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BANKS FRAGILITY: DOES IT MATTER TO DIVERSIFY THEIR INCOME? A CROSS-COUNTRIES EVIDENCE

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Abstract
Income diversification sounds like more invulnerable yet, it is not always the case. Income diversification in banking could be advantages or disadvantages. This is because at one hand, income diversification mitigates the risk exposure and on the other hand, it exposes the banks to more vulnerable financial health. Using unbalanced panel data of cross-countries that spans from 2009 to 2018, the study aims (i) to investigate the factors that influence banks fragility; (ii) to compare significant different of banks fragility level between Islamic and conventional banks and; (iii) to assess the interaction effects of income diversification on the relationship between size and banks fragility. The study employs random effect model with cluster standard error in order to rectify the heteroscedasticity and autocorrelation issues. The study discovers capital level, cost efficiency, credit risk and size are the driven factors for banks fragility. Higher capital level and credit risk hamper the banks fragility. Corroborating to the too-big-to-fail theory, larger banks are more exposed to vulnerable of banks fragility. Interestingly, it is proven that different level of income diversification interacts the relationship between size and banks fragility differently. It is proposed for smaller banks to less focus on diversifying their income. Instead, the smaller banks should focus on the traditional banking businesses in which, accepting deposits and providing financing. Meanwhile, the larger banks are proposed to follow portfolio theory by diversifying their income in order to mitigate the banks fragility exposure.

Research paper

Keywords: Bank, Diversification, Liquidity, Stability, Financial Risk

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Introduction

The unstable financial system causes disruption in the financial development of the country probably leads to unsound economic growth. There is a possibility of a bank to collapse in a huge economic downturn when the bank cannot withstand the current economic situation as what happened in the recent Global Financial Crisis (GFC). Indeed, a bank by itself is not independent. A bank is interdependent with other banks through the interbank financing relationship. A collapsed bank creates bank run and consequently a domino effect to the other banks. Thus, bank failure, particularly a large bank, causes difficulties to the other financial institutions. The domino effect may cause chaos in the banking industry influencing all the banking players since it is a contagious phenomenon in the banking industry (Zhang et al., 2021). In order to avoid the chaos that could spark off the market, the central bank of the country or regulator are obligated to regulate and make wise decisions by taking proactive actions to avoid potential risks that can evade bank failure. Bank which is the backbone of the country play an important role as a core financial service provider. Indeed, a stable financial health of a country is important to avoid failure in the financial system. This is to ensure sustainable economic growth thus; the bank is supposed to be a strong and resilient in the market. According to Viphindrartin et al. (2021), a stable financial system portrays well allocated of funds and proper risk management by the banks thereby, improves the economic growth of the country.

Risk is the uncertainty which is subject to loss or negative result. Banks are exposed to a broad number of risks in its operations and activities. There are numerous risks involved in the banking system such as credit risk, liquidity risk, capital risk, business and operational risk as well as market risk.

The sources of risk include risk in granting loans, liquidating funds, staff turnover rate and others that are related to the banking system. These risks are inevitable, but can be mitigated. For instance, Berger et al. (2019) note that financing is one of the leading roles for a bank to the economy. A prudent and closely monitor of the financing given is crucial to control and reduce the number of borrowers' default. This is due to the hike up the number of defaulters would raise the credit risk percentage of the banks. Soon, it possibly triggers the liquidity of the bank. In this sense, there is an unbalance of asset and liability of the bank. The bank unable to collect all the financing given because of the number of defaulters increase. At the same time, there is no limitation for the customers to withdraw their money from the bank. As a result, the bank possibly needs to grant a high number of withdrawals. Hence, greater exposure to liquidity risk that consequent to fragile banking health.

