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Nonlinearity of Competition-Stability Nexus: Evidence from Bangladesh

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Abstract
Financial deregulation since the 1980s has been stimulating fierce competition among banks and influencing financial stability across the world. In pace with this, Bangladesh's banking industry is also experiencing intense competition since it is composed of many banks. The empirical evidence on competition and stability widely debate to date, perhaps for not considering the potential nonlinearity. Therefore, our study aims to explore the nonlinear impact of competition on the financial stability of Bangladeshi banks over 2010-2017. For achieving this objective, we compute the Boone indicator and Z-score using bank-level data to measure competition and stability, respectively, and examine the nonlinear dynamics of competition-stability nexus employing threshold analysis in a panel setup. Our findings confirm that the competition-stability relationship is nonlinear and implies that financial stability is more substantial (weaker) in a less (more) competitive market. Our results bear specific policy implications.

Keywords:
Boone's indicator, competition, financial stability, panel threshold analysis

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Introduction

The liberalization of the financial system and reforms of banking industries across the borders have altered the functional and competitive atmosphere for banks. Inline, Bangladesh is also experiencing an escalating new-entries in the flourishing banking industry. Banks in the fast-growing and emerging economies like Bangladesh exist at the top of the financial system with immense importance. Because of having a less developed capital market, Bangladesh mostly relies on banks to finance its economic growth and development. Higher demands for banks in developing and transitional economies may cause intense competition in the banking industry.

The empirical investigations show that intense competition may either entice banks to take excessive risks and cause financial debris (Allen & Gale, 2004; Carletti & Hartmann, 2002; Jimenez, Lopez, & Surina, 2013), or may bring efficiency through reducing costs and price of the financial service and motivate banks to maintain a buffer capital that ensures financial stability (Pruteanu-Podpiera, Weill, & Schobert, 2008; Schaeck, Cihak, & Wolfe, 2009; Schaeck & Cihák, 2014; Clark, Radić, & Sharipova, 2018). Moreover, some research findings exemplify inconclusive relationship between competition and stability (Allen & Gale, 2004; Berger, Klapper, & Turk-Ariss, 2009; Saif-Alyousfi, Saha, & Md-Rus, 2020).

These theoretical and empirical literature on financial stability and competition show ambiguous as well as debated conclusions and lead to two different views endorsing the ideas of financial fragility and financial stability. The competition-fragility view, first proposed by Keeley (1990), argues that higher bank competition increases bank's risk-taking incentives, because excessive competition erodes the franchise value of banks by reducing their monopoly rents and hence to survive in competition, banks will engage in more risky activities for example, by disbursing loans to borrowers without proper screening. Therefore, extreme competition is alleged for the failure of the US and the UK financial sectors (Llewellyn, 2007; Milne, 2009). A more recent study by Beck, Jonghe, and Schepens, (2013) claims that in an economy with a developed and strictly regulated financial framework, competition and banking fragility are positively related, and variation of regulation can change the intensity of this relationship.

Alternatively, the competition-stability view argues that in a competitive environment, banks are found to maintain a buffer capital that decreases the propensity of the financial crisis (Schaecket al., 2009). In less competitive market banks tends to charge higher rates on loan to increase profitability, which may raise the risk of bankruptcy (Boyd & De Nicoló, 2005), whereas in a competitive market lower rate charged by banks motivates borrowers to invest in less risky projects and makes the lending safe, albeit lower revenue from low rate can make the banks vulnerable, which makes the competition-risk relationship U-shaped (Martinez-Miera & Repullo, 2010)

To further examine the interaction of banking soundness and competition, Schaeck and Cihák (2014) has analyzed 3600 banks from ten European countries and more than 8900 US banks and found competition as favorable for banking soundness, whereas

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Kasman and Kasman, (2015) found the opposite relation while analyzing Turkish banking industry.

The mixed findings of Berger et al. (2009) and Saif-Alyousfi, et al. (2020) make this mysterious relationship even more interesting by supporting both the stability and fragility view. They find strong positive and negative relation of market power with loan portfolio risk and overall exposure, respectively, and suggest that their coexistence can influence stability or fragility at the same time. Moreover, a recent paper of Saha and Dutta (2020) find that competition contributes to stability; however, there is evidence of fragility in the presence of concentration in the banking industry.

