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The Impact of Industry Concentration on Stability:
The Case of Indonesian Islamic-Commercial Banks

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Abstract

This study aims at investigating the impact of the banking industry's concentration on the stability of Islamic commercial banks in Indonesia. This study used a single country setting of 14 Islamic-commercial banks in Indonesia from 2011 to 2020. The data utilized in this study comprised all Islamic-commercial banks' assets in Indonesia, excluding commercial banks with Islamic business units. The influence of concentration level on the stability of Islamic-commercial banks was investigated using a panel data model. According to Hausman's test, the fixed-effect model is more suitable than the random-effect model. The findings indicate that the "concentration-stability" hypothesis was supported-robust using two concentration level measurements: CR4 and HHI. It is implied that banks tended to be more stable at the higher competition level. From the bank's specific characteristics, only the cost-to-income ratio significantly influenced the bank's stability, as expected. Other bank-specific characteristics, such as bank size, credit risk, and income diversity, had no substantial influence on observed bank stability. A robustness check was performed by estimating new models that included multiple control variables that did not change the effect of concentration level on the bank's stability. This study adds to the literature by demonstrating the "concentration-stability" hypothesis in the Indonesian Islamic-commercial banking industry. Moreover, this study's results confirm the previous study's findings using different methods and measures of industry concentration. In addition, this study is relevant in the context of the merger action of three large Islamic commercial banks.

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I. Introduction

Governments, financial institution agents, depositors, and debtors have begun to recognize the importance of Islamic banks' position in the financial system as their market share has increased internationally. Previous research has found that Islamic banks have a more stable financial condition than conventional banks. Islamic banks have witnessed an 8% increase in the loan-to-deposit ratio, a 2.2% decrease in non-performing loans, and a 2.9% increase in the capital adequacy ratio. In times of crisis, Islamic banks tend to be more stable (Cihák et al., 2012).

The absence of interest is the most prevalent feature that separates Islamic banks from regular ones. Islamic banks that adhere to Islamic standards forgo any transactions involving interest by substituting profit or loss sharing and goods-services exchange (Siddiqi, 2000). Sharia-compliant finance does not permit charging interest payments (*riba*), as only goods and services may be priced. On the other hand, Sharia-compliant finance is based on profit-loss and risk-sharing on both the liability and asset sides. In reality, however, Islamic scholars have created products that mimic traditional banking products, substituting fees and dependent payment mechanisms for interest rate payments and discounting. Furthermore, leasing-like products are popular among Islamic banks because they are closely tied to real estate transactions (Thorsten et al., 2013).

Since the passage of Law No. 7 of 1992 on Banks, Indonesia has had a dual banking system that includes both conventional and Islamic banking services. More precisely, Law No. 21 of 2008 on Islamic banks has allowed public and private banks to expand their business to Indonesians who mostly practice Islam as their religion. Since 1991, Indonesia has seen a considerable surge in the creation of Islamic commercial banks. Furthermore, the assets have significantly increased in the past decade. In 2020, the asset was about 408.75 trillion Rupiah, a 200.05% growth from 2011 with an average annual growth of 13.33%. The growth is higher than the total banking industry growth of 9.68% YoY in the same period. However, the number of Islamic-commercial banks has shown slow growth. It grew from 6 banks in 2009 to 11 banks in 2010, and that number remained constant until 2013. In 2020, the number of Islamic-commercial banks was 14, with a one-bank addition every two years.

With the assets growing rapidly and the number of banks not changing significantly, the Islamic-commercial banks in Indonesia are under low competition from the competition view. It can be seen from the concentration ratio (CR4) of Islamic-commercial banks that amounted to 0.58 on average from 2011 to 2020. The competition level of Islamic banks in Indonesia is lower than its conventional counterpart. The CR4 of Indonesian conventional banks

in the same period was about 0.47. That condition implies that the banks can maximize their profit by optimizing banks market power, which helps banks' profit increases their stability. On the other hand, that condition potentially reduces consumer welfare through the higher margin rate.

The banking industry has two schools of thought on the relationship between concentration and stability: the "concentration-fragility" and the "concentration-stability" hypotheses. According to the "concentration-stability" or "competition-fragility" hypothesis, banks cannot collect monopoly rents in a competitive market, resulting in lower profitability and less stability (Keeley, 1990). On the contrary, according to the "concentration-fragility" or "competition-stability" concept, more competition in the banking market forces banks to offer borrowers cheaper lending rates. As a result, banks' default risk is lowered because borrowers have a better likelihood of loan payback (Boyd et al., 2006).

Many pieces of evidence support both views in the case of conventional banks. Studies conducted by Risfandy et al., (2020), Thu et al., (2019), Kabir and Worthington (2017), Kasman and Kasman (2015), Chang et al. (2008), and Beck et al., (2006) discovered that when the level of competition raised, bank stability suffered. The "concentration-stability" idea is therefore validated. The other findings, on the other hand, supported the "concentration-fragility" concept. The research steered by Ijtsma et al., (2017), Shijaku (2017), Mirzaei et al., (2013), and Amidu and Wolfe (2013) revealed that the higher concentration had an inverse impact on the banks' stability. Interestingly, Calice et al., (2021) demonstrated a unique result. It was non-linear relation between concentration and stability. Furthermore, it also depended on the level of concentration. They found that when the concentration was approximately 50% or less, concentration positively impacted the banks' stability. Meanwhile, a 65% or more concentration would negatively impact the bank's stability.