Following the previous global financial crisis 2007-2009, income diversification in banking businesses is more appealing. Despite of focusing only on traditional banking businesses, the banks also focus on non-traditional banking businesses for instance, income from fees and commissions. Income contribution from the non-traditional banking businesses increase banks profitability in the form of retained earnings. The involvement of banks in income diversification suggests conflicting views. According to the Markowitz portfolio theory, diversification of income is a good decision of risks mitigation in banking (Boyd & Graham, 1988; Boyd et al., 1993; Ramakrishnan & Thakor, 1984; Tajpour et al., 2021; Moghadam & Salamzadeh, 2018; Batrancea et al., 2019). The theory indicates, rather than solely focusing on the traditional banking businesses, involvement of the banks in the non-traditional banking businesses could be part of the risk mitigation tools. However,

there are opponent views that propose, income diversification in banking leads to banks fragility inter alia, DeYoung and Roland (2001) and Stiroh (2004). The scholars argue diversifying of income in banking induce to volatile earnings in which, contradict to the earlier Markowitz portfolio theory. The effects of income diversification on banks fragility are still debatable.

To further scrutinize the banks fragility, the study compares the fragility level between Islamic and conventional banks due to inconclusive and continuous noise in finance and banking literature. Previous study for instance, Boulanouar et al. (2021) address Islamic banks are more prone to default indeed, more fragile. Similarly, Hoque and Liu (2021) disclose Islamic banks are more fragile than conventional peers due to limitation of funds mobilization because of limited financing instruments available for Islamic banks. Contrastingly, Abuzayed et al. (2018) discover Islamic banks are more stable relative to conventional peers in GCC countries. Meanwhile, a study by Alqahtani and Mayes (2018) reveal no significant different of Islamic banks stability relative to conventional peers at the early strike of the global financial crisis 2007-2009. However, the Islamic banks are less stable as compared to conventional peers at the later of crisis period. Yet, the result is meaningful especially for the larger Islamic banks but not the smaller Islamic banks. Oppositely, Alqahtani and Mayes (2018) find large conventional banks are more soundness than smaller conventional banks. The comparative banks fragility between Islamic and conventional peers shows inconclusive and ambiguous empirical evidences thus, it is a meaningful to compare the fragility level between Islamic and conventional banks.

In response to this issue, the study further investigates banks fragility of both Islamic and conventional banks. The objectives are threefold. The

study aims (i) to examine the factors that influence banks fragility, (ii) to compare significant different of banks fragility level between Islamic and conventional counterparts and, (iii) to analyze the interaction effect of income diversification on the relationship between size and banks fragility. The study includes bank specific variables that are, capital adequacy, efficiency, credit risk, size and income diversification in determining the factors influence banks fragility. The inclusion of income diversification makes this paper more unique. Indeed, diversifying of income show inconclusive evidences in past research. At one point, high income diversification lessen banks stability for example, Moudud-Ul-Huq et al. (2021) reveal income diversification enhance banks stability. Meanwhile, there are also cases that high income diversification induce to grater banks fragility. Bilgin et al. (2021) find income diversification offers more risk to the banks thereby, greater fragility. Given the main banking business activities that accepting deposits and providing financing, the inclusion of income diversification probably provides new insight into the body of knowledge specifically, the banking risk.

Motivated by the study on income diversification and bank risk conducted by Wang and Lin (2021), the study extends the concern on effects of income diversification towards banks fragility by taking into consideration different banks' size. The study postulates that, too-big-to-fail banks have different influence on banks fragility. The study further investigates the interaction effect of income diversification towards the relationship between size and banks fragility. The rationale is because the income diversification varies with bank size. The study conjectures different size of banks would have different levels of income diversification. This is perhaps due to the banks are

heterogenous in term of business model either focusing on the traditional banking businesses or diversifying their income to other non-interest income.

