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Diversification, risk, and performance: Do the type of family and state ownership matter?

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ABSTRACT

Purpose — *This study aims to examine the roles of the ultimate owners, i.e., family and state, as moderating factors on the relationships between bank diversification, risk, and performance. To capture different aspects of diversification, we consider bank income, loan, deposit, and asset diversifications.*

Method — *The data analysis technique employed in this research is multiple regression in the form of pooled regression. The data were sourced from the financial statements of 53 banks in Indonesia. It is worth noting that the data used in this study comprise panel data, which combines time series and cross-sectional data. This utilization of panel data serves to increase the depth of observation in the research.*

Result — *Income diversification provides benefits to banks in the form of risk reduction and performance improvement. On the other hand, loan, deposit, and asset diversifications have a negative impact on banks by enhancing risks and degrading performance. Furthermore, ownership of the bank by the family and the state negatively impacts income diversification, possibly due to the lack of ultimate expertise, which results in limitations in transferable skills. In contrast, ownership of the bank by the family can weaken the positive effects of loans and assets.*

Contribution — *This study provides significant insights into the development of banking research, offering a more comprehensive measure of diversification in terms of income, loans, deposits, and assets. Moreover, this study measures bank ownership through ultimate ownership, which can reveal the actual ownership of the bank.*

Keywords: *diversification, bank, risk, performance, ownership, state*

INTRODUCTION

A number of pieces of empirical evidence show that diversification provides benefits to banks. However, the recent financial crisis has shown that aggressive diversification can increase risk and reduce performance (Berger et al., 2010a). The adverse impact of diversification is due to an increase in supervisory costs (Cerasi & Daltung, 2000), income volatility (DeYoung & Roland, 2001a), a reduction in comparative advantage due to activities beyond management capabilities (Klein & Saidenberg, 2005), and increasing agency costs that arise because managers carry out activities that harm the company to achieve their personal benefits (Laeven & Levine, 2007).

Furthermore, research on diversification and its effect on risk and bank performance has been conducted in developed countries, especially in America (DeYoung & Roland, 2001a; K. Stiroh, 2006) and Europe (Hayden et al., 2007; Lepetit et al., 2008a). Research in the context of developing countries is limited, and further investigation is needed. Meslier (2014) stated that there are major changes in the financial industry in developing countries such as deregulation and competition that motivate banks to diversify. Developing countries have unstable financial systems as well as banking market structures and regulations that are different from developed countries, making them more likely to diversify.

The dilemma of whether banks have to diversify or focus has gained great attention from researchers (Berger et al., 2010b; DeYoung & Roland, 2001b; Hidayat et al., 2012a; Lepetit et al., 2008b; Mercieca et al., 2007; Stiroh, 2004). However, there is no consensus among researchers, with evidence showing the presence of economies and diseconomies of diversification. The absence of consensus on this matter has encouraged us to investigate more about why banks benefit and lose when implementing diversification, considering various aspects such as different definitions of diversification and various ownership structures.

The extant literature on the roles of families and the state in the ownership of banks has not provided a crystal-clear consensus. For instance, several studies documented the benefits of family ownership on performance and risks (Anderson & Reeb, 2003; Pindado et al., 2014). Meanwhile, several studies have found adverse impacts of family ownership on bank risks and performance (Cronqvist & Nilsson, 2003a) and no significant effect of family ownership on company performance (Barry et al., 2011). Other studies (San Martin-Reyna & Duran-Encalada, 2012) reveal that different results regarding the effect of family ownership are due to differences in the country context. Furthermore, state ownership is perceived to have an adverse effect on bank performance due to

lower profits, greater risks, and inefficient operations. Meanwhile, state ownership is considered to increase bank efficiency because it is supported by government regulation (Berger et al., 2010a).

The purpose of this study is to examine whether the benefits of bank diversification (income, loan, deposit, and asset diversification) vary under different types of ownership. More specifically, we examine the role of family and state ownership in banks' diversification strategies. The effect of the ownership structure on the relation between diversification and firm value can be more relevant in institutional frameworks where investor protection is weak (La Porta et al., 1999a).

METHOD

Sample

We drew our sample from 53 commercial banks in Indonesia. The sample was chosen based on the availability of data needed for this study. The data used are secondary data obtained from the companies' annual reports and Bank Orbis Focus. Based on the annual reports, we tracked the ownership of the banks to the very top (ultimate) owners. In case the immediate owner is not a listed firm, we went further to track annual reports or information available elsewhere. The data in this study are unbalanced panel data. This is because the data needed for each research sample do not have the same availability, so the number of observations is different for each variable. The data used in this study are secondary data obtained from Orbis Bank Focus and the related bank annual reports.