The reason behind these debated and mixed results might be the non-linearity of the relationship between competition and stability, as most of the aforementioned studies assume a linear relationship between them. Though the theoretical paper of Martinez-Miera and Repullo (2010) suggested a U-shaped relationship between competition and stability, it is not properly addressed in the literature yet. Only the study of Jimenez et al. (2013) investigate whether a non-linear relationship between concentration and stability exists in the Spanish banking system; albeit, concentration is a very delicate proxy of competition (Claessens & Laeven, 2004) and could generate a spurious, misleading and suboptimal findings. Besides, lesser concentration does not necessarily mean higher competition, since Berger et al. (2009) suggest that concentration and competition could coexist and can simultaneously induce stability or fragility. Therefore it is imperative to further investigate the nonlinearity of this nexus.

To the best of our knowledge, no study to date has investigated the nonlinearity of the nexus between competition and stability considering an erudite measure of the former, especially in a transitional economy setup. Therefore, considering the debated competition-stability nexus and the empirical gap to explore the no-linearity between them, we investigate this relationship in the context of a transitional economy like Bangladesh using bank-level data of 30 listed banks over 2009-2017.

For this investigation we compute and use Z-score and Boone indicator to measure bank stability and competition, respectively and apply fixed effect panel threshold model (Hansen, 1999) to investigate whether a certain level of competition is critical to achieve stability or to identify the optimum competition from which the stability tends become weaker. To check the robustness of our estimations, we construct and use an alternative Boone indicator. Furthermore, to address the endogeneity, we apply the threshold model introduced by Seo and Shin (2016). The results of our study indicate that though competition contributes to stability; however, the impact becomes moderated at higher level of competition.

Our findings contribute to the existing literature in several ways. First, we calculate the Boone indicator and Z-score and portray the most comprehensive scenario related to the competition and stability of all the listed banks of Bangladesh. Second, our study contribute to identify the optimum level of competition to maintain and foster financial stability by analyzing the nonlinear relationship between competition and stability, which is

still an under-researched area of financial economics. Finally by addressing the endogeneity issues and generating reliable results using a relatively advanced model of threshold analysis (Seo & Shin, 2016), our study also support the policy formulation to ensure the banking stability of a country. Moreover, as our study is based on a fast-growing emerging economy, Bangladesh, which is characterized as a bank dependent financial system, therefore the research approach and robust findings of this study can be applied for other emerging countries to uphold sustainable competition in the financial market, and thus, ensure the economic stability of the nation.

Methods

To analyze the nonlinear relationship between bank competition and stability, bank-level data of competition, financial stability, and control variables- bank size, liquidity, and asset growth rate are hand collected from annual reports of the concerned banks. Our sample consists of all the banks listed in the stock exchange. At present, there are fifty-four commercial banks in Bangladesh, among which thirty banks are listed in the stock exchange.

In addition, country-level control variables- GDP growth rate and financial depth are collected from World Development Indicator (World Bank, 2019) for the periods 2009-2017, which constitute a balanced panel of 270 observations. Prior to the analysis, all data are winsorized at the 1st and 99th percentile to reduce the influence of outliers.

To measure financial stability a wide range of indicators were devised following the global financial crises of 1980s and 1990s, like, Z-score, probability of bankruptcy, standard deviation of ROA, non-performing loan ratio and so on, among which Z-score is very common and used by many researchers (Amidu & Wolfe, 2013; Fu, Lin, & Molyneux, 2014; Kasman & Kasman, 2015; Beck, et al., 2013; Morgan & Pontines, 2014; Saha & Dutta, 2020). Z-score measures the insolvency risk of a bank; a higher value indicates a lesser risk of bankruptcy and higher bank stability. We calculate Z-score as follows:

$$Z\text{-}score_{it} = \frac{ROA_{it} + \left(\frac{E}{TA}\right)_{it}}{\sigma ROA_{it}} \qquad (1)$$

where ROA is the return on assets, E/TA represents the equity to total assets ratio, and σROA denotes the standard deviation of return on assets. We use three-year rolling time windows to compute the standard deviation of ROA to allow for time variation in the denominator of the Z-score.