Among others, recent literatures that focus on income diversification and banking risks are Alsharif (2021), Ghenimi et al. (2021) and Hunjra et al. (2021). However, the previous studies do not take into consideration the inclusion of income diversification as an interacting variable in analyzing the banks fragility. The study concerns that income diversification of the banks is heterogenous for different size of banks. Thus, the study hypothesizes that different level of income diversification interacts the relationship between size and banks fragility differently. The study conjectures large banks in a country are willing to take more risks in their operations and activities because they are more confident that they will be bailed out by the government in the case of failure. These larger banks are tendentious to take higher risk as they are too-big-to-fail. Due to these grounds, this study becomes crucial in order to assure corroborate economic growth. Hence, it is essential to mitigate banking risks in order to lessen the risk bubble over the financial sector and secure the continuity of the financial system of a country[1]. The more risks created, the higher the possibility of banking default or failure to take place. The rest of the paper is organized as follows. Section 2 presents related literature on banks fragility. Section 3 explains our data, variables, and methodology. Section 4 discusses the empirical findings of the study. Section 4 concludes the paper and provides policy implications.

[1] The whole economy of Greece collapses as a result of contagion effect caused by the financial crisis Hasan, Z. (2010). Dubai financial crisis: causes, bailout and after-a case study. *Journal of Islamic Banking & Finance*, *27*(3), 47-55. https://mpra.ub.uni-muenchen.de/id/eprint/26397 .

Related Literature

This section explains banks fragility from both theoretical and empirical perspectives. Banks fragility jeopardizes the whole financial system of a country. This is due to the connectedness of the banks with another. Therefore, one bank collapse, especially significant large bank would drag the other bank too. Thus, it is an urgency for the banks to maintain the stability while growing their businesses. The study identifies four (4) theories related to this study that are, financial fragility crowding out deposit theory, risk absorption theory, Markowitz portfolio theory and the too-big-to-fail theory. The study explains the aforementioned theories and related empirical evidences in the following paragraph.

Among others, capital is important to the banks. This is because the capital aids absorb risks and uncertainties that possibly harming the financial position of the banks. Theoretically, financial fragility crowding out theory posit capital is negatively related to the banks fragility (Berger & Bouwman, 2009; Diamond & Rajan, 2001). The authors further explain that banks with the higher capital level tend to reduce financing given to the customers. As a result, fewer monitoring activities recorded by the banks. This is because of, highly capitalized banks are less fragile thus less urgency for the banks to provide more financing hence, more liquid of the banks. In another point of view, Gorton and Winton (2017) propose financial fragility crowding out theory as an increase in capital induces to crowd out of deposits. Due to that reason, the banks probably have limited sources to offer financing hence, less exposure on banks fragility. A study by Morina and Qarri (2021) and Sahyouni et al. (2021) support the theory of funding fragility crowding out theory that indicates, high capital level leads to less exposure on banks fragility. In

contrast, the risk absorption theory proposed by Allen and Gale (2004), Coval and Thakor (2005) and Repullo (2004) show capital is positively related to the banks fragility. Allen and Gale (2004) document that banks are bonded with risks when meeting demand withdrawal from the customers. Meanwhile, the later authors notes increase of capital causes the banks to absorb more risks. This is due to the banks are aware of their capacity in absorbing risks given, the higher capital level. Therefore, the higher capital level causes to greater banks fragility. Empirically, Mohammad et al. (2020) find the listed Islamic banks in Amman Stock Exchange with high capital level are exposed to greater banks fragility.

Theoretically, Markowitz portfolio theory postulates income diversification is a tool of risk mitigation for the banks (Boyd & Graham, 1988; Boyd et al., 1993; Ramakrishnan & Thakor, 1984). The theory proposes negative relationship between income diversification and banks fragility. The more income diversified by the banks, the less fragile they are. Empirically, Maghyereh and Yamani (2022) find income diversification in Islamic banks hinder banks fragility relative to conventional peers. The authors highlight Islamic banks are more likely to diversify their income due to relatively smaller market power than conventional peers. Due to competitive environment, Islamic banks are urged to diversify their income in order to earn higher rate of return while compliant to Shariah principles. Thus, the greater engagement of income diversification lessens banks fragility exposure. According to Dang (2020) diversification of income weaken the core function of a bank in meeting demand withdrawal from the customers hence, greater exposure on banks fragility in Vietnam. The author further explains, rather than focusing its business model, the banks have to spend multiple of resources in order to