Variable measurement

In this study, we have established two dependent variables (performance and risk), four independent variables (income diversification, loan diversification, deposit diversification, asset diversification), and a moderation variable (family and state ultimate ownerships). The operational definitions and measurements of the variables used are as follows:

Risk and performance

In this study, risk is defined as the losses faced by banks, either in the form of bank profit volatility or the probability of failure faced by the bank. The level of risk is measured by DSROA and DSROE, which represent the standard deviation

of ROA and ROE (t, t-1, t-2). The higher the values of DSROA and DSROE, the greater the risk of volatility faced by the bank. This measurement is consistent with previous studies conducted by (Barry et al., 2011; Saghi-Zedek, 2016a; Setiyono & Tarazi, 2014a). Furthermore, the risk of failure faced by the bank is measured by ZSCORE. A low ZSCORE value indicates a high probability of failure, and conversely, a high ZSCORE suggests a lower probability of failure. This measurement is also in line with previous research conducted by (Saghi-Zedek, 2016a; Setiyono & Tarazi, 2014a) using the following formula:

$$\text{ZSCORE} = \frac{\text{ROA+ETA}}{\text{DSROA}} \ldots\ldots\ldots\ldots (1)$$

ZSCORE : Risk of bank failure

ROA : Return on asset

ETA : Equity to total assets ratio

DSROA : Standard deviation of return on asset

The examination of the effect of diversification on loan risk faced by banks, proxied by NPLs, was also conducted in this study. High NPL values indicate high loan risks faced by banks, and vice versa. Furthermore, the risk of stock price volatility is measured by Beta. A Beta value greater than 1 for a stock indicates that the stock has higher volatility than the market, and vice versa.

Bank performance is defined as the bank's ability to generate profits. In this research, performance is measured by ROA (return on asset), which is the ratio of profit before tax to total assets, ROE (return on equity), which is the ratio of profit before tax to total equity, RAROA (risk-adjusted return on assets), which is the ratio of ROA to DSROA, and RAROE (risk-adjusted return on equity), which is the ratio of ROE to DSROE.

Income diversification

Income diversification was measured using the Adjusted Hirschman-Herfindahl Index (AHHI), a diversification measurement referenced in previous studies by (Acharya, Hasan, Saunders, The, & May, 2016; Elsas et al., 2010; Saghi-Zedek, 2016; Stiroh, 2004), and calculated with the following formula:

$$\text{DIVINC} = \left(1 - \left(\left(\frac{\text{II}}{\text{TOI}}\right)^2 + \left(\frac{\text{NII}}{\text{TOI}}\right)^2\right)\right) \text{x } 100\% \text{.....(2)}$$

DIVINC : Income diversification

II : Interest income

NII : Non interest income

TOI : Total operating income

Loan diversification

Loan diversification was assessed using the Adjusted Hirschman-Herfindahl Index (AHHI), a diversification measurement previously employed in research by (Acharya et al., 2016a; Berger et al., 2010b), and calculated using the following formula:

$$\text{DIVLOAN} = \left(1 - \left(\left(\frac{\text{COMLOAN}}{\text{TL}}\right)^2 + \left(\frac{\text{CONLOAN}}{\text{TL}}\right)^2 + \left(\frac{\text{OL}}{\text{TL}}\right)^2\right)\right) \text{x } 100\% \text{.....(3)}$$

DIVLOAN : Loan diversification

COMLOAN : Commercial loan

CONLOAN : Consumer loan

OL : Other loans

TL : Total loan

Deposit diversification

Deposits diversification was quantified using the Adjusted Hirschman-Herfindahl Index (AHHI), a diversification metric employed in a prior study by (Berger et al., 2010b), and calculated using the following formula:

$$\text{DIVDEP} = \left(1 - \left(\left(\frac{\text{TIME}}{\text{TD}}\right)^2 + \left(\frac{\text{SAVING}}{\text{TD}}\right)^2 + \left(\frac{\text{DEMAND}}{\text{TD}}\right)^2 + \left(\frac{\text{BANK}}{\text{TD}}\right)^2 + \left(\frac{\text{OTHER}}{\text{TD}}\right)^2\right)\right) \text{x } 100\% \text{.....(4)}$$

DIVDEP : Deposit diversification
TIME : Time deposits
SAVING : Deposit
DEMAND : Demand deposit
BANK : Other bank's deposit
OTHER : Other types of deposits
TD : Total deposits

Asset diversification

The level of asset diversification is assessed using the Adjusted Hirschman-Herfindahl Index (AHHI), a diversification measurement referenced in previous research by (Berger et al., 2010b), and calculated with the following formula:

$$\text{DIVASSET} = \left(1 - \left(\left(\frac{C}{TA}\right)^2 + \left(\frac{DEPO}{TA}\right)^2 + \left(\frac{FIN}{TA}\right)^2 + \left(\frac{FIXED}{TA}\right)^2 + \left(\frac{OTHER}{TA}\right)^2\right)\right) \text{ x } 100 \ldots..(5)$$

DIVASSET : Asset diversification
C : Loan
DEPO : Deposits with other banks
FIN : Financial investment
FIXED : Fixed assets
OTHER : Other types of assets