To determine competition H-statistic, concentration ratios, Lerner index, Boone indicator, and other measures could be used. Structural measures like HHI (Herfindahl-Hirschman Index) and bank-concentration ratio represent competition through level of concentration, which is found as a delicate proxy of competition (Claessens & Laeven, 2004), and thus, could generate misleading outcomes. Moreover, a high degree of industry concentration does not necessarily imply a less competitive market (Owen & Pereira,

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2018). On the other hand, Lerner index is also criticized for not being able to confine the degree of product substitutability (Vives, 2008). Whereas Boone indicator, introduced by Boone (2001, 2008) is found to overcome these shortcomings and is employed by some researchers like Schaeck and Cihák (2014), Saif-Alyousfi et al. (2020), Kasman & Kasman (2015), Saha & Dutta (2020). Following the relevance, this study also uses the Boone indicator to measure the competition. Boone (2008) calculates the level of competition by estimating the elasticity of firm performance, in terms of its market shares, with respect to its marginal costs, as follows:

$$ln(Market\ share)_{it}=\alpha+\beta\ ln\ (Marginal\ cost)_{it} \qquad (2)$$

where the coefficient β denotes the Boone indicator. To ensure the robustness of the estimation, we use market share of total loan (hereafter, Boone-loan) as well as market share of total deposits (hereafter, Boone-deposit) respectively to estimate Boone indicator. In principle Boone indicator argues that competition creates a negative relation between performance and marginal cost that becomes stronger at higher level of competition. Following Schaeck & Cihák (2014), we approximate the marginal costs by calculating the average variable costs as marginal costs cannot be observed directly.

To control the bank-specific heterogeneity and economic condition, we use different control variables. Similar to Jeon and Kim (2013), loan to deposit is used to control the liquidity, a higher value of which signifies lower liquidity. The log of total asset is used to control bank size, which is also used by Kasman and Kasman (2015) and Jeon and Kim (2013). To account for the business growth, asset growth rate is also used as a control variable. Furthermore, GDP growth rate (gGDP) and broad money as a percentage of GDP are used to control the fluctuations of economic activity and financial depth. Description and sources of all variables used are presented in appendix Table-A1.

To explore potential non-linearity in the effect of Competition on Bank stability we use the following fixed effect non-dynamic panel threshold model as developed by Hansen (1999).

$$FS_{it}=\beta_0+X_{it}(q_{it}<\gamma)\beta_1+X_{it}(q_{it}\geq\gamma)\beta_2+\lambda Z_{it}+\upsilon_i+\varepsilon_{it} \qquad (3)$$

where FSit is the financial stability, Xit is the regime dependent variable and Zit is a set of regime independent variables, ui is the country fixed effect and ε_{it} is iid residual with mean zero and finite variance. The observations are divided into two 'regimes' depending on whether the threshold variable qit is smaller or greater than the threshold γ. The regimes are distinguished by the different regression slopes, β_1 and β_2. The hypothesis of no threshold effect can be represented by the linear constraint H0: $\beta_1 = \beta_2$. Hansen (1999) suggests a likelihood ratio statistic (LR) under the null of no threshold effect, with p-values computed via bootstrap analog suggested by Hansen (1996) which shows that this bootstrap analog produces asymptotically correct p-value. Hansen (1999) suggests that the method can be extended in a straightforward manner to higher order thresholds models. To explore whether there is a threshold in the impact of competition on financial stability, we use competition as both the regime dependent variable and threshold variable.

Result and Discussion

Table 1 presents the descriptive statistics of the data used in this study. The mean value and standard deviation of the Z-score are 32.88 and 26.343, respectively, showing an overall stable state; however, the minimum value 1.336, represents some banks are susceptible to financial distress. The minimum values of -0.31and -0.11, the maximum values of 0.036 and 0.07 and the mean values of 0.033 and 0.34 associated with the Boone-loan and Boone-deposit, respectively show a high level of competition in banking industry. The standard deviation of loan to deposit ratio (1.732) and financial depth (3.396) indicate high variations of liquidity across banks and financial development over years. All other variables show moderate variation. To facilitate comparability among variables and simplify the interpretation of our results, we standardized all variables as it creates a unit less measure. Cross-section variation of Z-score and Boone indicators are presented in the appendix Table-A2