manage the diversified sources of income. In another study, Dang (2022) discloses income diversification gives adverse impact to banks fragility. As the banks are more focus on income diversification activities, it deteriorates the banks financial health and become more fragile. This possibly due to the non-interest income is more volatile as compared to the income from traditional banking activities. Similarly, Xu et al. (2019) discover too much reliance on income diversification especially, the non-interest income leads to greater banks fragility. A study by Kim et al. (2020) reveal the ambiguous relationship between income diversification and banks fragility. The authors find banks that highly involve in income diversification are more susceptible to banks fragility. Meanwhile, the banks that moderately involve in income diversification are less susceptible to banks fragility.

Cost efficiency measures the efficiency and effectiveness of the banks in managing their resources. According to Boukhatem and Djelassi (2020) cost efficient banks in Saudi are less exposed to greater fragility regardless of Islamic or conventional banks. This is due to the banks are good in managing their resources and at the same time, maintaining high income. Although the banks incur high-cost management, it is still manageable given the high income generated. Therefore, better cost-efficient results in less exposure on banks fragility. On the other hand, Chen et al. (2021) discover a positive relationship between cost efficiency and banks fragility. The author depicts better cost efficiency induces the banks to greater fragility. This possibly due to the opportunity cost that bank have to endure in order to become efficient banks. The argument affirms to Amin et al. (2018). For instance, in order to efficiently manage their costs, the banks have to control or reduce the usage of resources used in monitoring activities. Due to that reason, the monitoring

activities are not up to the standard. There are possibilities of imprudent monitoring to the customers thus, causes to greater fragility of the banks since the monitoring activities is not at the fullest implementation.

Credit risk portrays the non-performing financing of the banks. As the banks show high credit risk, it indicates there are a huge percentage of the defaulters which unable to make payment for their financing as per agreed. Mahdi and Abbes (2018) and Ghenimi et al. (2021) discover high credit risk contributes to greater banks fragility. If let say the defaulters are those handling giant projects which funded through financing given by the banks, of course the default gives significant impact to the banks. Probably the banks are unable to meet demand withdrawal from the depositors. This induces to greater liquidity risk hence, the banks become more fragile. Oppositely, Manganaris et al. (2017) address negative relationship between credit risk and banks fragility. The authors further explain, the banks that are more conservative or take precaution especially affected during the global financial crisis tend to hold more liquidity level. Therefore, although the credit risk is high, the banks have a buffer of liquidity to cushion for the risk. As a result, the banks become less fragile.

Different size of banks has different tolerance towards the risk. According to Ghenimi et al. (2021) smaller size of Islamic banks has high liquidity, thereby less expose to banks fragility. This is probably due to the smaller Islamic banks have limited sources of funding from external as compared to the larger Islamic banks. The larger Islamic banks have better sources of funding and at the same time, these banks practice moral hazard of too-big-to-fail theory (Stern & Feldman, 2004). The theory indicates that large banks take more risk because of they are aware that the government would

bail them out in the case of failure. So, the large banks are more risk appetite and high tolerance towards the risk. Due to that reason, larger banks tend to hold less liquidity, in which, expose themselves to a greater banks' fragility. A study by Dahir et al. (2018) support the theory of too-big-to-fail. The authors find larger banks in Brazil, Russia, India, China, and South Africa (BRICS) takes more risk because of the banks could seek for government intervention if anything happened. Accordingly, the study proposes the following hypotheses based on the previous literature:

Hypothesis 1. There is a significant influence of capital level towards banks fragility.

Hypothesis 2. There is a significant influence of cost efficiency towards banks fragility.

Hypothesis 3. There is a significant influence of credit risk towards banks fragility.

Hypothesis 4. There is a significant influence of income diversification towards banks fragility.

Hypothesis 5. There is a significant influence of size towards banks fragility.

Hypothesis 6. There is a significant different of banks fragility between Islamic and conventional banks.

Hypothesis 7. Income diversification significantly interacts the relationship between size and banks fragility.

