitive strategy does not result in negative signs despite competition considered as one of pre-conditions for efficiency, technological innovation. In addition, the recent financial crisis and the following sharp economic recession have sparked substantial interest in the link between bank competition and financial stability. Nevertheless, no high consensus is documented because “competitive – instability” view reveals that financial stability become worse driven by the severity of competition (see Keeley, 1990; Boyd et al, 2005; Soedarmono et al, 2011 for a review) while a potential contribution of competition is the increase of financial stability (see Allen and Gale, 2004; Koetter and Poghosyan, 2009 for a review). In other words, the mixed theoretical predictions and the at least partly ambiguous existing empirical findings motivate researchers to revisit the question of whether bank competition affect positively or negatively bank stability in each banking sector.

The sustainable development of Vietnamese banking system in line with international standards is driven by the progress of international integration. In this period, banks have continually increased chartered capital to compete more fiercely with the aim of taking market share. This lead to competitiveness to be improved dramatically. However, Vietnamese commercial banks also confront certain obstacles. One of them is competitiveness among Vietnamese commercial and foreign banks. Overall, the competitiveness of Vietnamese banks is limited compared to foreign banks because of the limitation of technology, capital and human resources, although our banks have received supports from government. More specially, Vietnamese commercial bank’s competitiveness has been influenced significantly by the recent financial crisis and economic recession that one of the most prominent feature is that NPLs increase dramatically while the risk management system is not sufficient to control loss-given-default for the small banks. In contrast, the large banks have taken advantage of extra income out of expected interest but from deferred interest and penalty fee. In other words, they offer the trade-off between risk-taking and income.

To the best of our knowledge, we are the first to examine comprehensively the effect of bank competition on financial stability in the context of Vietnamese banking system. Therefore, the contribution of our study is twofold. The largest novelty of our study is again to provide empirical support for the significant role

played by competition in determining financial stability. The second novel contribution lies in the use of the Vietnamese database of commercial banks. The choice of Vietnam to transit theories into empirical results would contribute to increasing literature on the relationship between bank competition and financial stability. The differences of legal, institutional and macroeconomic conditions may account for discrepancies among countries. Moreover, the existing empirical evidence on the relationship in developing markets are not rich compared to developed countries. Therefore, this research will add to have a better view about the relationship in a developing country as Vietnam.

## **2 Literature review and hypothesis development**

The empirical findings on financial stability driven by the severity of competition in countries around the world indicate mixed results.

On the one hand, the predominant view of "competition - risk" suggests that diversification is one of the main sources of instability. The interests in the relationship between competition and stability in banking sector were triggered by Keeley (1990) who initiated an academic hypothesis named "franchise value", the framework provides findings that product diversification to compete contributes to erode brand value, consequently leading to collapse. Explained that banks tend to trade-off exceed risks in order to earn more profits. As the quality of the loan portfolio is most likely to deteriorate due to debt holders' the requirements of more marginal benefit and thereby the increase of bankruptcy. Hellmann et al. (2000) reach the same conclusion that removing the ceiling of interest rate leads to increase competition on price, encouraging moral hazard. In addition, recent studies have illustrated that enhancing competitiveness causes the reduction of borrowers' loan-related information and their motivation to manage loans, resulting in a worse effect on financial stability (Allen and Gale, 2004). Banks with high competition lead to destabilize the banking system and disadvantage to financial stability (Boyd et al., 2004). Besides, Berger et al. (2009) also demonstrates that more bank competition erodes market power, decreases profit margin, and results in reduce franchise value that encourages bank risk-taking. Also, Ariss (2010) examines how different degrees of market power affect bank efficiency and stability, concludes that an increase in the degree of bank concentration leads to greater bank stability and profit efficiency. Vives (2010) assesses competitive theories and empirical findings related to bank competition; he denotes that competition plays role of deciding the severity of bank instability. Zhao et al. (2010) assess the extension to which deregulation measure aimed at promoting competition lead to increased risk-taking. Their outcomes suggest that competition encourages increased risk-taking. Similarly, the empirical findings in