Table 1. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Z-score	270	32.88	26.343	1.336	153.944
Boone-loan	270	0.033	0.001	-0.031	0.036
Boone-deposit	270	0.034	0.017	-0.011	0.07
log (total asset)	270	25.672	0.698	23.19	27.31
Asset growth	270	0.295	1.15	-0.961	14.451
Loan to deposit ratio	270	1.163	1.732	0.394	21.173
gGDP	270	6.292	0.669	5.045	7.284
Financial depth	270	61.662	3.396	54.882	65.848

Table-2 represents the result of the fixed effect panel threshold analysis of equation (3). We use Boone-loan and Boone-deposit as a measure of competition in models 1 and 2, respectively. The significant level of threshold is 1.7846 for both models. As higher negative value of the Boone indicator signifies higher competition, therefore the Boone indicator higher than and equal to the threshold value (≥1.7846) implies lesser competition and the Boone indicator less than the threshold value ((<1.7846) highlights higher competition.

In both regimes (higher and lower competition) of both models, competition contributes to financial stability; however, the coefficient is higher in the second regime (lower competition), which signifies financial stability is stronger in lesser competition and vice-versa. This finding can be explained as competition increases efficiency, reduce the lending rate of banks, and thus reduce the moral hazard of the borrowers, which contributes to financial stability. Nevertheless, at the higher competition, the market power, as well as the earning decreases, and/ or banks may take more risks to maintain the market share by disbursing loans to borrowers without proper screening, which may result in slow down of financial stability. When competition is below the threshold

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(optimum) level, these results support the competition-stability hypothesis like Schaeck, Cihak, & Wolfe, 2009, Schaeck & Cihák, 2014 and Clark et al., 2018; nevertheless, intense competition, higher than the optimum level, moderates financial stability. Among different control variables, bank size has a significant negative impact on stability which implies larger bank may increase risk and/or the operation cost, and thus, hampers stability. Whereas, financial depth has a significant positive impact on stability, signifying financial depth contribute to increase the resilience of financial system.

Table 2. Panel Threshold Analysis

Variables	(1)	(2)
Threshold estimates	1.7846	1.7846
95% confidence interval	[1.6586, 1.7787]	[1.6346, 1.8133]
Regime 1: Higher Competition		
Boone-loan	-0.572***	
	(0.182)	
Boone-deposit		-0.566***
		(0.183)
Regime 2: Lower Competition		
Boone-loan	-1.369***	
	(0.277)	
Boone-deposit		-1.256***
		(0.264)
Regime independent variables		
log (total asset)	-0.436***	-0.437***
	(0.121)	(0.122)
Asset growth	-0.053	-0.052
	(0.057)	(0.057)
Loan to deposit ratio	-0.016	-0.016
	(0.059)	(0.059)
gGDP	-0.003	0.001
	(0.097)	(0.097)
Financial depth	0.994***	0.990***
	(0.166)	(0.166)
Constant	-0.103**	-0.105**
	(0.052)	(0.053)
Observations	270	270
R-squared	0.235	0.229
Number of Banks	30	30

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

The panel threshold analysis developed by Hansen (1999) has a limitation as it assumes that all variables in the model are strictly exogenous. Therefore, the estimation

using the Hansen (1999) model may not be consistent as there is a possibility of reverse causality in our model. The stability of the banking industry may attract more new banks or exiting banks to open new branches to increase the market share. Besides, there can be unobserved heterogeneity among banks in our sample.

Therefore to address the endogeneity issues, we apply an extended model with a potentially endogenous threshold variable developed by Seo and Shin (2016). We assume the threshold variable Boone indicator as the endogenous variable and market share of deposit as the instrument variable. We choose the market share of deposit as an instrument variable because it is strongly correlated with Boone Indicator, without having a direct influence on bank stability. Moreover, Schaeck and Cihák (2014) use the same variable as an instrument for the Boone indicator. As GDP growth rate and financial depth are country-level variables, therefore they are assumed to be exogenous in our model.