In the case of the dual banking system, the study of Risfandy et al., (2020) uncovered that concentration level did not affect the Islamic banks' stability. However, by studying the banking industry in eighteen MENA countries, Albaity et al., (2019) found the positive impact of concentration on the Islamic banks' stability. Therefore, applying the "concentration-stability" hypothesis specifically to the Islamic banks using a single-country setting, i.e., Indonesia, would be interesting. Moreover, applying that hypothesis in the case of Indonesian Islamic banks is relevant to the current situation. It is because, by early 2021, the Indonesian Islamic banking market structure had been dramatically altered as a result of merger activity by the three major Islamic commercial banks, namely Bank Syariah Mandiri, Bank Negara Indonesia Syariah (BNI Syariah), and Bank Rakyat Indonesia Syariah (BRI Syariah) that

recently becomes Bank Syariah Indonesia (BSI). The Indonesian Financial Service Authority (OJK) has authorized the merger by the directive of OJK Board Commissioner Number 4/KDK.03/2021. Therefore, by early of 2021, the concentration ratio of Indonesian Islamic banks had significantly risen to about 0.56. Conversely, without merger, that concentration was only about 0.49.

When contemplating an increase in the concentration level of the Indonesian Islamic banking industry, it is necessary to verify one of two hypotheses: whether the increase in concentration will have a positive or negative influence on bank stability. As a result of analyzing it, the findings may be useful in filling a research gap on two opposing hypotheses in the context of the Islamic banking industry. Moreover, to the authors' knowledge, the study related to the nexus between competition and stability in the context of the Islamic banking industry in Indonesia is relatively rare, if any. Therefore, it would also be relevant in the context of regulatory policy following the merger of three of the largest Islamic banks.

This paper is divided into five sections; the next section is the literature review on conceptual theory and previous studies regarding competition and stability, the banking industry in general, and Islamic banking specifically. The third section discusses the research method used in this study. While section four is the result and discussion, the last section is this study's conclusion and policy implications.

II. Literature Review

2.1. Background Theory

The debate over the concentration-stability hypothesis began when Keeley (1990) released an essay demonstrating how higher bank competition leads to increased bank failures in the United States. According to him, when multiple banks compete, profit margins shrink, causing institutions to take unnecessary risks to maximize returns. It will therefore result in a reduction in the quality of loan portfolios, increasing bank instability. As a result, the more concentrated banking sector comprises larger institutions that can leverage economies of size and breadth while diversifying their assets. In a more competitive economy, banks are less motivated to screen their clients, increasing the risk of fragility. It is because banks gain less informational rent from their relationships with debtors (Allen & Gale, 2004).

Competition in the banking system can also impact stability through a phenomenon called "financial contagion." Banks are price takers under perfect competition, and none of them is motivated to lend liquidity to struggling banks, hurting the whole industry when the problematic bank

collapses. Moreover, when the banking system is more concentrated with a small number of large banks, the financial authority will monitor it more easily. Thus, the banking system is more resilient to shocks (Allen & Gale, 2000). A financial crisis is also claimed to happen more likely in a less concentrated banking system (Allen & Gale, 2004; Boyd et al., 2004). The less concentrated banking system is more vulnerable to crises because it lacks significant financial products that may benefit from large profits, functioning as a buffer against asset quality degradation.

Contrary to the arguments in support of the concentration-stability view above, some argued that it is also possible that increased bank competition will lead to a decrease in financial instability, known as the "concentration-fragility" view. Banks with market power could profit more by charging a higher interest rate. This higher interest rate may lead to riskier loan portfolios because of adverse selection and moral hazards. Safer borrowers may be discouraged because of higher funding costs, but other borrowers may be involved in riskier activities to cover the high funding cost, increasing the probability of default. Increased non-performing loans undermine financial stability (Boyd & Nicolo, 2005; Stiglitz & Weiss, 1981).

Beck et al., (2006) suggested that larger banks in a concentrated financial system might be difficult to oversee because of organizational complexity. Transparency may also decrease as the banks become more complex as they expand across multiple business lines and geographical locations. Because of these, regulatory actions may be less effective in avoiding excessive risk exposure. Proponents of this view also argued that larger banks in a more concentrated banking system tend to receive high public guarantees, which can cause moral hazard problems (Amidu & Wolfe, 2013). Mishkin (1999) posited the "too-big-to-fail" concept, which argues that as banks become too big, the moral hazard problem may worsen when managers make hazardous investments on the idea that the government's safety net will cover them.

2.2. Previous Studies

The empirical research on the relationship between bank concentration and stability offers numerous reasons to support the competition-stability nexus, the competition-fragility nexus, or possibly both nexuses. The following presents previous empirical literature related to banks' concentration and stability. Firstly, the studies, which support the "concentration-stability" nexus, are presented. Beck et al., (2006) investigated the effect of bank concentration and regulation on the possibility of a systemic banking crisis. They used CR3 to measure bank concertation. Using data from 69 countries from 1980 to 1997, they discovered that a more concentrated financial sector

was less likely to have a systemic banking crisis. Chang et al., (2008) inspected the impact of concentration level on the stability of banks in the Brazilian banking system. They used HHI and the bank's non-performing loan (NPL) to proxy banks' concentration level and stability, respectively. Their study revealed the inverse relation between concentration level and NPL (fragility of banks); therefore, the "concentration-stability" hypothesis was supported.