Turkey by Kasman and Kasman (2015) aims to support for competition-fragility view; the authors find that bank with higher competition level will face to higher credit risk, hence, it is essential when bank restrict competitive pressure. Jimenez et al. (2013) provided evidence that competition causes risky portfolio leading increases bad debts in Spanish banks. Further, banks with high market power in lending sector are under pressure of increasing bankruptcy because borrowing with high interest introduce deadweight costs and hence difficulties for customers to repay, leading to exacerbate adverse selection and moral hazard. Hence, the greater severity of competition encourages banks to accept more diversified risks, making banking system more vulnerable with shocks (Anginer et al, 2014). Kabir and Worthington (2017) tell a similar story on the negative effect of bank competition on financial stability that excessive competition in the banking industry lowers the franchise value of banks and induces them to have a riskier loan portfolio, and is thus associated with greater instability. Moreover, in their framework, they also find the magnitude of the market power effect on stability is greater for conventional banks than Islamic banks in 16 developing economies.

**We hypothesize that competition impacts negatively on financial stability of commercial banks (H1).**

On the other hand, the "competition - stability" perspective favors the existence of a positive relationship between competition and financial stability. Enhancing competitiveness is encouraged to minimize the probability of increasing bankruptcy because the lack of competitive operations can exacerbate the instability of banks (Stiglitz and Weiss, 1981). Mishkin (1999) paid attention to the notion of "too big to fail", exhibits that large banks exist moral hazard established by managers who usually accept risky deals under the patronage of central bank. Moreover, banks with less competition lead to provide non-standard credit loan easily, increasing probability of default (Caminal and Matutes, 2002) or higher interest rate leads to the poorer loan portfolio's risk due to adverse selection and moral hazard (Stiglitz and Weiss, 1981). Boyd and De Nicolo (2005) reach the same conclusion that banks with high market power prefer lower competition in the loan market which encourages them to set high interest rate for borrowers which in turn increases their risk-taking tendency and default risk. They further argue that the bank will face high moral hazard and adverse selection problem and lose solvency as the losses are ultimately transferred from the borrowers to the banks. Moreover, Beck et al. (2006); Schaek et al. (2009) reveal that banks hold higher capital buffers when operating in a more competitive environment and competitive banking markets are less likely to experience systemic crises or competition is inversely related to most risk indicators, suggesting that competition does not erode bank stability (Liu et al., 2012). Soedarmono et al. (2012) examine the relation on competition, crisis and bank risk find that concentration in banking sector causes higher capital ratio, income fluctuation and the probability of failure. Anginer et al. (2014) conclude that bank competition promotes risk diversification which helps banks avoid to sudden

shocks. Fu et al. (2014) show that greater concentration experiences financial fragility and that lower pricing power also induces bankruptcy. Furthermore, large banks in concentrated market experience subsidies from policy makers through “too-big-to-fail” schemes which alter their risk-taking motives and include them to take extra risk, thus intensifying their fragility (Acharya et al, 2012). Additionally, the relationship between bank concentration and NPL ratio indicates that more market power associated with more insolvent loan portfolios (Berger et al, 2009).

**We hypothesize that competition effects positively on financial stability of commercial banks (H2).**

The mixed theoretical predictions and the at least partly ambiguous empirical evidence motivate us to revisit the question of whether bank competition affect positively or negatively bank stability in the case of Vietnamese commercial banks. However, the aftermath of the recent financial crisis and the following sharp economic recession have the extremely great negative influences to banking sectors. Soedarmono et al. (2013) point exactly out that under the circumstances of financial crisis of the period of 2007 - 2009, higher market power in the banking industry might contribute to minimize moral hazard which directly affected Asian banks. In addition, Liu et al. (2012) exhibit that the ongoing consolidation and banking restructuring process in these countries does not necessarily lead to lower competition. Reductions in restrictions on banking activities, particularly on foreign bank operations, appear to lead to higher levels of competition. Increased competition is also shown to reduce bank risk-taking. Therefore, competition policy, which has been launched in South East Asia, can be viewed as a policy action aimed at strengthening the stability of the banking systems. In the context of Vietnam, during concession, because of the existence of no interesting difference in Vietnamese banking industry in comparison with South East Asia and Asean banking sector, hence, Vietnam is not an exception. In other words, H2 will be more pronounced to the case of Vietnam.