Table 3. Panel Threshold Analysis Considering Endogeneity

Variables	Regime 1: Higher Competition	Regime 2: Lower Competition
Boone-loan	-0.979***	-2.391**
	(0.128)	(1.023)
log (total asset)	-0.500***	-0.833
	(0.053)	(1.318)
Asset growth	0.111***	-5.630**
	(0.026)	(2.373)
Loan to deposit ratio	0.060	-13.529***
	(0.060)	(3.952)
gGDP	0.005	0.762***
	(0.033)	(0.149)
Financial depth	1.221***	0.601
	(0.127)	(0.553)
r	0.862***	
	(0.009)	
Constant	-0.479	
	(1.448)	
Observations	270	
Number of Banks	30	

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

The results are presented in Table-3. Similar to the results of the Hansen (1999) panel regression (Table-2), the coefficient of the Boone indicator is negative and significant in both regimes; however, the coefficient is higher in lower competition regime, which signifies financial stability is moderated at the higher competition and vice-versa. Consistent with our result of Table-2, the coefficient of log (total asset) is negative and financial depth is

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positive; however, only significant in higher competition regime. These results imply bank size increases risk at the higher competition and financial depth strengthens the stability at the higher level of competition. GDP growth has a significant positive effect, whereas loan to deposit ratios have a significant negative effect in lower competition, signifying higher economic growth and liquidity contribute to stability at the lower competition. Asset growth is significantly positive and significantly negative at the higher and lower level of competition, respectively.

Conclusion

Since the deregulation of the financial sector, competition in the banking industry around the world has been escalating continuously, and the financial ecosystem is evolving along with new challenges. Against this backdrop, impact of competition on financial stability has become a prime concern among policy-circles and researchers, and an extensive number of studies have been conducted in this area; nevertheless, a consensus is yet to achieve. Besides, the research initiative to explore the nonlinear impact of competition on financial stability is still very scant. Therefore to contribute to this field of study and to fill the empirical gap of exploring the nonlinearity of competition-stability nexus, we studied the banking industry of Bangladesh based on a sample of 30 listed commercial banks for the period 2009-2017. To attain our research objectives, we use bank-level data and calculate the Z-score, Boone indicator (for both deposit and loan market) to measure the stability and competition, respectively, of the selected banks. We employ the Hansen (1999) panel threshold model to identify the optimum level of competition and analyze the heterogeneous impact of competition at different regimes identified by the threshold.

The findings of our threshold analysis show that the competition-stability nexus is nonlinear. Moreover, though in both regimes, below or above the threshold, competition contributes to the financial stability; however, the coefficient is higher in the lower regime of competition. Therefore our results signify that financial stability is stronger (weaker) in a less (more) competitive market.

Our empirical findings contribute to the debate regarding the relationship between competition and stability and have some significant policy implications. According to our results a healthy competition is essential for the stability in emerging economies. Optimum level of competition helps foster financial stability, though beyond the certain threshold it moderates the stability. This fresh insight concerning the moderating role of intense competition from an emerging market perspective will assist policymakers to formulate appropriate policies for endorsing financial stability. Though it is argued that competition in the financial market supports the financial inclusion, financial efficiency and financial development; however, fierce competition may erode the development gain through curbing the stability of financial sectors. Therefore regulators should consider the threshold level of competitiveness to regulate new entrants into the financial sector and encourage healthy competition among financial institutions as competition incentivizes the financial system to improve cost-effectiveness and reallocates revenues from inefficient units to successful and efficient ones.

References

Allen, F., & Gale, D. (2004). Competition and Financial Stability. *Journal of Money, Credit and Banking*, *36*(3), 453-480. https://doi.org/10.1353/mcb.2004.0038.

Amidu, M., & Wolfe, S. (2013). Does Bank Competition and Diversification Lead to Greater Stability? Evidence from Emerging Markets. *Review of Development Finance, 3*(3), 152–166. https://doi.org/10.1016/j.rdf.2013.08.002

Beck, T., Jonghe, O. D., & Schepens, G. (2013). Bank Competition and Stability: Cross-Country Heterogeneity. *Journal of Financial Intermediation, 22*(2), 218-244. https://doi.org/10.1016/j.jfi.2012.07.001

Berger, A. N., Klapper, L. F., & Turk-Ariss, R. (2009). Bank Competition and Financial Stability. *Journal of Financial Services Research*, *35*(2), 99–118. https:// doi.org/10.1007/s10693-008-0050-7

Boone, J. (2001). Intensity of Competition and the Incentive to Innovate. *International Journal of Industrial Organization, 19*(5), 705–726. https://doi.org/10.1016/S0167-7187(00)00090-4

Boone, J. (2008). A New Way to Measure Competition. *The Economic Journal, 118*(531), 1245–1261. https://doi.org/10.1111/j.1468-0297.2008.02168.x

Boyd, J. H., & De Nicolo, G. (2005). The Theory of Bank Risk Taking and Competition Revisited. *Journal of Finance, 60*(3), 1329–1343. https://doi.org/10.1111/j.1540-6261.2005.00763.x

Carletti, E., & Hartmann, P. (2002). Competition and Stability: What's Special About Banking? *European Central Bank (ECB) Working Paper 146*.