Family and state ultimate ownership

In this study, we employ a direct or indirect ownership threshold of 20% to ascertain the ultimate owner of the bank. This criterion is based on a previous study conducted by (La Porta, Lopez-De-Silanes, & Shleifer, 1999), which posits that ownership exceeding a 20% threshold is sufficient to exert effective control over a company. Ultimate shareholders are categorized into family and state ownership. In the data processing phase, the ultimate ownership category is represented by dummy variables with the following conditions: DFAM, a dummy variable set to 1 if the ultimate owner is a family, and 0 otherwise; DSTATE, a dummy variable set to 1 if the ultimate owner is the state, and 0 otherwise. The

determination of ultimate bank ownership can be illustrated as follows: when Mr. A holds a 50% stake in company B, which in turn owns 100% of the shares in Bank C, Mr. A is considered the ultimate owner of Bank C with an indirect control of 50%.

Control variables

In this study, several control variables were utilized, as follows:

a) **Company Size:** Company size serves as a control variable, reflecting the magnitude of assets owned by the company. Total assets, which signify the size of the bank, can influence both the risk and performance of the bank. Larger assets can enhance shareholder control and deter banks from engaging in excessive risk-taking behavior. Additionally, larger banks may achieve cost savings through economies of scale. In this study, bank size is represented as the logarithm of total assets. The use of company size in this continuous numerical form is expected to be a predictor capable of effectively explaining the variance in the dependent variable (Berger et al., 2010a).

b) **Equity-to-Assets Ratio:** The equity-to-assets ratio is a financial metric utilized to assess a company's financial health and long-term profitability. Previous literature related to bank diversification has suggested that the ratio of equity to total assets can impact both bank risk and performance (Saghi-Zedek, 2016b). Banks that allocate a smaller portion of equity to assets tend to exhibit higher risk, while those with a larger proportion of equity to assets tend to be more risk-averse. This, in turn, affects the bank's ability to generate profits.

c) **Stock Exchange Listing Status:** Banks listed on stock exchanges are subject to closer monitoring and stronger market discipline compared to non-listed banks. This heightened scrutiny tends to incentivize listed banks to achieve better performance and mitigate risk (Setiyono & Tarazi, 2014b). Furthermore, banks listed on stock exchanges gain access to additional sources of funding to support their operations. The status of being listed on the Indonesia Stock Exchange is represented using a dummy variable, where a value of 1 is assigned if the bank is listed, and 0 if it is not listed.

Empirical model

The research model used is as follows:

$$Risk_{it} / Performance_{it} = \beta_0 + \beta_1 Div_{it} + \beta_2 dOwn_{it} + \beta_3 Div_{it}*dOwn_{it} + \beta_4 Size_{it} + \beta_5 ETA_{it} + \beta_6 dlisted_{it} + \varepsilon_{it}$$

Risk in this study is measured by various indicators, including the standard deviation of ROA, the standard deviation of ROE, Z-score, NPL, and Beta. On the other hand, performance is assessed based on financial metrics such as ROA, ROE, risk-adjusted ROA, and risk-adjusted ROE. The variable "Div" represents the level of diversification in income, credit, deposits, and assets. The moderating variables in this study are family ultimate ownership and state ultimate ownership categories, represented by dummy variables. Several control variables are also included, such as "log (asset)," which represents the natural logarithm of total assets, "equityasset," denoting the ratio of total equity to total assets, and "dlisted," which is a dummy variable indicating the listed status on the Indonesia Stock Exchange.

The data analysis technique employed in this study involves multiple regression, specifically pooled regression, and it is conducted using the Stata program. Hypothesis testing is carried out after estimating the model, and the choice between fixed effects and random effects is determined through the Hausman Test.

Hypothesis development

There are several perspectives on diversification motivations, as outlined by Montgomery (1994), who suggests three main perspectives: the market power view, resource-based view, and agency perspective. Additionally, Elsas et al. (2010) argue that the primary motivation for banks to diversify is an increase in value. Meanwhile, Pennathur, Subrahmanyam, & Vishwasrao (2012) argue that liberalization encourages banks to compete for market share, making diversification a plausible strategy to increase market share.

The implementation of diversification strategies can have negative consequences for banks, such as increased supervision costs (Cerasi & Daltung, 2000), reduced profits (Berger et al., 2010a), income volatility (DeYoung & Roland, 2001a), and a reduction in comparative advantage due to activities beyond management capabilities (Klein & Saidenberg, 2005).