Kasman and Kasman (2015) examined the concentration level of the financial stability of banks in Turkey. They used the Boone indicator and adjusted learner index as a proxy of concentration level and both NPL and Z-Score as a proxy of stability. According to their findings, increasing concentration would increase NPL but lower the Z-score. Kabir and Worthington (2017) scrutinized the impact of concentration level proxied by the learner index on the stability of banks, which was measured by z-score, non-performing loan (NPL), and distance to default in the banking industry of 16 countries, covering both conventional and Islamic banks. Their study found that increasing market power would make the banks more stable. There was also a negative impact of the learner index on the bank's NPL.

Moreover, a positive relation between the learner index and default distance was founded. Therefore, those results suggest that the "concentration-stability" hypothesis was supported for both Islamic and conventional banks. Thu et al., (2019) investigated the influence of competition level, market concentration, and efficiency of banks on the bank's stability in China, Hongkong, Malaysia, and Vietnam. The competition level and market concentration were measured by the learner index and CR3, respectively. Their study revealed that increased competition levels would negatively affect the banks' stability. Similarly, an increase in market concentration would lead to the stable condition of banks. Hence, the "concentration-stability" hypothesis was supported by their study.

For the Islamic banks' case, Albaity et al., (2019) disclosed that Islamic banks in MENA nations have been more stable than conventional ones in a less competitive industry. However, greater competition exacerbates Islamic banks' risk-taking behavior and renders them more vulnerable ascribed. In principle, Islamic banks eliminate interest, speculation, gambling, and complex derivatives in favor of profit-and-loss sharing and risk-sharing. As a result, Islamic banks cannot earn interest and must rely on non-interest income, such as fees and commissions. Furthermore, the financial structure of assets in an Islamic bank's portfolio differs from that of conventional banks in that Islamic banks must fund their asset portfolios with equity and deposits, whereas regular banks can use both stock and debt. As a result, Islamic banks' risk profile is lower than regular banks to achieve profitability. Islamic banks are

more stable since they have a reduced risk profile (Albaity et al., 2019; Doumpos et al., 2017; Hassan & Aliyu, 2018; Thorsten et al.,2013).

Then, the studies advocating the "concentration-fragility" hypothesis were explored. Using CR5 and HHI as a concentration measure, IJtsma et al., (2017) assessed the influence of market structure on the stability of the EU banking system in 1998-2014 by considering both bank-level and country-level stability. The results showed that concentration negatively affected stability both at the bank and country level. They argued that the similarity of results at both levels is a sign of robustness not found in previous related literature. Shijaku (2017) studied the influence of bank concentration on the possibility of a country experiencing systemic bank fragility. He discovered findings that support the concentration-fragility theory by using on-site bank balance sheet information to establish a proxy of bank stability and HHI and CR to quantify market concentrations.

Over the period 1999-2008, Mirzaei et al., (2013) evaluated the impact of market structure on profitability and stability for 1929 banks in 40 developing and mature markets. Using the CR5 as a proxy for market structure, their research discovered that the CR5 negatively and substantially influenced bank stability in industrialized nations. By using Learner Index and HHI as a proxy of competition level, Amidu and Wolfe (2013) studied the impact of competition on the stability of banks in emerging economies. Their study revealed that higher concentration levels hardly affected the stability of banks, and therefore, "the concentration-fragility" hypothesis is preferred to explain the impact of competition level on the stability of banks in emerging markets.

In association with the bank's specific variables, numerous studies have estimated the effects of the bank's specific variables, such as Cost to Income ratio (CIR), Financing to Asset ratio (FTA), Income Diversification (ID), and Asset growth on bank stability. Shijaku (2017) found that bank operation efficiency proxied by CIR had a negative relationship with the stability condition. It is strongly supported by Aun et al., (2019) investigating the effects of competition from Islamic banks on financial stability and profitability in Indonesia. Their study indicates that the CIR, a proxy for bank operation efficiency, had a negative and statistically significant relation with banking stability. The results also depict that credit risk proxied by the FTA ratio had typically impacted bank stability. As observed in the previous study in Ghana, Adusei (2015) showed an inverse relation between credit risk and bank stability from the rural banking industry data, although the relationship was statistically insignificant.

Regarding income diversification, Cihak and Fund (2014) found that more revenue diversification tends to raise stability in major Islamic banks, implying that shifting from lending-based operations to alternative income sources may enhance bank stability. It suggests that income variety has a favorable influence on financial stability. The contribution of income diversification is also explained by the study of Nisar et al., (2018), who demonstrate the effect of income diversification on the profitability and stability of South Asian commercial banks from 2000 to 2014. According to the study's findings, bank income diversification favorably influenced profitability and stability. Another bank-specific indicator, asset growth, may be quantified by the bank's size. Pham et al., (2021) studied the determinant of bank stability in emerging markets and discovered that a larger bank size would positively boost its stability since a larger bank is typically more efficient due to economies of scale. The finding was also associated with the empirical result of Khasawneh (2016), which showed a significant and positive relationship between bank size and bank stability.

Despite industry and bank-specific variables, several control variables are expected to explain Islamic commercial banks' stability: economic growth, exchange rate growth, M2 to GDP ratio, and a dummy of the COVID-19 pandemic. Economic growth is predicted to have either a positive or negative impact on stability. Pham et al., (2021) found a positive relationship between economic growth and the stability of banks in Vietnam. Moreover, in the case of Islamic banks, Khasawneh (2016) discovered the positive impact of economic growth on the stability of Islamic banks in MENA countries. He argued that an increase in economic growth reflects an expansion in all economic activities, which increases the ability of debtors to meet their obligations. On the other hand, Soedarmono et al., (2011), Amidu and Wolfe (2013), Kasman and Kasman (2015), and Thu et al., (2019) suggested a negative impact of economic growth on the stability of banks. It was due to excessive risk-taking behavior during economic booms.