Therefore, the banks fragility is still a hot topic in finance literature. The inconclusive and debatable issues strengthen the important and urgency to scrutinize further the topic on banks fragility. The following section explains on the data, variables and methodology used in achieving the proposed objectives.

Data, Variables and Methodology

The study aims to investigate the pivotal concern of banks fragility are initiated from the sampling of countries; Bahrain, Bangladesh, Kuwait, Malaysia, Qatar, Saudi Arabia and United Arab Emirates. The unbalanced panel data spans from 2009 to 2018 consist of 115 Islamic and conventional banks that brings out 804 of total observations. These banks were selected as study sampling due to the dual-banks system offered in the countries with main consideration of substantial contributions of both Islamic and conventional banks in tapping the market. All data were obtained from FitchConnect database and the study uses Stata 12 for diagnostic and estimation purposes.

Fragility issue in banking undoubtedly raises a major worry among players in the industry. In this context, the study examines the issue by focusing on the bank's liquidity with the proxy of net loans to total assets. The study proposed a model that takes into account the role of capital, cost efficiency, credit risk, income diversification, and bank size in prompting bank's fragility of the banks in the selected countries. Type dummy is included to distinguish between Islamic and conventional banks fragility. Further, the model incorporates interaction function between size and income diversification to analyze the marginal effect of size on banks fragility based on the level of income diversification. Table 1 displays the detail definition and proxies applied in the model.

Table 1. Variables Definition and Proxies

	Symbol	Proxy Measurement
Dependent Variable		
Banks Fragility	BF	Net Financing to Total Assets (%)
Independent Variables		
Capital Level	CAP	Equity to Total Assets (%)
Cost Efficiency	CE	Expenses to Revenues (%)
Credit Risk	CR	Impaired Financing to Gross Financing (%)
Bank Size	SIZE	Total Assets of Banks (million USD)
Control Variable		
Type	TYPE	1 for Islamic Banks; 0 Conventional Banks
Interaction Variable		
Income Diversification	YD	Non-interest Income to Gross Revenue (%)

Prior to model estimation and analysis, the model was tested using preliminary diagnostic statistics to validate the model. The study conducts heteroscedasticity test for the panel data as well as panel unit root testing for the model. The study also performs variance inflation factor (VIF) test for multicollinearity detection and Wooldridge test for autocorrelation detection. The panel data testing is to determine the most appropriate panel data estimation in achieving the study objectives (Dana et al., 2021, 2022). The following econometric equation is presented to substantiate the study hypotheses:

$$BF_{it} = \beta_0 + \beta_1 CAP_{it} + \beta_2 CE_{it} + \beta_3 CR_{it} + \beta_4 YD_{it} + \beta_5 SIZE_{it} + \beta_6 TYPE_{it} + \beta_7 YD_{it} * SIZE_{it} + \mu_{it} \quad (1)$$

Finding and Discussion

The panel data testing eliminates the pooled ordinary least squares (POLS) as the most appropriate model in the study. Hence, the study proceeds with the random effect model (REM) in order to put a distinction between Islamic and conventional banks which is not visible using the fixed effect

model (FEM) due to collinearity issue. The diagnostic testing[2] indicates no serious multicollinearity issue according to Wooldridge (2016) given, the mean variance inflation factor is 1.16, which is less than 10. There is no unit root issue in the proposed model. Nevertheless, the Modified Wald Test discloses there is heteroscedasticity issue in the model while Wooldridge test for autocorrelation in panel data reject the hypothesis of no first order autocorrelation. In response to these issues, the study moves forward with the random effect model with cluster standard error regression as proposed by Hoechle (2007). Table 2 exhibits the findings of the random effect generalized least square regression.

The Wald chi2 statistic is 95.03 and significant at 1 percent level implies the proposed model are fit and acceptable. The variation of banks fragility of Islamic and conventional banks in the selected countries can be explained from the explanatory variable encompassed in the model by at least 30 percent. Overall, the study finds capital, cost efficiency, credit risk and size are certainly important factors in affecting banks fragility. Although there is no evidence of a direct relationship between income diversification and banks fragility, the interaction effect provides new insight on the moderating role of income diversification between size and banks fragility.