However, various studies have found benefits of bank diversification. Elsas et al. (2010b), in their research spanning nine countries from 1996 to 2008, found that income diversification improved bank performance and increased efficiency. Income diversification benefits banks by expanding economic scopes and

achieving economies of scale, making it easier to sell other financial products through strong customer relationships (product bundling). Lepetit et al. (2008a) found that income diversification can increase bank profits due to a wider range of business activities. In the Indonesian context, previous research by Hidayat et al. (2012b) showed that income diversification can reduce risk, especially for banks with small assets. Based on the explanations above, the proposed hypotheses are as follows:

H1: Income diversification affects risk and bank performance

Furthermore, loan diversification provides benefits to banks in the form of increased profits. These increased profits can offset the supervision costs associated with loan diversification. Loan diversification allows banks to mitigate risk when one sector experiences setbacks, as the bank still has a diversified loan portfolio in other sectors. The Basel Committee has highlighted that portfolio concentrations in banks have led to many banking crises, emphasizing the importance of diversification as a strategy to avoid the risk of failure. Various results from this study corroborate the evidence that loan diversification can reduce risk and improve bank performance. Based on the explanations above, the proposed hypothesis is as follows:

H2: Loan diversification affects risk and bank performance

Meanwhile, in terms of funding sources for bank intermediation activities, deposit diversification aims to protect banks against liquidity risk, especially when the capacity to obtain loan funds is relatively weak or expensive. Additionally, diversification reduces the weighted average capital, enhancing the efficiency of bank loans from other parties. Adrian (2013) conducted research on banks in Europe and revealed that the banking crisis could be caused by excessive dependence on certain funding sources. They added that the vulnerability of banks to systemic risk was driven by an imbalance in funding sources in terms of funding instruments, maturity, and currency type. These perspectives indicate that bank deposit diversification aims to reduce risk and increase the cost efficiency of funds, ultimately boosting bank profits. Based on the explanations above, the proposed hypothesis is as follows:

H3: Deposit diversification affects risk and bank performance

Several previous studies have demonstrated that when a bank diversifies its portfolio, it has the opportunity to reduce the risk of failure and increase profits.

Portfolio diversification aims to eliminate non-systemic risk by allocating resources to different assets. Based on the explanation above, the proposed hypothesis is as follows:

H4: Asset diversification affects risk and bank performance

Corporate governance is an essential aspect of banking, particularly in preventing financial crises caused by poor governance (Levine, 2004). Banks have unique characteristics such as information opacity, strict regulation, moral hazard potential, "too big to fail" (TBTF) status, and government intervention, setting them apart from non-financial companies. Therefore, bank governance differs from that of non-financial firms.

Furthermore, the ownership structure plays a crucial role in determining risk and performance (Laeven & Levine, 2008). In the pyramidal/ultimate ownership structure, shareholders can exert control through the intermediation of several other companies (Saghi-Zedek, 2016a). In this multi-layered ownership structure, various shareholder categories influence the bank's decision-making process, including the implementation of diversification strategies. To achieve superior performance, diversified firms must gain a competitive advantage over their competitors.

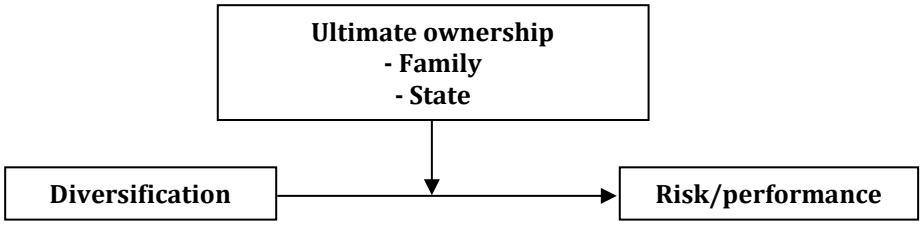
Previous studies have explored the impact of ownership on bank risk-taking. Saghi-Zedek (2016a) conducted research on the effect of ultimate ownership on income diversification strategies in European banks and found that banks owned by institutions tend to be risk-averse compared to banks owned by individuals, families, and governments. This difference arises because individual, family, and government shareholders prioritize short-term profits (Barry et al., 2011). Saghi-Zedek (2016a) also found that diversified banks tend to have volatile incomes and a higher risk of failure if they lack ultimate owners or if their ultimate owners are individuals, families, or countries. These findings can be attributed to the lack of expertise among ultimate shareholders in managing diversification.

Studies have documented that bank ownership by the state results in high risk-taking and low performance due to inefficient resource allocation, limited management incentives, and a preference for pursuing social benefits by state-owned banks. Although Barry et al. (2011) found that family-owned banks tend to avoid risks and are less profitable, families also limit management's autonomy, which can lead to a limited knowledge and ability to manage the bank's business activities. This limitation can result in family-owned banks facing competitive disadvantages compared to other companies. Meanwhile, Laeven (1999), in

research on banking in Asia, found that banks owned by families tend to have higher risk profiles than other banks. Based on these reviews, it can be hypothesized that:

H5: Bank ownership by family and state weakens (strengthens) the negative (positive) impact of diversification on risk (performance)

Figure 1. Research framework



Source: author's compilation (2023)

RESULT AND DISCUSSION

Descriptive statistics

Based on the descriptive statistics presented in Table 1, it is observed that 40 percent of the observations pertain to family-owned banks, 30 percent are state-owned banks, and the remaining belong to other ownership categories such as banks and institutions. Moreover, the mean standard deviation of ROA is 0.42, and the mean standard deviation of ROE is 6.7. Additionally, the mean NPL, representing non-performing loans, is calculated to be 1.7%, with the highest NPL recorded at 3.74%. This data suggests that none of the banks in the sample have crossed the NPL threshold of 5%.