Moreover, Martinez-Miera and Repullo (2010) document a non-linear relationship between bank competition and financial stability. This is because the ultimate purpose of enhancing competitiveness is to diverge bad effects with the immediate step of products quality improvement. Therefore, in the first period, improving competitiveness delivers banks to a better situation. However, a negative aspect of this issue is that banks tend to focus on operational diversification but they neglect of intrinsic resources leading easily to unexpected risks. Narrowly interpreted, they find the empirical support for the U-shaped relationship between competition and bank risk. The probability of default goes up following an increase in bank competition but it has a downward trend after reaching a threshold. The idea was supported by Berger et al (2009), Kasman and Kasman (2015).

**We hypothesize that the nexus of competition and financial stability is nonlinear (H3).**

### 3 Methodology

Since our empirical analysis involves estimating dynamic nature of financial stability. Therefore, the traditional econometric techniques, such as: OLS, FE or RE are not appropriate to estimate because these method are insufficient to address the potential endogeneity between the lagged dependent variables and error term, and hence resulting bias and misleading inferences related to the relationship. The benchmark estimator of OLS considers all banks as an entity. However, characteristics are different among banks, for example, brand name, corporate governance (time-invariant features). In order words, the bias of OLS results from the assumption of a homogeneous entity. In the meanwhile, the advanced FE and RE take into account the bank-specific factors. Nevertheless, these could not possibly address Omitted-variable bias and reverse causality and correlation between error term and lagged dependent variable.

To address this important methodological issue, instrumental variable techniques are used. Arellano and Bond (1991) initiated the standard GMM estimator, also known as first-differenced GMM, where all variables are transformed by differencing and introduced instrument variables from the lagged levels of the regressors. However, the lagged levels of the regressors could be a poor instrument with the appearance of a serial correlation in the errors. In this case, the first differenced GMM might result in imprecise or even biased estimators. To overcome these shortcomings, Arellano and Bover (1995) and Blundell and Bond (1998) developed the SGMM which comprises two simultaneous equations, whereby, one equation is in lagged difference of the dependent variable as instruments for equation in levels, and other is in lagged levels of dependent variables as instruments for equation in first difference. Blundell and Bond (1998) demonstrate that the SGMM has smaller variances and is more efficient, thereby improving the precision in the estimator. The conditions for the S-GMM estimation include: (1) the visibility of over-identifying restrictions in order to ensure the suitability of instruments and no correlation between instruments and error term; (2) no second-order autocorrelation in first-order differences. Therefore, Hansen and Arellano-Bond tests are employed with the aim of checking the suitability of two conditions above. Besides, the two-step GMM method is better than the one-step GMM because of using covariance-matrix in case of existing serially correlated errors in the second-order or heteroscedasticity. For these reasons, the two-step SGMM is the most appropriate method to regress this relationship. Before estimating two-step SGMM, the presence of autocorrelation, heteroscedasticity, and endogeneity of the data set is tested with Wooldridge test, Breusch-Pagan/Cook-Weisberg test, and the Wu-Hausman test, respectively. After the estimation of two-step SGMM, some tests were also performed, such as AR(1) and AR(2) to check presence of autocorrelation at first and second difference respectively, first stage F-test using 2SLS estimator to test relevance, and Hansen's J-test to test the validity of instruments of endogenous

variables, such as competition measures. Wald test is also used to ensure the fit for all our regression models.

### 3.1 Empirical model

This study investigates whether financial stability is driven by bank competition in Vietnamese commercial banks. We further take into account the influence of competition on financial stability in the non-linearity, following Martinez-Meira and Repullo (2010), Kasman and Kasman (2015). The general regression model to assess the impact of bank competition on financial stability in Vietnamese commercial banks is as follows:

$$\text{STABILITY}_{i,t} = \beta_0 + \beta_1 \text{STABILITY}_{i,t-1} + \beta_2 \text{COM}_{i,t} + \beta_3 \text{CON}_{i,t} + u_{i,t} \quad (1)$$

Where  $\text{STABILITY}_{i,t-1}$  is the one period-lagged financial stability factors, COM and CON denote vectors of competition and control variables, respectively.