Claessens, S., & Laeven, L. (2004). What Drives Bank Competition? Some International Evidence. *Journal of Money, Credit and Banking. 36*(3), 563-583.

Clark, E., Radi, N., & Sharipova, A. (2018). Bank Competition and Stability in The CIS Markets. *Journal of International Financial Markets, Institutions and Money*, *54*, 190-203. https://doi.org/10.1016/j.intfin.2017.12.005.

Fu, X. M., Lin, Y. R., & Molyneux, P. (2014). Bank Competition and Financial Stability in Asia Pacific. *Journal of Banking and Finance, 38*(1), 64-77. https://doi.org/10.1016/j.jbankfin.2013.09.012

Hansen, B. E. (1996). Inference when a Nuisance Parameter is not Identified Under the Null Hypothesis. *Econometrica, 64*, 413–430.

Hansen, B. E. (1999). Threshold Effects in Non-Dynamic Panels: Estimation, Testing, and Inference. *Journal of Econometrics, 93*(2): 345–368. https://doi.org/10.1016/S0304-4076(99)00025-1.

Jeon, J. Q., & Lim, K. K. (2013). Bank Competition and Financial Stability: A Comparison of Commercial Banks and Mutual Savings Banks in Korea. *Pacific-Basin Finance Journal, 25*, 253–272. https://doi.org/10.1016/j.pacfin.2013.10.003

Jimenez, G., Lopez, J. A., & Surina, J. (2013). How Does Competition Affect Bank Risk-Taking? *Journal of Financial Stability, 9*(2), 185–195. https://doi.org/10.1016/j.jfs.2013.02.004

http://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttp://doi.org/10.15408/etk.v20i1.15984

Kasman, S., & Kasman, A. (2015). Bank Competition, Concentration and Financial Stability in the Turkish Banking Industry. *Economic Systems, 39*(3), 502-517. https://doi.org/10.1016/j.ecosys.2014.12.003

Keeley, M. C. (1990). Deposit Insurance, Risk, and Market Power in Banking. *American Economic Review, 80*(5), 1183–1200.

Llewellyn, D. T. (2007). The Northern Rock Crisis: a Multi-Dimensional Problem Waiting to Happen. *Journal of Financial Regulation and Compliance, 16*(1), 35–58. https://doi.org/10.1108/13581980810853208

Martinez-Miera, D., & Repullo, R. (2010). Does Competition Reduce The Risk of Bank Failure? *The Review of Financial Studies, 23*(10), 3638–3664.

Milne, A. (2009). *The Fall of the House of Credit*. Cambridge: Cambridge University Press.

Morgan, P. J., & Pontines, V. (2014). Financial Stability and Financial Inclusion. *Asian Development Bank Institute Working Paper Series No. 488*.

Owen, A. L., & Pereira, J. M. (2018). Bank Concentration, Competition, and Financial Inclusion. *Review of Development Finance*, *8*(1), 1–17. https://doi.org/10.1016/j.rdf.2018.05.001

Pruteanu-Podpiera, A., Weill, L. & Schobert, F. (2008). Banking Competition and Efficiency: A Micro-Data Analysis on the Czech Banking Industry. In: Brada, J. C., & Wachtel, P (eds). *Global Banking Crises and Emerging Markets.* London: Palgrave Macmillan.