Before proceeding to test the hypotheses, the regression model estimation method was selected using the Hausman test. Furthermore, to ensure compliance with classical assumptions, multicollinearity tests were conducted among independent variables. To address heteroscedasticity, the robust option was employed to obtain robust standard errors, enhancing the reliability of the analysis.

Table 1. Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Panel A. Risk					
DSROA	242	0.4231983	0.3827313	0.022	2.124
DSROE	242	6.748285	18.55965	0.232	125.391

ZSCORE	242	65.44122	63.40209	3.38806	284.398
NPL	246	1.701545	1.081233	0.18	3.74
BETA	131	1.464763	2.528894	-2.042	8.819
Panel B. Performance					
ROA	261	1.753019	1.125003	-0.741	4.869
ROE	261	13.57745	8.345273	1.487	31.527
RAROA	242	8.606777	9.592382	-0.368	47.995
RAROE	242	7.396107	8.744629	-0.298	53.176
Panel C. Independent Variable					
DIVINC	213	15.46985	11.80275	0.919	45.159
DIVLOAN	219	29.66798	18.54508	0.577	54.17
DIVDEP	211	52.47657	13.05642	15.86	70.912
DIVASSET	219	50.1912	7.805679	26.668	68.459
Panel D. Moderating Variable					
DFAM	265	0.4	0.4908249	0	1
DSTATE	265	0.309434	0.463135	0	1
Panel C. Control Variable					
DLISTED	263	0.5019011	0.5009497	0	1
EQUITYASSET	262	13.70968	5.438122	0.218775	25.199
SIZE	262	80,900,000	158,000,000	469,929	910,000,000

Note: the size of the bank is expressed in trillion rupiah

Source: Processed data (2023)

Discussion

Diversification, risk, and performance

The results of the study demonstrate that income diversification can effectively reduce various aspects of bank risk, including the risk of profit volatility, the risk of failure, and credit risk. Furthermore, income diversification has been shown to bring significant benefits to banks by enhancing their overall performance. These positive outcomes stemming from income diversification are achieved through the realization of economies of scope and economies of scale. Additionally, the strong relationship between banks and their customers facilitates the sale of various financial products, which not only reduces marketing costs but also enhances bank efficiency, ultimately leading to an increase in market value.

These findings align with prior research, such as the study by Lepetit et al. (2008a), which found that income diversification can boost bank profits due to a broader range of business activities. However, it's worth noting that the results differ from the study conducted by Acharya et al. (2016b) on the impact of credit diversification on risk and performance in Italian banks during the period 1993-1999. Acharya et al. found that credit diversification does not guarantee higher profits and lower risk for banks. In the Asian context, a study by Berger et al. (2010a) on the effect of credit diversification on bank performance and risk in

China indicated that credit diversification reduces profitability and increases bank risk. This outcome was attributed to the limited ability of managers to expand into new business lines, particularly in a context where banking managers in China are appointed based on their proximity to the government.

Moderating effect of family and state ownership

The results of the regression analysis, as summarized in Table 2 and Table 3 (see below after the REFERENCES heading), provide insights into the relationship between bank ownership and the impact of diversification strategies on bank risk and performance. Specifically, the study finds that family ownership of banks tends to mitigate the negative effects of income diversification on bank risk, as measured by DSROE (0.554), and the risk of at-risk assets represented by NPL (0.332) at a 10% significance level. Additionally, family ownership is shown to weaken the positive effects of loan diversification on risk, as indicated by DSROA (-0.208) and ZSCORE (0.205). The regression results further reveal that family ownership diminishes the positive effects of income diversification on performance, measured by ROA (-0.826) and ROE (-4.892).

However, the impact of family ownership varies depending on the type of diversification. While it weakens the negative effect of deposit diversification on ROA (2.760) and ROE (17.22), it has a negative impact on the risk of income diversification as proxied by DSROA (0.556). Conversely, state ownership weakens the positive effect of deposit diversification on risk, as seen in the values of DSROA (-1.815) and DSROE (-2.885). Moreover, country ownership strengthens the negative effect of loan diversification on performance, as measured by RAROA (-2.569).

The results also highlight the distinct roles of family and state ownership in implementing diversification strategies. State-owned banks tend to excel in deposit diversification, as indicated by the significant ROE value (23.52). These findings emphasize the importance of considering ownership structures when assessing the effectiveness of diversification strategies in the banking sector.