Using exchange rate growth as a determinant of banking stability is relatively rare. However, one study found the negative impact of exchange rate depreciation on the stability of banks. It was because when the exchange rate is depreciated, the asset quality will deteriorate (Malika, 2020). In addition, a greater M2 to GDP ratio suggests excess liquidity in the financial market and, as a result, may presage a lending boom. When it is not accompanied by prudent credit monitoring, it may create instability in the banking industry (Jahn & Kick, 2012). Both exchange rate growth and the M2 to GDP ratio are rarely used as explanatory variables in the analysis of banking stability, especially in Islamic banks. Therefore, it will potentially be a novelty of this study. Lastly, following Elnahass et al., (2021), the COVID-19 pandemic is

involved as an explanatory variable, and it is expected to have a worse impact on the bank's stability.

III. Methodology

This study's main objective was to assess the influence of industry concentration on Indonesian commercial-Islamic banks' stability. The estimation also included banks' specific characteristics, such as cost-to-income ratio (CIR), loan-to-asset ratio (LTA), income diversification (ID), and asset growth. Moreover, the models were extended by including macro-factors as control variables. Those control variables were also utilized to conduct a robustness check. This study is inspired by scholars who estimated those issues, such as Cihak and Hesse (2008), Mirzaei et al., (2013), Fu et al., (2014), IJtsma et al., (2017), and Shijaku (2017).

3.1. Data

The data used in this research were the annual financial performances of 14 Islamic-commercial banks in Indonesia from 2011 to 2020. In those observed periods, the number of Islamic commercial banks in Indonesia was 14; therefore, this study covered the entire population (excluding the Sharia business unit of conventional banks). The bank-level data were sourced from the banks' financial statements published by the Indonesian Financial Service Authority. The data on macroeconomic variables were collected from the Statistics of Economy and Finance, published by the Bank of Indonesia.

The Z-score was used to assess bank stability, quantifying the danger of bankruptcy; a higher Z-score indicates that the bank is further away from default. Compared to other regularly used indicators such as NPL, z-score indicates bank stability more strongly because NPL is generally backward-looking and pro-cyclical (Baselga-pascual et al., 2015; Cole et al., 2019; Poghosyan & Čihak, 2011). In empirical literature about bank stability, the log of the z-score is often preferred compared to the simple z-score. It is because the distribution of the simple z-score tends to be heavily skewed, whereas the log of the z-score is not (Houston et al., 2010; Laeven & Levine, 2009). The authors followed this approach in this study.

An independent variable, the log z-score as measured individual banks' stability. Following Cihak and Hesse (2008), the log z-score was computed below.

$$lz = \log\left(\frac{k + \mu}{\sigma}\right)$$

Where k is equity capital and reserves as a percent of asset, μ is the average return as a percentage of the asset (proxied by return on asset or ROA), and σ

is the standard deviation of return on assets as a proxy for return volatility. Several explanatory variables are in the model. The operationalizations of these variables are described in Table 1.

Table 1. Variables Description

Variables	Proxy	Description	Expected Sign
CR4	Concentration Level	An industry level of concentration of Indonesian Islamic commercial banks is measured by the concentration of assets held by the four largest banks divided by the total asset of banks within the industry. The higher value of this variable indicates a higher concentration.	+/-
Herfindahl-Hirschman Index (HHI)	Concentration Level	It is another alternative to the concentration of Indonesian Islamic commercial banks. HHI is calculated as the sum-squared of the bank's assets to the total Islamic-Banking Industry Asset. The higher value of this variable denotes a higher concentration.	+/-
Cost to Income Ratio (CIR)	Efficiency	It measures bank operating efficiency, calculated by gross operating expenses divided by gross operating income. The higher ratio reflects the fact that banks are operationally inefficient.	-
Financing to asset ratio (FTA)	Credit risk	It is a measurement of credit exposure in the structure of assets, computed by total bank financing divided by banks' total assets. A higher ratio is a higher credit risk.	-
Banks Asset	Banks Size	The natural logarithm of banks' total assets in billion Rupiahs	-
Income Diversity (ID)	Diversification	It measures how far the banks diversified their source of income. A higher value of this variable represents a higher degree of diversification. The calculation of income diversity follows Cihak and Hesse (2008): $$ID = 1 - \left| \frac{(Net\ interest\ income - other\ operating\ income)}{total\ operating\ income} \right|$$	+
Growth	Business Cycle	A rate of yearly economic growth	+/-
Exchange Rate Growth (ER_G)	External Risk	A rate growth of domestic currency (IDR) towards foreign currency (USD)	-
M2 to GDP	Financial Deepening	It measures a deepening of the Indonesian financial system.	+/-
COVID-19	Dummy	1: the year 2020 0: otherwise	

3.2. Model Development

The impact of concentration and Islamic-commercial banks' stability would be estimated using a panel-data regression model referring to Cihak and Hesse (2008), with several modifications in variables following Mirzaei et al., (2013), Fu et al., (2014), IJtsma et al., (2017), and Shijaku (2017). The estimation can be written as follows.