Saha, M., & Dutta, K. D. (2020). Nexus of Financial Inclusion, Competition, Concentration and Financial Stability: Cross-country Empirical Evidence. *Competitiveness Review*. https://doi.org/10.1108/CR-12-2019-0136

Saif-Alyousfi, A.Y.H., Saha, A., & Md-Rus, R. (2020). The Impact of Bank Competition and Concentration on Bank Risk-Taking Behavior and Stability: Evidence from GCC Countries. *The North American Journal of Economics and Finance*, *51*, 100867. https://doi.org/10.1016/j.najef.2018.10.015

Schaeck, K., Cihak, M., & Wolfe, S. (2009). Are Competitive Banking System More Stable? *Journal of Money, Credit and Banking*. *41*(4), 711–734. https://doi.org/10.1111/j.1538-4616.2009.00228.x

Schaeck, K., & Cihák, M. (2014). Competition, Efficiency, and Stability in Banking. *Financial Management, 43*(1), 215–241. https://doi.org/10.1111/fima.12010.

Seo, M., & Shin, Y. (2016). Dynamic Panels with Threshold Effect and Endogeneity. *Journal of Econometrics, 195*, 169-186.

Vives, X. (2008). Innovation and Competitive Pressure. *Journal of Industrial Economics, 56*(3), 419-469. https://doi.org/10.1111/j.1467-6451.2008.00356.x

World Bank. (2019). *The World Development Indicators (WDI)*. Washington DC: World Bank. Retrieved from https://databank.worldbank.org/source/world-development-indicators

Appendix:

Table A1: Sources and measurements of variables

Variables	Description/ Measurement	Source
Dependent Variable		
Financial Stability	$\log(\text{Z-score}) = \log\left(\frac{\left(\text{ROA}+\frac{\text{Equity}}{\text{Assets}}\right)}{\sigma\text{ROA}}\right)$	Author's calculation
Independent Variables		
Competition	Boone indicator: $\ln(\text{Market share})_{it} = \alpha + \beta \ln(\text{Marginal cost})_{it}$	Author's calculation
Control Variables		
Bank size	log(Total asset)	Financial statement
Liquidity	Loan to deposit ratio	Author's calculation
Bank growth	Asset growth rate	Author's calculation
Economic growth (gGDP)	Growth of GDP	WDI, WB
Financial depth	Broad money to GDP	WDI, WB

Table A2: Cross-section variation of Z-score and Boone indicator

Bank Name	Z-score	Boone-loan	Boone-deposit
AB Bank Limited	43.56987	0.468585	0.468585
Al-Arafah Islami Bank Ltd.	28.19283	-0.4547	-0.4547
Bank Asia Limited	44.2354	0.141181	0.141181
Brac Bank Limited	34.05192	1.23933	1.23933
City Bank Limited	16.46487	0.510534	0.510534
Dhaka Bank Limited	21.43155	-0.20853	-0.20853
Dutch-Bangla Bank Limited	26.65651	0.894948	0.894947
EXIM Bank Limited	24.73169	-0.14653	-0.14653
Eastern Bank Limited	36.79347	0.121552	0.121552
First Security Islami Bank Ltd.	40.25451	-0.72097	-0.72097
ICB Islami Bank Limited	22.15171	-2.27247	-2.27247
IFIC Bank Limited	15.55053	0.192848	0.192848
Islami Bank Bangladesh Ltd.	59.32566	1.628667	1.628668
Jamuna Bank Limited	16.98542	-0.31268	-0.31268
Mercantile Bank Limited	24.47242	0.027591	0.027592
Mutual Trust Bank Limited	38.45659	-0.41865	-0.41865
National Bank Limited	18.93471	0.828017	0.828016
National Credit &	45.20552	-0.43368	-0.43368
Commerce Bank Ltd.	45.20552	-0.43368	-0.43368
One Bank Limited	19.14979	-0.40755	-0.40756
Premier Bank Limited	40.39299	-0.18908	-0.18908
Prime Bank Limited	41.21711	0.673823	0.673824
Pubali Bank Limited	23.75729	0.767971	0.767971
Rupali Bank Limited	33.74252	0.197702	0.197702
Shahjalal Islami Bank Limited	21.27317	-0.69738	-0.69739
Social Islami Bank Limited	80.687	-0.65233	-0.65233
Southeast Bank Limited	28.02343	-0.20343	-0.20343
Standard Bank Limited	33.3699	-1.0092	-1.0092
Trust Bank Limited	21.46717	-0.55536	-0.55536
United Commercial Bank Limited	26.40746	0.583471	0.583472
Uttara Bank Limited	59.44604	0.406344	0.406343

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