The study also adds one period-lagged value of financial stability factors as an independent variable in the model for the purpose of indicating that the rate at which bank risk converges toward a long-run level (Kasman and Kasman, 2015). Moreover, to investigate whether financial stability is driven by bank competition, the squared competition indices are added to the equation as follows:

$$\text{STABILITY}_{i,t} = \beta_0 + \beta_1 \text{STABILITY}_{i,t-1} + \beta_2 \text{COM}_{i,t} + \beta_3 \text{COM}_{i,t}^2 + \beta_4 \text{CON}_{i,t} + u_i \quad (2)$$

### 3.2 Variable construction

#### Stability variables

This research uses the standard score named Z-score as the primary measure of financial stability, following the works of Berger et al. (2009), Soedarmono et al. (2013) and Schaeck and Cihák (2014). The theoretical underpinning of the Z-score is based on the work of Roy (1952), which measures a bank's distance from insolvency, where insolvency is a condition in which loss exceeds equity, such as  $(-\pi > E)$ , where  $\pi$  stands for profit and E stands for equity. The probability of insolvency can be represented as probability  $(E/A < -ROA)$ , where E/A is the equity asset ratio and ROA is the return on assets. The inverse of the probability of insolvency is  $(ROA + E/A)/\delta(ROA)$ , where  $\delta(ROA)$  is the standard deviation of ROA. Thus, the Z-score is defined as the inverse of the probability of insolvency and indicates an individual bank's soundness. The Z-score is calculated in the

following manner: 
$$\mathbf{Z - score} = \frac{\mathbf{ROAA + E/TA}}{\mathbf{\delta ROAA}}$$

In order to control skewed problem, we suggest the natural logarithm of Z-score to normalize its value following the work of Soedarmono et al. (2013). Besides, credit risk is as a ratio of loans in groups 3, 4 and 5 to total bank loans or NPL

ratio which also represents for financial stability. If NPL is high and cannot be controlled it will lead to failures. Hence, NPL is an important factor that should be strictly followed because NPLs are mainly employed to describe credit quality. In the meanwhile, credit risk is one of the major risks. Hence, credit risk is a concern of interest in terms of bank stability (Kasman and Kasman, 2015). If the more the bad debt ratio to total outstanding loans is, the riskier the lending portfolios (Berger et al, 2009). Furthermore, the higher in NPL ratio, the more probable in bank insolvency (Kabir and Worthington, 2017).

Finally, capital ratio is also an alternative measure of financial distress. The measure is used in many researches involving competition-financial stability such as Berger et al. (2009); Soedarmono et al. (2013); Kasman and Kasman (2015). In this study, we propose capital adequacy ratio (CAR) as financial stability measurement. This measure assesses the banks' adaptability when they face to sudden shocks (Gersl and Hermanek, 2008). Based on Basel committee, CAR is

measured following recipe below: 
$$CAR = \frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Risk Weighted Assets}} \times 100\%$$

#### Competition variables

The Lerner index initiated by Lerner (1934) is employed to measure bank competitive extent because the unstructured approach is able to evaluate market power of banks with the concentration on the difference of price and marginal costs (Tusha and Hashorva, 2015). Specifically, the Lerner index defined as the difference between output price and marginal cost exhibits that whether banks evaluate their products higher than marginal cost (Berger et al, 2009); if Lerner = 0, the market is perfectly competitive and vice versa if Lerner = 1, the market is completely monopoly. The Lerner index is calculated as follows:

$$\text{Lerner}_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}}$$

Where  $P_{i,t}$  is the output price of bank  $i$  at time  $t$  which is the ratio of total revenue to total assets and  $MC_{i,t}$  is the marginal cost of bank  $i$  at the end of period  $t$ .

Since the marginal cost of banks cannot be directly observed, the MC is calculated based on total cost. The bank's total cost (TC) is calculated by the logarithm of cost with one output factor (total assets ( $Q_{i,t}$ )) and three inputs ( $W_j$ ) including: labor cost ( $W_1$  - the ratio of employee cost to total asset); material cost ( $W_2$  - the ratio of non-interest expense to fixed asset); capital cost ( $W_3$  - the ratio of interest cost to total bank deposits) (Berger et al, 2009). Specifically, the specification of total cost is as follows:

$$\ln TC = \beta_0 + \beta_1 \ln Q_{i,t} + \beta_2 \frac{1}{2} \ln Q_{i,t}^2 + \sum_{k=1}^3 (\gamma_{kt} \ln W_{k,it}) + \sum_{k=1}^3 (\phi_k \ln Q_{i,t} \ln W_{k,it}) + \sum_{j=1}^3 \sum_{k=1}^3 (\ln W_{k,it} \ln W_{j,i,t})$$