$$lZ_{i,t} = \beta_0 + \beta_1 CR4_{i,t} + \sum_{n=4} \beta_n B_{i,t} + \varepsilon_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$
$$lZ_{i,t} = \beta_0 + \beta_1 HHI_{i,t} + \sum_{n=4} \beta_n B_{i,t} + \varepsilon_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$
$$lZ_{i,t} = \beta_0 + \beta_1 CR4_{i,t} + \sum_{n=4} \beta_n B_{i,t} + \sum_{n=3} \beta_n C_{i,t} + \varepsilon_{i,t} \dots\dots\dots\dots\dots (3)$$
$$lZ_{i,t} = \beta_0 + \beta_1 HHI_{i,t} + \sum_{n=4} \beta_n B_{i,t} + \sum_{n=3} \beta_n C_{i,t} + \varepsilon_{i,t} \dots\dots\dots\dots (4)$$

Four estimation models were used to estimate the impact of concentration level on the Indonesian Islamic commercial banks' stability. As a dependent variable, the log of z-score was used as a proxy for banks' stability. In the estimation model (1), CR4 was employed to proxy the concentration level. The banks' specific variables were captured in the vector, $B_{i,t}$, consisting of bank efficiency (CIR), credit risk (LTA), size (Asset), and income diversification (ID) of banks *i* at time *t*. Those banks' specific variables were utilized in all estimation models. In the estimation model (2), HHI was employed as a proxy of concentration level, an alternative way to see whether the different concentration levels measured impact the banks' stability. The underlying reason to separate those two measures of industry concentration is that the multicollinearity problem potentially exists if they are put together in one model. When CR4 and HHI have a positive and significant influence on stability, the "concentration-stability" hypothesis is proven. On the contrary, once those variables have a negative and significant influence, it will support the "concentration-fragility" hypothesis.

Estimations of models (3) and (4) came from estimation models (1) and (2), respectively, with several additional macro and external variables represented in vector $C_{i,t}$. The vector comprised GDP growth, exchange rate growth, financial deepening (M2/GDP), and the COVID-19 pandemic in 2020 as a dummy variable. The additional variables in models (3) and (4) were intended to give a robustness check to see if any different impacts of concentration level and banks' specific variables exist on the banks' stability. All estimation models would be assessed using panel data regression. The Hausman test would also decide whether all estimate models should use a random or fixed-effect model. Furthermore, the White and Wooldridge tests would be used to discover heteroscedasticity and serial-correlation problems to obtain the best estimator of all models.

IV. Results and Analysis

4.1. Descriptive Statistic

Table 2 presents the descriptive statistics of variables used in the econometrics model. The variables presented in this table are in their level forms.

Table 2. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Bank Z-Score	140	7.288	6.919	-2.289	31.217
LTA	140	0.659	0.136	0.000	0.970
CIR	140	0.882	0.297	0.442	2.921
Income Diversity	140	0.263	0.275	0.000	1.531
Asset (Billion IDR)	140	18.400	24.000	0.300	127.000
GDP Growth (% YoY)	140	4.525	2.455	-2.700	6.170
Exchange Rate Growth (% YoY)	140	0.760	1.189	-0.273	3.800
Inflation (% YoY)	140	4.235	2.180	1.680	8.390
M2 to GDP Ratio (%)	140	39.566	1.955	36.738	44.700
HHI	140	0.184	0.017	0.167	0.217
CR4	140	0.567	0.070	0.488	0.693

Table 2 shows the descriptive statistics of the variables across banks and periods and the macroeconomic variables during observation periods. Eight of the ten variables had a low data variability. Meanwhile, the rest displayed high variation. The bank asset and exchange rate growth were the two variables with high data variation. The high variation of assets reflected that a few banks with a larger size dominated the Indonesian Islamic commercial banking industry. The exchange rate had a high variation due to this volatile variable.

4.2. Results

Before conducting the regression analysis, the panel data model required the Hausman test to determine the best estimation methods, either a random or fixed-effect model. A classical assumption test was also conducted to ensure the model did not suffer from heteroscedastic and serial correlation problems. While the Wooldridge test addressed the serial correlation problems, the White test addressed the heteroscedasticity problem. Table 3 reveals the results of the Hausman, Wooldridge, and White tests for all models. As mentioned above, models (1) and (2) estimated the impact of concentration level measured by Concentration Ratio (CR4) and Herfindahl-Hirschman Index (HHI) as well as banks specific factors on the stability of Indonesian Islamic commercial banks. Then, models (3) and (4) were estimated as a robustness check that included macroeconomic variables as the controls. The intention of inserting control variables was to see whether the estimation model results (1) and (2) changed when the additional control variables were present.

The heteroscedasticity problem was identified in models (1), (3), and (4), with the p-value of the White test in those models being significant at alpha 1%, respectively. Furthermore, the serial correlation problem was also detected in all the estimation models because the p-value of the Wooldridge test was

significant at alpha 10%. Therefore, to get the best estimation, the robust standard error estimation was employed to solve that problem, both heteroscedasticity and serial correlation problems.