[2] The result for heteroscedasticity, panel unit root test and autocorrelation are not reported but available upon request.

Table 2. Random Effect Model with Cluster Standard Error

Model	Basic	Interaction	
Capital Level	**-0.513**	***-0.517	***
	(0.103)	(0.102	)
Cost Efficiency	**-0.077**	***-0.075	***
	(0.025)	(0.025)	
Credit Risk	**-0.409**	***-0.414	***
	(0.109)	(0.109)	
Size	0.002	**0.099**	**
	(0.023)	(0.05)	
Income Diversification	**-0.099**	***-0.055	
	(0.026)	(0.034)	
Size* Income Diversification		**-0.004**	**
		(0.002)	
Type	0.808	0.721	
	(1.061)	(1.062)	
Constant	**76.727**	***75.709	***
	(2.017)	(2.123)	
Observations	804	804	
Chi-squared	**94.64**	***95.03	***
R-squared Within	0.0797	0.0849	
R-squared Overall	0.4569	0.4836	
R-squared Between	0.3082	0.3293	

Note: *** is significant at 1% level, ** is significant at 5% level and * is significant at 10% level.

As commonly agreed in the body of knowledge, capital plays an important part in determining banks fragility (Morina & Qarri, 2021; Sahyouni et al., 2021). The findings further support the theory of financial fragility crowding out deposits that bank capital is capable to lessen banks fragility. The opposite relation between the two are significant at 1 percent level. It is logically acceptable banks that held greater capital to have lower finding fragility while banks with lower capital are exposed to greater banks fragility. Given high levels of capital, banks have more flexibility to offer more financing and at the same time are able to maintain sufficient liquidity level obtained from deposits. Due to this reason, banks managed to minimize the banks fragility in their core business activities. On the contrary, banks with low capital level needs to deal with the opportunity cost of using the available deposits

in providing financing to the customers. Greater financing offers by the banks lead to high exposure of banks fragility in their funding activities. The estimation result discloses a 1 percent decrease in capital induces to approximately a half percent increase of banks fragility. Thereby, the effect of capital on banks fragility is momentous and must be taken seriously to mitigate banks fragility.

Apart from capital, the study also reveals the importance of cost efficiency in influencing the banks fragility level of Islamic and conventional banks. Unlike capital, cost efficiency offers a trade-off relationship with banks fragility. Note that the study uses inverse proxy for cost efficiency, the expenses to revenue ratio, which represent a greater ratio implies less cost efficient. Finding in Table 2 highlights the more cost efficient the bank, the more fragile the bank. The result affirms to Chen et al. (2021). On the contrary, banks that are less cost efficient are exposed to lesser banks fragility. The evidence is found to statistically significant at 1 percent level. The result suggests banks with high-cost efficiency emphasize on the cost minimization. In other words, bank cuts off certain spending activities in which one of them may affect the financing evaluation process and thus prone to lower asset quality. The lack of monitoring activities with the aims to minimize cost trigger to greater banks fragility whilst the deposit is shrinking due to bad financing. Oppositely, banks that spend more on monitoring process, managed to reduce the bad financing proportions and lessen the banks fragility, yet need to trade-off with the cost efficiency.

The study further investigates the impact of credit risk on banks fragility for Islamic and conventional banks to obtain more insights on this discussion. The finding exposes significant negative relationship between credit

risk and banks fragility. The result proposes banks with intense credit risk have more stringent financing assessment thus disburse financing to selective customers. The decision leads to lower banks fragility of banks to face high credit risk in order to neutralize the existing credit risk exposed by the bank. On the other hand, banks that perceive themselves to have lower credit risk have more tolerance on the risk, hence can offer more financing to the customers. Given high financing activities of these banks exposed the bank to higher banks fragility. The study managed to substantiate the hypothesis between credit risk and banks fragility at 99 percent confidence interval.