Following this, the marginal cost equation is computed by taking the first derivative of the total cost function, by:

$$MC = \frac{TC_{it}}{Q_{it}} [\beta_1 + \beta_2 \ln Q_{it} + \sum_{j=1}^3 (\phi_k \ln W_{kit})]$$

Where  $(\beta)$  and  $(\phi)$  coefficients are determined from the regression outcomes of the total cost specification constructed. In order to conserve space, the estimation of Lerner index is unreported. However, we will provide when are required.

### Control variables

Control variables include bank-specific features and macroeconomic factors to control the net impact of competition on financial stability. Bank-specific variables include: SIZE-the natural logarithm of total assets; TA\_GRO-the growth rate of total assets value of the current year compared to the previous year and L\_TA-the ratio of total loans to total assets. Macroeconomic characteristics contain: LN(GDP)-the natural logarithm of gross domestic product and INF-inflation rate.

### 3.3 Data

Database is obtained from several sources. A set of secondary data on commercial banks are provided by Stoxplus<sup>16</sup> while country-level data on macroeconomics are retrieved from World Bank. Our initial sample on commercial banks includes all 34 commercial banks in Vietnam with 297 observations during the period of 2006 – 2016. We only retain banks with no missing data. Besides, those without special features, such as merge, acquisition is also included. Moreover, our study focuses mainly on Vietnamese commercial banks and hence we exclude cooperative banks, development banks and foreign banks. For a bank to be included in our analysis using panel data models, we also require the banks to have data for all variables for at least consecutive 5 years. These screening procedures result in a final unbalanced sample of 27 banks, with 210 bank-year observations. Furthermore, all continuous variables are winsorized at the 5th and 95th percentiles to alleviate the impact of outliers.

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<sup>16</sup> A company specializes in collecting and analyzing data on banks in Vietnam

## 4 Results and discussions

### 4.1 Descriptive statistics and correlations

Table 1 presents the summary statistics for the entire sample. On average, a bank in the entire sample has CAR, NPLs and LnScore ratio of 0.137, 0.023 and 2.977 respectively being in the range of capital adequacy ratio, bad debt ratio and standard score. Narrowly interpreted, capital adequacy ratio shows that Vietnamese commercial banks have paid attention on obeying the minimum ratio (9%) which is regulated by State Bank of Vietnam (SBV). Moreover, NPLs demonstrated that banks still remain their bad debt at the threshold of international standard (3%) proposed by Basel committee. Finally, banks' Zscore has varied their observation which brings advantage in our research. With respect to competition variables, the means of LERNER index is 35.9%, indicating that the competitive extent is extremely serious. An average bank in the sample has total asset logarithm of 18.019 million VND, an total asset growth speed of 38.7%, a loans to total asset ratio of 51.2%. In terms of macroeconomic characteristics, the means of natural logarithm of GDP and inflation rate are 9.437 million VND and 8.5%, respectively.

Table 1: Descriptive statistics results

STT	Variable	Mean	Std. Error	Min	Max
1	CAR	0.137	0.056	0.052	0.459
2	NPL	0.023	0.015	0.001	0.096
3	LnZscore	2.977	0.605	1.337	4.566
4	LERNER	0.359	0.135	-0.078	0.637
5	SIZE	18.019	1.344	13.135	20.730
6	TA_GRO	0.387	0.704	-0.392	8.355
7	L_TA	0.512	0.137	0.041	0.808
8	LN(GDP)	9.437	0.186	9.026	9.654
9	INF	0.085	0.060	0.009	0.231

Source: Author's calculation

Table 2 illustrates the correlation matrix of both dependent and independent variables. An important hypothesis is no multicollinearity among the explanatory variables. All of the correlation coefficients in table 2 are less than 0.8. Following Klein's rule of thumb, it can be concluded that the independent variables in the equation are not multi-collinear. Additionally, we also test multi-collinearity via Variance Inflation Factor (VIF). However, these indices fluctuate from 1.06 to 2.46 (less than 5), proved that it is unlikely to have multicollinearity (to conserve space, these VIF indexes are unreported).