Table 3. Results of Hausman, Wooldridge, and White Test

Model	White Test		Wooldridge		Hausman	
	H0: Constant Variance		H0: No first-order autocorrelation		H0: Random Effect Apply	
	p-value	Result	*p-value*	Result	*p-value*	Result
Model 1	0.0000	Reject H0	0.0052	Reject H0	0.0228	Reject H0
Model 2	0.3162	Cannot Reject H0	0.0085	Reject H0	0.0475	Reject H0
Model 3	0.0000	Reject H0	0.0045	Reject H0	0.0275	Reject H0
Model 4	0.0000	Reject H0	0.0019	Reject H0	0.0262	Reject H0

Table 4. FEM Results of Models (1) and (2)

Variable	Model 1	Model 2
Constant	-3.7366	-1.2931
	(3.7326)	(3.3603)
Concentration	1.5932*	1.7416*
	(0.8277)	(0.8776)
Financing to Asset Ratio	-1.2858	-1.0025
	(0.8490)	(0.76)
Cost to Income Ratio	-1.0607**	-1.0331**
	(0.4155)	(0.4231)
Income Diversity	0.5957	0.5785
	(0.3567)	(0.3572)
Asset	0.4802*	0.4423
	(0.2667)	(0.2541)
R Squared-Within	0.3483	0.3287
R Squared-Between	0.1812	0.1881
R Squared-Overall	0.1873	0.1894
N	140	140

*) **) Significant at 10% and 5%
In Model 1, the concentration ratio is CR4, while in Model 2, the concentration ratio is HHI.

The Hausman test results showed that the p-value was significant at alpha 5%. The test, therefore, suggests that the Fixed Effect Model (FEM) was appropriate for all models. Table 4 below demonstrates the FEM model test results after the regression was estimated using the robust standard error estimation.

As shown in Table 4, it can be seen that R^2 was quite low. Before conducting

an analysis, the authors might first explain that condition. Gujarati and Porter (2008, p. 81) argued that classical linear regression does not require a high R^2. Furthermore, they also argued that low R^2 could arise due to the diversity of the units in the sample. From the nature of the data, as Wooldridge (2012, p. 440) pointed out, the use of panel data is also inextricably linked to the potential problem of unobserved heterogeneity. It is strongly related to unobserved factors that change over time and affect dependent variables. Individual-bank heterogeneity can lead to greater variability in the dependent variable across entities, making it challenging to explain a large proportion of the total variation and thus potentially leading to a lower R-squared.

In addition, according to Cameron (2005, p. 715), estimating the coefficient of any time-invariant regressor is impossible as it is absorbed into the individual-specific effect. The relationship between independent variables and the dependent variable for individual banks may change over time due to numerous factors, including economic cycles, financial crises, or changes in industry dynamics. When the effects of the independent variables change over time, explaining a large fraction of the variation becomes more challenging, resulting in a lower R^2 since only changes in the conditional mean caused by changes in time-varying regressors can be predicted. Furthermore, Ozili (2022) also suggested that low R^2 is not necessarily bad and that R^2 between $0.1 - 0.5$ is still acceptable in social science research whenever some variables are statistically significant. Empirically, some studies also revealed low R^2, such as Ijtsma et al., (2017), who had R^2 at about 45%. Even Khasawneh (2016) and Shijaku et al., (2017) only had R^2 between 10% - 15% in their study.

Based on those arguments, the authors believe the lower R^2 is acceptable overall. Hence, the models (1) and (2) results could still be used. Based on those results, the concentration level measured by both CR4 and HHI revealed a positive and significant impact on the stability of Islamic-commercial banks in Indonesia. In other words, increasing the concentration ratio by 1 point improves the stability by 1.6%. The other market concentration measurement, HHI, uncovered that when the HHI rises by 1 point, it increases stability by 1.74 %. The two concentration measurements were significant at a 5% confidence level. These findings support the "concentration-stability" or "competition-fragility" hypotheses. Thus, it can be inferred that the higher the concentration level, the more stable the stability of Islamic commercial banks.

Those results align with Albaity et al., (2019), who studied the impact of concentration level on the Islamic banks' stability in a multi-country setting. Their study advocated the "concentration-stability" hypothesis due to the concentration level's positive and significant impact on the Islamic bank's stability. Therefore, using the single-country setting, this study is also

consistent with the study of multi-country settings in the context of Islamic banks' concentration and stability. Moreover, the results are also supported by scholars studying the "concentration-stability" hypothesis in the context of the conventional banking system, such as Risfandy et al., (2020), Thu et al., (2019), Kabir and Worthington (2017), Chang et al., (2008), and Beck et al., (2006), who found the positive impact of concentration level on the banks' stability.

Several arguments explain the "concentration-stability" view. Albaity et al., (2019) contended that banks could not achieve abnormal returns in a more competitive market, decreasing bank profit. The decreased revenue lowers banks' ability to deal with market forces and shocks, encouraging a higher level of risk-taking behavior (Fu et al., 2014). Thu et al., (2019), who discovered that higher concentration was related to bank stability, claimed that in a highly competitive market, banks gain market share by boosting deposit rates and lowering lending rates to entice consumers to lend and take on debt. The narrow interest-rate spread can increase bank costs and decrease bank earnings, severely damaging bank stability. Aside from that, banks might be more generous in their lending standards, lowering the quality of their loans. Consequently, banks are confronted with poor or non-performing loans, which raise bank risks and weaken bank stability. Moreover, Islamic banks have a lower risk profile to achieve profitability than regular banks. As a result of their lower risk profile, Islamic banks are more stable (Albaity et al., 2019; Doumpos et al.,2017; Hassan & Aliyu, 2018; Thorsten et al., 2013).