Overall, the study concludes that both family and state ownership can have both positive and negative impacts on the implementation of diversification strategies in banks. Effective control and regulatory measures are crucial for managing these effects. Family and state ownership can lead to increased risk and decreased performance when there is a lack of expertise in implementing diversification strategies. These findings align with previous research by Saghi-Zedek (2016b), which also found that family and state ownership can result in higher risk and lower performance compared to banks owned by institutional

investors. Additionally, this study contributes to the broader body of research on the role of ownership in influencing bank risk and performance, with several studies indicating adverse effects of family ownership on these factors (Cronqvist & Nilsson, 2003b) and state ownership being associated with lower profitability, greater credit risk, and operational inefficiencies (Cornett et al., 2010).

CONCLUSION

A number of pieces of empirical evidence show that diversification provides benefits to banks. However, the recent financial crisis has shown that aggressive diversification can increase risk and reduce performance. Furthermore, the existing literature on the roles of families and countries in bank ownership has not provided a crystal-clear consensus. This study tests the roles of family ownership on bank diversification and the relationships between risk and performance.

Banks owned by families and the state yield diverse effects in the implementation of diversification. Using a sample of emerging market banks in Indonesia, we observe several results. Furthermore, ownership of the bank by both the family and the state negatively impacts income diversification, possibly due to a lack of specialized expertise that limits skill transfer. Instead, ownership of the bank by the family is able to weaken the positive effects of loans and assets.

The results show that diversification of income and deposits has a positive impact on banks. Therefore, banks should strive to diversify their income and deposits. Meanwhile, banks should focus on lending and managing asset portfolios to minimize risk and maximize performance. Furthermore, family and state ownership of banks can have both positive and negative impacts on the implementation of diversification strategies. Therefore, the control and implementation of regulations relevant to family and state ownership can minimize the negative impact of family and state ownership of banks.

Measurement of diversification in this study uses the Herfindahl-Hirschman Index, a measurement widely used to assess bank diversification. The use of other measurement methods to gauge diversification can be an opportunity for further research. Furthermore, this study does not test the limits of diversification for banks. Measuring the maximum limit of this diversification is an opportunity to provide new insights into the banking literature.

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Table 2. The effect of diversification on risk moderated by family and state wwnership