Table 2: Correlation matrix

	CAR	NPL	LnZscore	LERNER	SIZE	TA_GRO	L_TA	LN(GDP)	INF
CAR	1								
NPL	0.02	1							
LnZscore	0.42	-0.01	1						
LERNER	-0.24	-0.08	0.04	1					
SIZE	-0.55	0.02	-0.41	0.47	1				
TA_GRO	0.34	-0.21	0.15	-0.03	-0.32	1			
L_TA	-0.13	-0.07	0.01	0.23	0.17	-0.18	1		
LN(GDP)	-0.13	0.18	0.13	0.17	0.46	-0.42	0.04	1	
INF	0.06	0.04	-0.49	-0.38	-0.21	0.04	-0.16	-0.45	1

Source: Author's calculation

## 4.2 Results and discussion

In Table 3, we present two-step SGMM regression results from each empirical specification. The reliability tests denote that the models are satisfactory in terms of serial correlation with the P-value of AR (1) less than 0.05 and the P-value of AR (2) not statistically significant; it means that serial correlation is present at first order, but absent in the second order and hence no the second order autocorrelation. Moreover, the significant value of Wald test implies that all models are correctly specified. In addition, the significant value of Hansen test ensures the validity of over-identifying restrictions indicating that instrument variables used for handling endogeneity problems are valid. Narrowly interpreted, Hansen test's results record a high P-value which is over 0.1, hence it is impossible to disprove the hypothesis that the instruments are appropriate. This demonstrates that the instruments solve the endogeneity concerns. Therefore, the beta coefficients of the regression model can be used to analyze.

Table 3: SGMM regression results

Dep. Variable	CAR		NPL		LnZscore	
	(1)	(2)	(3)	(4)	(5)	(6)
L.CAR	0.4036***	0.7499***	-	-		-
L.NPL	-	-	0.8554***	0.4734***		-
L.LnZscore	-	-	-	-	-0.0749***	0.1060***
LERNER	0.1757***	0.9371***	0.0600***	0.3969***	4.7684***	15.208***
LERNER_2		-0.8904***		-0.5263***		- 19.522***
SIZE	-0.0999***	-0.0736***	-0.0195***	-0.0219***	-0.5921***	-0.4437***
TA_GRO	0.0545***	-0.0895***	-0.0008	0.0008	-1.2824***	-0.918***
L_TA	-0.1127***	0.1026***	0.0169*	0.0132	-0.3249**	1.992***
LN(GDP)	0.3332***	0.2407***	0.0837***	0.1376***	-2.3241***	-1.687***
INF	0.0993***	0.3773***	0.144***	0.0994***	-7.6051***	-7.720***
_cons	-1.2510***	-1.1604***	-0.4766***	-0.9740***	35.4792***	24.070***

Dep. Variable	CAR		NPL		LnZscore	
	(1)	(2)	(3)	(4)	(5)	(6)
Model						
No. instrument	19	19	23	23	31	27
Pro>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Hansen test	0.735	0.713	0.310	0.328	0.625	0.207
AR1	0.015	0.070	0.018	0.024	0.089	0.011
AR2	0.432	0.757	0.952	0.674	0.868	0.197