Furthermore, the results corroborate with Calice et al., (2021). They found that when the degree of concentration level is less than 65%, an increase in concentration will positively affect the stability of banks, mediated by profitability. Nevertheless, when the concentration level is more than 65%, a rising concentration makes banks more fragile due to the higher credit risk. A further explanation is that when the four largest banks have a market share lower than 65%, the higher profitability resulting from the ability to set a high-interest rate will compensate for the credit risk. However, a higher interest will be imposed on borrowers when the concentration is at 65% or above. Then, it will increase the borrowers' risk-taking behavior. Since the bank credit risk increases, rising profitability will not compensate for the loss due to the higher credit risk increasing the likelihood of a banking crisis. Recently, the concentration level of the Islamic commercial bank industry in Indonesia was 49% before the merger of the three largest banks and 56% after that. Therefore, the "concentration-stability" view is relevant to merger and acquisition (M&A), as it happened in the Indonesian Islamic commercial banking industry recently, with a concentration below 65%. Thu et al., (2019) suggested that M&A activities may lessen competition in the banking sector,

boost bank size and market power, and assist banks in achieving economies of scale, improving profitability, and enhancing stability.

In this study, almost all banks' specific factors had the direction of influence as expected. However, only the CIR variable was significantly impacted. Meanwhile, the bank's assets significantly affected the bank's stability only in model (1), whereas in model (2), that variable still had a similar sign but was statistically insignificant. The CIR variable, reflecting the efficiency of banks' operations, negatively impacted the banks' stability. This variable had the same meaning in all the estimation results. These findings are consistent with Shijaku (2017), who found that CIR negatively affected banks' stability. For the Indonesian case, the study of Aun et al., (2019) revealed the negative and significant impact of CIR on stability. It can also be associated with the relatively high Indonesian Islamic-commercial banks' inefficiency level, 87.7% on average. A higher inefficiency score will lead to instability. Moreover, using the DEA and SEA approaches to measuring efficiency, Thu et al., (2019) uncovered efficiency's negative and significant impact on banks' stability. Therefore, maintaining efficiency is important to improve stability. If the banks operate optimally, minimizing cost or maximizing revenue, it will improve their profitability and stability.

The financing to asset ratio (FTA) negatively influenced banks' stability, though it was statistically insignificant in the two models. It can be a sign that the increasing domination of loans or financing in the asset structure will potentially create instability for the banks. The FTA ratio is a proxy of credit risk and shows the degree to which the bank is expected to change its borrower repayment attitudes. This finding is similar to Adusei (2015), who found a negative relation between FTA and bank stability in Ghana; however, the impact was statistically insignificant. It can be inferred that when the banks increase their financing activity, they will be exposed to credit risk, which finally affects the stability of banks due to the loss caused by credit risk. It was also proven by Alam et al., (2018) and Amidu and Wolfe (2013), who reported the negative impact of FTA on the bank's credit risk, proxied by non-performing loans.

In the two models, income diversity (ID) also had a positive impact but was statistically insignificant. Regarding the variable sign, this finding is similar to Cihak and Fund (2014) and Nisar et al., (2018), who found that ID positively impacted the stability of banks. However, they found that ID significantly affected the banks' stability. Nevertheless, the findings can indicate that when the banks optimize their income from non-financing activities, their stability potentially improves. In association with revenue diversification, Nisar et al.,

(2018) suggested that non-interest income can be optimized rather than fee and commission to improve banks' stability.

The asset variable, reflecting banks' size, had a positive influence and was statistically significant in the model (1). Even though the variable was not statistically significant in model (2), its sign is consistent with that in equation (1). Theoretically, this finding supports the "concentration-stability" hypothesis, implying that increasing bank size will improve stability (Thu et al., 2019). This finding is comparable to Adusei (2015), Khasawneh (2016), and Thu et al., (2019), who found the positive influence of a bank's size on the stability of a bank. The larger bank will be more stable due to several reasons. Firstly, according to Basel Accord II, a bank's capital is subject to the bank's assets covering the credit risk. The higher credit is channeled, the higher capital is required. Therefore, well-capitalized banks improve creditworthiness, lowering funding costs and the danger of insolvency and having more capacity to create business and cope with hazards. Then, banks with larger assets benefit from economies of scale, and giant banks may gain from their market strength, creating abnormal profits. Thirdly, larger banks are more likely to diversify their product and lending portfolios than smaller ones, reducing risk (Mirzaei et al., 2013).

4.3. Robustness Check

In conducting the robustness check, two variables, representing concentration level and the bank's specific variables, were re-estimated within the presence of macroeconomic variables and the time of the pandemic in 2020. Table 5 depicts the robustness check estimation and the results of the models.

Table 5 reveals that both concentration levels had a positive influence on the stability of banks. However, in the model (4) proxied by HHI, the concentration level was statistically insignificant to affect stability. Nevertheless, by having a similar sign with the models (1) and (2) results, it is clear enough to argue that the "concentration-fragility" hypothesis was again supported. These findings imply that macroeconomic factors, such as economic growth, exchange rate growth, and financial deepening, do not change the impact of the competition level on stability.

Except for economic growth, which negatively and significantly impacted stability, other macro variables did not have statistically significant impacts. A rise in economic growth potentially created instability in Islamic banks in Indonesia, and the impact was statistically significant in the model (4). That finding, along with Kasman and Kasman (2015) and Thu et al., (2019), found a negative relationship between economic growth and banks' stability. The argument behind this finding is that during periods of higher GDP growth,

banks in emerging and developing countries tend to be more unstable; banks can loosen their monitoring functions and, consequently, increase the risk of insolvency during the peak of the business cycle, as suggested by Amidu and Wolfe (2013).