VARIABEL	RISK																			
	DSROA				DSROE				ZSCORE				NPL				BETA			
DIVINC	-0,454				-0.701***				0,479				-0.421***				1.497*			
	(-1.45)				(-3.20)				-1,61				(-2.68)				-1,77			
DIVINC*DFAM	0,15				0.554**				-0,162				0.332*				-1.441*			
	-0,45				-2,56				(-0.52)				-1,70				(-1.67)			
DIVINC*DSTATE	0,169				0.556*				-0,248				0,114				-1,188			
	-0,42				-1,77				(-0.63)				-0,34				(-1.42)			
DIVLOAN		0.208***				0,233				-0.184***				-0,00577				0,27		
		-3,23				-0,57				(-3.16)				(-0.04)				-0,24		
DIVLOAN*DFAM		-0.208**				0,034				0.205**				-0,0875				-0,666		
		(-2.16)				-0,08				-2,26				(-0.50)				(-0.58)		
DIVLOAN*DSTATE		0,118				-0,952				-0,12				-0,0126				-1,49		
		-1,23				(-1.13)				(-1.33)				(-0.07)				(-1.28)		
DIVDEP			0,834				0,738				-0,757				-0,856				8,795	
			-1,31				-0,80				(-0.56)				(-0.98)				-1,09	
DIVDEP*DFAM			-0,856				0,488				1,115				0,705				-4,609	
			(-1.26)				0,488				-0,78				-0,70				(-0.57)	
DIVDEP*DSTATE			-1.815**				0,488				2,585				1,119				-2,411	
			(-2.22)				0,488				-1,40				-1,01				(-0.21)	
DIVASSET				0.0551*				-0,0142				-0.0433*				0,02				-0,0878
				-2,01				(-0.46)				(-1.92)				-1,03				(-0.32)
DIVASSET*DFAM				-0,0043				0,0647				0,00545				0,0233				-0,176
				(-0.13)				-1,54				-0,19				-0,80				(-0.60)
DIVASSET*DSTATE				0,000257				0,0498				-0,00901				-0,0009				0,00715
				-0,01				-1,17				(-0.28)				(-0.04)				-0,02
DFAM	-0,315	0,575	3,454	0,477	-0.726**	0,0568	-1,468	-3,802	0,442	-0,505	-4,195	-0,442	-1.047**	0,15	-3,019	-2,209	2,759	1,246	21,56	13,3
	(-0.64)	-1,54	-1,26	-0,23	(-2.14)	-0,04	(-0.25)	(-1.44)	-0,95	(-1.46)	(-0.77)	(-0.24)	(-2.56)	-0,25	(-0.77)	(-1.21)	-1,36	-0,33	-0,69	-0,71
DSTATE	1.843**	-0,419	7.352**	1,702	1.347**	5.406*	12.90***	-1,701	-1.724**	0,416	-11.77*	-1,398	-0,159	0,281	-4,319	-1,97	2,776	4,88	10,82	4,474
	-2,66	(-1.23)	-2,20	-0,75	-2,05	-1,71	-2,86	(-0.65)	(-2.43)	-1,33	(-1.70)	(-0.66)	(-0.18)	-0,47	(-0.97)	(-1.36)	-1,30	-1,25	-0,26	-0,23
SIZE	-0,394	0,0781	0,159	0,145	-0,395	-0,303	-0,11	0,171	0,595	-0,0286	0,625	0,019	0.397*	0,261	0,245	0.790*	-0,749	-0,144	-0,645	-4.898**
	(-0.69)	-0,67	-0,96	-0,28	(-0.71)	(-0.63)	(-0.24)	-0,32	-1,06	(-0.26)	-1,12	-0,04	-1,80	-1,27	-1,15	-1,80	(-1.36)	(-0.42)	(-0.33)	(-2.17)
ETA	-0,0104	0.0352**	0.0384**	0,00356	-0,012	-0,00026	0,00399	0,00147	0.0868***	0.0387**	0.0697**	0.0720**	0,0191	0,0187	0,0167	0,035	-0.178***	-0.141**	-0.195*	-0.183**
	(-0.42)	-2,41	-2,49	-0,15	(-0.38)	(-0.01)	-0,17	-0,05	-3,03	-2,29	-2,32	-2,53	-0,91	-0,94	-0,85	-1,15	(-2.79)	(-2.26)	(-1.90)	(-2.45)
DLISTED	0,626	-0.467**	-0,327	0,534	0,472	0,517	0,409	0,271	-0,609	0.417**	-0.842*	-0,57	0,326	0.435*	0.443*	0,736				
	-1,13	(-2.27)	(-1.55)	-1,22	-1,15	-1,30	-0,89	-0,73	(-1.11)	-2,23	(-1.93)	(-1.27)	-1,33	-1,75	-1,89	-1,47				
CONSTANT	1,769	-2.601***	-6.090**	-6,132	4,596	1,579	-1,753	0,334	-1,762	3.791***	2,193	5,937	-2,005	-2,193	1,402	-6.435*	6,096	3,95	-27,74	42.27*
	-0,39	(-2.63)	(-2.30)	(-1.43)	-1,04	-0,37	(-0.35)	-0,07	(-0.39)	-3,89	-0,31	-1,41	(-1.20)	(-1.26)	-0,38	(-1.78)	-1,36	-0,91	(-0.71)	-2,01
N	203	209	202	209	203	209	202	209	203	209	202	209	200	206	199	206	127	127	123	127
WALD TEST																				
DIVINC+DIVINC*DFAM	6.31**				1,33				7.51***				0,63				0,01			
DIVINC+DIVINC*DSTATE	1,85				0,46				1,22				1,03				0,48			
DIVLOAN+DIVLOAN*DFAM		0.00				8.12***				0,08				0,67				5.08**		
DIVLOAN+DIVLOAN*DSTATE		15.59***				0,95				15.39***				0,02				8.26***		
DIVDEP+DIVDEP*DFAM			0,01				1				0,04				0,08				10.13***	
DIVDEP+DIVDEP*DSTATE			2.88*				9.82***				2,12				0,13				0,8	
DIVASSET+DIVASSET*DFAM				6.79**				2.82*				0,24				3.82*				8.78***
DIVASSET+DIVASSET*DSTATE				5.28**				1,45				4.71**				2,51				0,97

*Note: The dependent variable bank risk that measured by logarithm standard deviation of ROA, logarithm standard deviation of ROE, logarithm of Zscore, and logarithm of NPL. Risk measurement with Beta proxy describes stock price volatility, the regression with this proxy is only to banks listed on Indonesia Stock Exchange. The independent variables in this regression are income diversification (in logarithms), loan diversification (in logarithms), diversification of deposits (in logarithms), and asset diversification. The moderation variable is family ownership (DFAM) and state ownership (DSTATE). Superscripts ***, **, and * denotes statistical significant at the 0.01, 0.05 and 0.10 levels respectively.*

Table 3. The effect of diversification on performance moderated by family and state ownership