Another important factor that is significant to banks fragility is non-other than the bank size. The positive relationship between the two variables is statistically significant at 5 percent level. Bank size is known as one of the crucial factors that influence banks flexibility and decision-making process (Dahir et al., 2018; Ghenimi et al., 2021). The study discloses bigger banks are exposed to greater banks fragility while small banks are less exposed to banks fragility. These scenarios can be explained by the moral hazard activities of the too-big-to-fail theory. Larger banks commonly have more opportunities to offer more financing with a wider scope of customers. These profitable activities are very tempting for the bank to resist. Furthermore, large banks normally have the capacity to fulfill financing demand from customers. Given more financing granted from these banks, the banks are facing a greater liquidity risk, therefore, are tied up with higher banks fragility. As for the small banks, the financing activities are limited relative to the large banks due to availability of funding capacity. Thus, small banks are more cautions in rationing their funding for financing activities and this caused to lesser bank fragility.

The study is mainly interested to examine the effect of income diversification towards banks fragility. The negative relationship between the variables proposes income diversification as mechanism in reducing banks fragility. Oppositely, banks with less diversified portfolio need to bear with greater banks fragility. Though, the study fails to reject the null hypothesis thus unable to statistically prove the direct relationship between income diversification and banks fragility. Ultimately, the model interacts income diversification and bank size to investigate the effect on banks fragility. Interestingly, the result discovers income diversification to be a significant moderator that influences the effect of size on banks fragility. Table 3 and Figure 1 display the marginal effect of the interaction. Earlier discussion on size discloses a positive relationship between size and banks fragility. The marginal effect divulges this positive relationship is true for banks with low-income diversification. Meanwhile the interaction portrays banks with high income diversification suggests a significant negative relationship between size and banks fragility. The results indicate the theory of too-big-to fail is only applicable for banks with limited diversification activities. These banks are complacent with their current position in the market, hence believe there is less urgency to diversify the income and exposed to high banks fragility. Smaller size of banks that have trivial diversification portfolio make more prudent financing decision to avoid banks fragility. On the contrary, banks that imposed substantial income diversification have less banks fragility given the banks are large in size. The smaller banks with high income diversification are then exposed to greater banks fragility. This is probably due to the lack of capacity of the small banks to allocate their resources into diversified income

generation activities. Unlike the small banks, large banks with adequate resources managed to diversify their portfolio and benefits from lower banks fragility. The large banks corroborate to the portfolio theory that indicates, income diversification is a means for risk mitigation (Boyd & Graham, 1988; Boyd et al., 1993; Ramakrishnan & Thakor, 1984).

Table 3. Average Marginal Effects Estimation, Banks Fragility/Size on Income Diversification

Income Diversification	Banks Fragility/Size	Delta-method Std. Err.	[95% Conf.	Interval]
0	0.099	0.050	0.001	0.198
5	0.080	0.042	-0.001	0.162
10	0.061	0.034	-0.004	0.127
15	0.042	0.026	-0.008	0.093
20	0.023	0.020	-0.015	0.062
25	0.004	0.016	-0.028	0.036
30	-0.015	0.018	-0.050	0.020
35	-0.034	0.023	-0.079	0.011
40	-0.053	0.030	-0.112	0.006
45	-0.072	0.038	-0.147	0.003
50	-0.091	0.047	-0.183	0.001
55	-0.110	0.055	-0.219	-0.001
60	-0.129	0.064	-0.255	-0.003
65	-0.148	0.073	-0.291	-0.005
70	-0.167	0.082	-0.328	-0.007
75	-0.186	0.091	-0.365	-0.008

Note: *** is significant at 1% level, ** is significant at 5% level and * is significant at 10% level.