Table 5. FEM Result of Models (3) and (4)

Variable	Model 3	Model 4
Constant	0.1129	3.4081
	(4.8908)	(3.5998)
Concentration	1.5293*	2.3701
	(0.7778)	(1.5585)
Financing to Asset Ratio	-1.104	-0.9416
	(1.0167)	(1.0024)
Cost to Income Ratio	-1.0419**	-1.0284**
	(0.4056)	(0.4202)
Income Diversity	0.5996	0.5875
	(0.3531)	(0.3698)
Asset	0.4757	0.4347
	(0.2784)	(0.2803)
GDP Growth	-0.1158	-0.2408**
	(0.0936)	(0.1109)
Exchange Rate Growth	0.0103	-0.0254
	(0.0675)	(0.0609)
M2 to GDP	-0.0858	-0.0582
	(0.0694)	(0.0821)
COVID-19	-0.4143	-1.4449
	(0.6474)	(1.1783)
R Squared-Within	0.3581	0.3366
R Squared-Between	0.1985	0.1925
R Squared-Overall	0.2012	0.1935
N	140	140

*) **) Significant at 10% and 5%

In Model 3, the concentration is CR4, while in Model 4, the concentration is HHI.

In models (3) and (4), the growth of the exchange rate had a different sign; however, its impact on stability was statistically insignificant in those two models. Therefore, it can be argued that no clear relation between exchange rate growth and the stability of Islamic commercial banks exists in Indonesia. Financial deepening, proxied by broad money (M2) to GDP ratio, negatively affected Islamic banks' stability. However, the influence was statistically insignificant in the two models. From the negative sign of that variable, those findings contradict Fendel and Stremmel (2016), who found that financial deepening lowers the likelihood of a banking crisis. However, when the financial deepening is measured by the ratio of domestic credit to GDP, whereas the domestic credit is also part of M2, an increase in that ratio will

raise the possibility of a banking crisis, as also suggested by Gupta and Kashiramka (2020). The probable reason behind this finding is that the financing expansion was not accompanied by enough prudential selection. Moreover, Hagen and Ho (2004) also argued that a rise in the credit-to-GDP ratio would lead to the instability of banks due to excessive demand in the money market.

Lastly, the authors see that the COVID-19 pandemic negatively impacted the stability of Islamic commercial banks in Indonesia. However, its influence was statistically insignificant in the two models. Nevertheless, from the negative sign of that dummy variable, it is enough to argue that the stability of banks was declining during that turmoil. It is also confirmed by Figure 1, showing that six out of 14 Islamic commercial banks in Indonesia experienced a decline in z-score in 2020. Empirically, this finding aligns with Elnahass et al., (2021), who found the negative influence of pandemic time on the stability of Islamic banks. They also uncovered that the pandemic eruption had a detrimental effect on lowering banks' profitability. It makes sense that during the pandemic disruption, economic activity was worsened. Banks' business follows the business cycle, and therefore, the banks' profitability will decline. Then, it will potentially affect the stability of banks. It is because profitability, proxied by return on asset (ROA), is one of the components to calculate stability.

V. Conclusion and Recommendations

5.1. Conclusion

In recent years, Islamic commercial banks in Indonesia have become more consolidated than regular banks. Regarding competitiveness in the banking industry, several studies offer two prepositions of the link between concentration and bank stability. According to the "concentration-fragility" nexus, a more concentrated market and banks with market dominance can earn more by charging higher interest rates, leading to riskier loan portfolios due to adverse selection and moral hazard. Lower profitability reduces the stability of banks. On the other hand, the "concentration-stability" nexus implies that a more concentrated banking sector is likely to comprise larger institutions that may leverage economies of size and scope and better diversify their portfolio, potentially boosting their stability.

This research aims to investigate the influence of concentration level on the stability of Indonesian Islamic commercial banks between 2011 and 2020. This study has two concentration levels: concentration ratio (CR4) and Herfindahl-Hirschman Index (HHI). Several specialized banking criteria, such as cost-to-

income ratio (CIR), loan-to-asset ratio (LTA), income diversity (ID), and asset growth, were also used. Some macroeconomic factors were incorporated in different models as a robustness check technique to see whether the result of major variables changed in the presence of other variables.

Based on the fixed-effect panel data model, this study's main results can be reiterated. First, in the more concentrated environment, the banks tend to be more stable; therefore, the "concentration-stability" hypothesis is supported. Second, the banks' specific variables influence, as expected, when the banks operate inefficiently to create instability potentially. The more the banks' channel financing activity, the more it potentially improves stability. In addition, revenue diversification will theoretically improve banks' stability and, thereby, maximize non-marginal revenue. The size of the banks also impacts the re-supported "concentration-stability" hypothesis. Third, explanatory factors within models are unaffected by the change of previous models without macro factors. Thus, the robustness check procedure successfully confirms that the concentration level consistently impacts the banks' stability.

5.2. Recommendations

The recommendation could be given in association with the merger action of the three large Islamic commercial banks recently. This study justifies that mergers will not inversely affect the stability of the Islamic banking industry in Indonesia. However, to anticipate excessive market power, ex-ante merger monitoring should be conducted by especially the Indonesian Financial Authority and the Indonesian Business Competition Supervisory Commission regulators.

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