Note: \*\*\*, \*\*, \* denote significance at 1%, 5%, 10%

source: author's calculation

Table 3 reports that the coefficients on the Lerner index are positive and highly significant at the 1% level. The results indicate that the competition is positively related to financial stability proxing by CAR and LnZscore, suggest that ceteris paribus, an increase in the severity of competition causes Vietnamese commercial banks more financially stable; the drawn conclusion is to support the "competition - stability" perspective and, is consistent with both our prediction (H2) and earlier findings in the literature (Berger et al, 2009; Moch, 2013; Fiordelisi and Mare, 2014). Nevertheless, in the case of proxy of NPL, the coefficients on NPL is positive. The drawn inference that ceteris paribus, banks compete more intensely, they suffer from higher credit risk, implying that when banks diversify their products to compete, the bad debt ratio is larger leading banks to become more unstable. In other words, the higher in outstanding loans, the more serious in bad debt ratio. The reason for this trend is that banks tend to lower evaluation standards or restrictions on credit activities. Moreover, banks with an efficient risk management system take advantage of loans in order to maximize their profits, leading to take more risk. The conclusion is consensus with the perspective of "competition - risk" and in line with both what we anticipate (H1) and Kasman and Kasman (2015). Although competition inversely affects credit sector, the inverse impact is not enough large to result in bank instability. A potential interpretation is that the speed of increasing the tie one and tie two capital more rapid than that of credit risk lead credit risk to be ambiguous, even loss-given-default is covered completely by addition capital and banks are more stable over time. An alternative interpretation is that the income from credit activities does not mainly account for the total income therefore, a negative sign from credit sector could not possibly dominate the whole bank stability.

Vietnamese commercial banks have competed mainly based on traditional interest rate-related activities such as loans, deposits. Basically, lending operations account for a large proportion of total assets. Therefore, increased competitive degree is commonly attributed to strengthening loans. Under competitive pressure, banks tend to loose the loan conditions. For this reason, riskier loans is followed by expanding lending activities in the Vietnamese context because our banking system cannot control the effects of overheated loans development and the consequences of the 2008 financial crisis. In sum, this results imply that banks

with more competition leads to more stable in case of considering in overall bank risk, but it makes banks increase their bad debts because of investing in riskier loan portfolio.

Otherwise, aforementioned empirical evidence on the positive effect imply that more competition in Vietnamese commercial banks leads to riskier loan portfolio, but overall, Vietnamese banking sector are more stable over time. It is clear that the speed of increasing the tie one and tie two capital more rapid than that of credit risk. Under State bank of Vietnam, all banks have been required to increase chartered capital with a large amount. To date, the chartered capital of Vietnamese bank is relative to South East Asia and Asia. Furthermore, the application of the Basel II standard is compulsory, hence the Car is always is higher than standard. In other words, the level of stability always is not threatened. According to the trade off theory between taking risk and return, Vietnamese banking system takes advantage of the income from high-risk loans to maximize profit which is an addition sources of capital to banks with effective risk management system.

To arrive at a more complete picture, we continue to find consistent evidence of nonlinear correlation (the U-shape curve) between competition and financial stability proposed in Berger et al (2009), Martinez-Miera and Repullo (2010), Kasman and Kasman (2015). The results in model 3 exhibit that the negative coefficient on the squared Lerner index is statistically significant at the 1% level. The new finding proves that the presence of the U-Shaped curve between competition and borrowers' affordability is practical, is in line with what we anticipate above (H3). In order to explain the non-linear relationship above in the context of Vietnam, we document that 2012 is the bottom of the U-shaped graph. The period 2010 - 2012 not only witnessed the most competitive period but also denoted that bad debt rose significantly. The reason could be explained is the banks aggressively competed not based on internal forces in the worse macroeconomic conditions, leading to more NPLs, so banks suffer more instability. Furthermore, the barriers in mobilization for foreign banks removed and they started to participate in the more equal competition environment with the domestic banks. On the other hand, Vietnamese commercial banks' inefficiency also led to an increase of competition and financial instability. In the period 2006-2010, many banks established generate the more competitive environment among banks along with the proliferation of Vietnamese economy. However, the existence of too many small-scaled banks because their starting points from rural commercial banks converted into urban commercial banks which had a rapid growth of assets and loan portfolios. As a result, the bad debt increased in the next phase and destabilized banking system. In addition, the application of the maximum lending rate makes competitiveness among banks more stressful. The reason is that Vietnamese commercial banks have developed by focusing on two main traditional products namely deposit and loans activities. Hence, banks mainly compete together in interest factor. Realizing the repercussions of extremely quick development in lending sector, a series of policies was

established to be contributive to address banks' stability. In the meanwhile, competitive extent was remaining even fiercer, generating the banks are more stable in the period of time from 2013-2016. (In order to conserve space the effects of control variables are not reported).

### Robustness test

We also examine the robustness of our results to alternative methods, the results from a battery of robustness tests after reliability test (Breusch-Pagan, Hausman test) have the interesting differences, for example, the low R-square and the insignificant relation between competition and financial stability. Therefore, proved that these regressions could not possibly be efficient to address endogeneity concerns while a potential endogeneity from the lagged dependent variables is not mentioned. This is consistent with our earlier discussion on econometric methods.