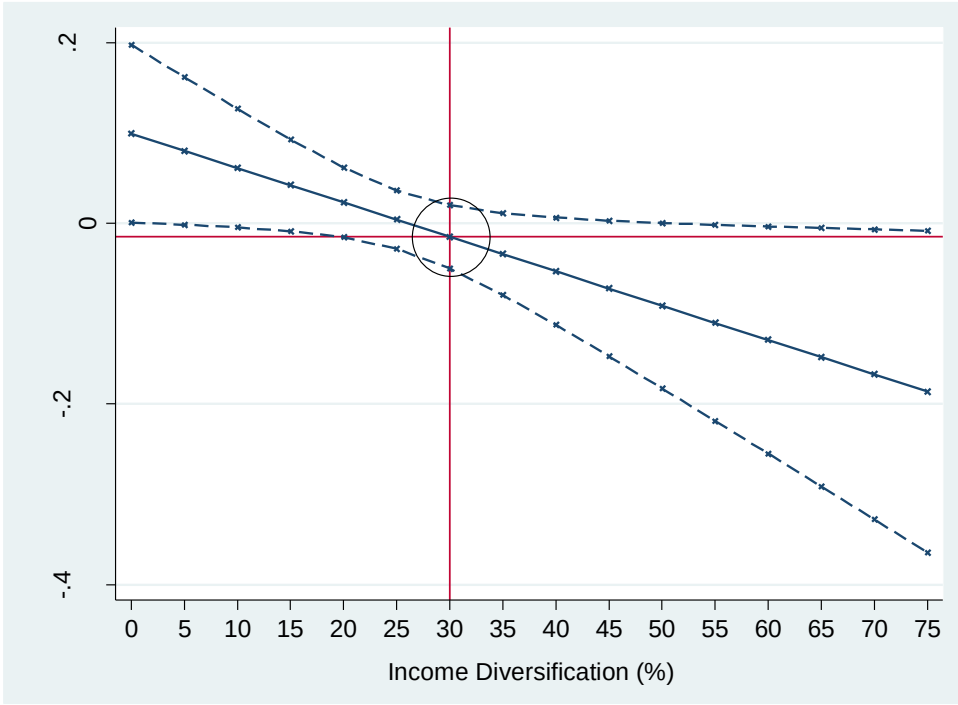

Figure 1. Average Marginal Effects of Size at Different Level of Income Diversification with 95% Confidence Interval

Additionally, the model includes type dummy to find if there is any distinction of banks fragility between Islamic and conventional banks. Although the study reveals Islamic banks are more fragile than the conventional ones, but the study conveys no significant difference of banks fragility between the two groups of banks. The result implies both Islamic and conventional banks are exposed to similar banks fragility in the case of improper asset-liability management. Given accepting deposits and providing financing are the core businesses for commercial Islamic and conventional banks, prudent asset-liability management is an urgency to mitigate the banks fragility.

Conclusion and Policy Implications

Banks fragility is one of the main concerns in the banking business. Fragile banks are not supporting the industry to instill public confidence and stability in the market, which is bound to be crucial in the banking industry. The more fragile the banks, the higher the possibility of banks to fail and create disruption in the country. Therefore, the study proposed a model to examine the essential factors of bank fragility with the aims to mitigate the issue.

The model provides insightful evidence of capital, cost efficiency, credit risk and size as the primary determinants of banks fragility. Although the study is unable to provide evidence of income diversification to directly influence bank fragility, the interaction effect suggests income diversification to significantly influence the effect of size on the bank fragility of the Islamic and conventional banks. Due to that reason, the study recommends large banks to make use of their capacity to fully utilize income diversification because of the bigger the bank size, the lower the bank are exposed to banks fragility. This affirms to the Markowitz portfolio theory that indicates greater income diversification reduce fragility level of the banks. Whilst smaller banks are proposed to concentrate on their core business activities and minimize income diversification in order to curb banks fragility. Smaller banks with relatively low capacity to diversify its portfolio probably are taking unnecessary risk should the banks embark into high income diversification activities, thus are exposed to greater banks fragility.

The study also suggests Islamic and conventional banks to maintain adequate capital level to dampen banks fragility. At the same time, banks may

consider the trade-off effect between cost efficiency and credit risks towards banks fragility.

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