	PERFORMANCE															
VARIABLE	**ROA**				**ROE**				**RAROA**				**RAROE**			
DIVINC	0.846**				5.320***				-1,739				1,175			
	-2,35				-2,71				(-0.60)				-1,02			
DIVINC*DFAM	-0.826**				-4.892**				3,379				-0,0376			
	(-2.26)				(-2.27)				-1,08				(-0.02)			
DIVINC*DSTATE	-0,417				-2,845				-0,997				-2,707			
	(-0.86)				(-1.11)				(-0.29)				(-1.57)			
DIVLOAN		0,632				4,476				-1.590*				-0,671		
		-0,94				-1,25				(-1.69)				(-0.87)		
DIVLOAN*DFAM		-0,722				-5,706				1,839				0,436		
		(-1.07)				(-1.48)				1,839				-0,48		
DIVLOAN*DSTATE		-1,122				-6,88				1,839				0,323		
		(-0.96)				(-1.54)				1,839				-0,34		
DIVDEP			-2.076*				-10,04				-4,851				5,341	
			(-1.85)				(-1.33)				(-0.56)				-0,83	
DIVDEP*DFAM			2.760**				17.22**				10,54				-0,0626	
			-2,29				-2,07				-1,13				(-0.01)	
DIVDEP*DSTATE			2,282				23.52**				8,142				0,63	
			-1,03				-2,42				-0,64				-0,07	
DIVASSET				-0.0534**				-0.313**				-0.357***				-0,213
				(-2.18)				(-2.02)				(-3.30)				(-1.48)
DIVASSET*DFAM				0,0274				0,0652				0,168				0,202
				-1,00				-0,38				-1,29				-1,08
DIVASSET*DSTATE				-0,0102				0,126				-0,0147				0,144
				(-0.32)				-0,71				(-0.07)				-0,77
DFAM	1.256**	2,77	-10.54**	-1,849	7.611**	21,92	-65.13**	-4,734	-9,803	-7.564*	-43,39	-10,06	2,31	-0,489	2,036	-9,217
	-2,24	-1,06	(-2.28)	(-1.06)	-2,32	-1,45	(-2.04)	(-0.43)	(-1.03)	(-1.68)	(-1.14)	(-1.37)	-0,61	(-0.16)	-0,07	(-1.04)
DSTATE	-1.667*	2,742	-10,32	-1,325	-8,534	18,25	-97.56***	-15,16	3,117	8.845**	-33,02	0,999	7,091	-1,345	-2,63	-7,661
	(-1.91)	-0,65	(-1.28)	(-0.64)	(-1.54)	-1,04	(-2.73)	(-1.33)	-0,30	-2,39	(-0.63)	-0,09	-1,50	(-0.44)	(-0.07)	(-0.82)
SIZE	-1.206*	-1.221**	-1.239*	-1.676***	-9.202***	-9.333***	-9.015**	-11.33***	1,935	1,661	0,415	1,454	4.864***	5.012***	3.789**	4.922***
	(-1.98)	(-2.30)	(-1.92)	(-3.44)	(-2.76)	(-3.09)	(-2.54)	(-3.91)	-0,93	-0,91	-0,19	-0,67	-3,12	-3,02	-2,02	-2,84
ETA	0,0068	0,00173	-0,00534	-0,00225	-0.866***	-0.901***	-0.969***	-0.927***	-0,0756	-0,0855	-0,164	-0,0987	-0,0392	-0,0593	-0,0476	-0,0627
	-0,31	-0,08	(-0.21)	(-0.12)	(-4.76)	(-4.99)	(-4.99)	(-5.28)	(-0.48)	(-0.58)	(-1.17)	(-0.64)	(-0.37)	(-0.56)	(-0.48)	(-0.59)
DLISTED	-0,528	-0,527	-0,562	-0,529	-0,36	-0,445	-0,902	-0,794	2,893	5.523**	4.424**	4.219*	0,969	1,236	1,233	1
	(-1.43)	(-1.48)	(-1.66)	(-1.59)	(-0.54)	(-0.88)	(-1.35)	(-0.74)	-1,40	-2,47	-2,14	-1,94	-0,73	-0,99	-1,07	-0,82
CONSTANT	9.954**	9.211*	19.94***	17.97***	87.40***	81.12***	134.9***	130.0***	-0,781	-0,122	25,9	15,34	-32.22***	-27.81**	-42,27	-18,32
	-2,11	-1,76	-2,97	-4,45	-3,36	-2,91	-3,18	-5,18	(-0.04)	(-0.01)	-0,62	-0,79	(-2.73)	(-2.10)	(-1.50)	(-1.20)
N	211	217	209	217	211	217	209	217	203	209	202	209	203	209	202	209
WALD TEST																
DIVINC+DIVINC*DFAM	0,04				0,23				2.71*				0,74			
DIVINC+DIVINC*DSTATE	2,14				2.87*				2,02				0,99			
DIVLOAN+DIVLOAN*DFAM		0,35				0,79				0,21				0,26		
DIVLOAN+DIVLOAN*DSTATE		0,3				0,54				32.12***				0,28		
DIVDEP+DIVDEP*DFAM			2,47				4.10**				4.41**				2.93*	
DIVDEP+DIVDEP*DSTATE			0,01				5.90**				0,14				0,78	
DIVASSET+DIVASSET*DFAM				1,54				2.96*				4.69**				0,01
DIVASSET+DIVASSET*DSTATE				1,08				0,01				3.41*				0,37

*Note: The dependent variable bank performance that measured by ROA, ROE, risk adjusted ROA, and risk adjusted ROE. The independent variables in this regression are income diversification (in logarithms), loan diversification (in logarithms), diversification of deposits (in logarithms), and asset diversification. The moderation variable is family ownership (DFAM) and state ownership (DSTATE). The significance levels *** , ** and * are 1%, 5% and 10%, respectively.*