Table 4: Robustness test results

Dep. Variable	CAR		NPL		LnZscore	
	OLS robust	FEM robust	OLS robust	REM robust	OLS robust	FEM robust
<b>LERNER</b>	-0.1168	-0.2596	0.0172	0.0175	0.6956	1.0494
<b>LERNER_2</b>	0.1913	0.3761	-0.0334	-0.0365	-0.1793	-1.5724
<b>SIZE</b>	-0.0325***	-0.0614***	-0.0008	-0.0008	-0.2936***	-0.2128**
<b>TA_GRO</b>	0.0203***	0.0214***	-0.0039**	-0.0041*	0.0460	0.0444
<b>L_TA</b>	0.0357	0.0387	-0.0091	-0.0106	0.0766	0.0264
<b>LN(GDP)</b>	0.0794***	0.1710***	0.0158	0.0152	0.6789**	0.5540
<b>INF</b>	0.1129	0.1577	0.0214	0.0183	-4.8920***	-5.5181***
<b>_cons</b>	-0.0349	-0.3476	-0.1083	-0.1010	1.9932	1.8730
<b>R-square</b>	0.3851	0.3658	0.0847	0.0843	0.5428	0.5179
<b>Prob &gt; F</b>	0.0000	0.0000	0.0030	0.0000	0.0000	0.0000
<b>No. obs</b>	151	151	210	210	210	210

Note: \*\*\*, \*\*, \* denote significance at 1%, 5%, 10%

source: author's calculation

### Conclusions and implications

Competition plays a vital role in banking operations, especially Vietnamese commercial banks have faced to difficulty of internal and external environment. In this study, we conduct to have a look into financial stability driven by bank competition in order to examine literature related to “competition - risk” and “competition - stability”. The Lerner index is used for assessing bank competition while financial stability is considered by banking soundness indices. In case of studying in overall bank risk, banks with higher competition brings to capital adequacy ratio (CAR) and firm's probability to failure (Z-score) seem to be more substantial. Otherwise, bank competition is considered as the cause of increasing

bad debt, hence, this demonstrates that expanding comprehensive or lending operations to compete is one of the main sources of increasing credit risk. In other words, enhancing competitiveness in whole or lending operations will boost credit risk. In the meanwhile, this research also point out the correlation between bank competition and financial stability is non-linear with U-Shaped curve, implying that the positive and negative impact only happen the right or left of the bottom, respectively.

Based on the empirical results, some implications are proposed to enhance financial stability when Vietnamese commercial banks tend to be more competitive as follows:

First, although the expansion of products is considered as one of the main reasons of increasing loan-related risks, this does not mean that banks have to stop competitive strategy. In sharp contrast, banks need to be encouraged to compete to other both domestic and foreign banks more fiercely because competition is an indispensable trend to obtain the ultimate goal of value maximization. This requires each bank to have appropriate strategy, including: reductions in restrictions on credit activities, promoting quality and applying cutting-edge technologies in risk management. In addition, Vietnamese commercial banks need controls in lending operation-related risks in order to partially alleviate NPLs, take measures to detect and address the threaten of lending activities.

Second, the aftermath of the financial crisis of 2008 in Vietnamese banking system is that NPL increased dramatically, exhibiting that debt loans is influenced by macroeconomic conditions. Therefore, in order to ensure the safe range of bad debts, macroeconomic factors such as inflation, unemployment, and economic growth must be maintained stably. To obtain this, the state bank of Vietnam plays a role in advising the most appropriate policies for the government. More specifically, the monetary policies must be suitable for the context of Vietnam in each period to control inflation but ensure high economic growth for the ultimate purposes of increased competition and decreased NPLs.

Third, the determination of the U-curve bottom is an extremely essential intermediate step because this is a background to draw the possible implications for competition in each period. Specifically, the competitive strategy should be enhanced in short term in order to improve credit risk by diversifying non-interest products. However, this trend will not be encouraged if credit risk reaches the bottom because of the serious repercussion of competition. Therefore, bank with higher competition in the long-term period should pay attention on managing credit risk.

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