

# Board Characteristics and Bank's Portfolio Risk

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**Abstract**—This study aims to analyze the effect of the characteristics of boards on bank portfolio risk. Using data from 74 commercial banks in Indonesia in 2011-2017, this research performs panel data regression. The result of data analysis using panel data fixed-effect model shows that the characteristics of directors, age, gender, and the education level have influences on bank portfolio risk. Moreover, bank-specific factors such as the size of the managed public savings, the number of loans granted, the level of profitability also have significant effects on the level of bank risk. These results indicate that the characteristics of the board of directors, as the specific factors of banks, influence the level of risk of banks in Indonesia.

**Index Terms**—Bank; Executive; Portfolio Risk; Age; Female; Education

## I. INTRODUCTION

Public attention to the quality of governance in the banking industry is increasing in line with the increasing frequency of failures in the management of banks, both individual and systemic, that endanger the economy of many countries since governance is considered important in influencing banks to avoid financial failures that can lead to banking crises [1]. Many pieces of research have been done to understand how the role of the board of directors as part of corporate governance impact the behavior of companies. Bank boards are more critical as governance mechanisms because the directors' fiduciary responsibilities extend beyond shareholders to depositors and regulators (Macey and O'Hara, 2003). In bank lending activities, the role of the board is more important because other stakeholders such as shareholders or debtholders cannot implement effective governance in banks [2]. Ruigrok et al. (2006) in O'Connell et al. [3] show that the board also has an important role regarding activities such as designing and implementing strategies and fostering relationships between companies and their external environment. Given their multi-faceted tasks, it seems reasonable that the board can influence company performance.

One of the relatively new topics is the diversity of individual characteristics of the members of the board of directors. The characteristics and composition of the board of directors affect the decision making by the board of directors that ultimately affects the company's performance [4], [5], [6]. Diversity in board members provides unique characteristics for companies that can create added value and can influence policy making [4], [5], (Elsaid, 2014). Previous studies have tried to see the influence of the composition of the board of directors,

ranging from the number of directors, sex, age, or educational background to the level of bank risk [7], [8], (Meca et al., 2015). However, the previous researches still show different results related to the influence of each aspect of the diversity of bank performance.

This study aims to see the influence of the characteristics on the composition of the board of directors, including the age of the board of directors, the number of female directors and the educational background of the board of director, to risk level in Indonesian banking. We use publicly available bank data in Indonesia during 2011-2017. The banking industry in Indonesia controls about 85% of financial assets, thus becoming the center of intermediaries between the surplus unit and deficit unit in the Indonesian economy. However, knowledge of the influence of diversity of the board of directors' characteristics to banking risk level in Indonesia is still minimal. One previous research by Kusumastuti et al. [9] found that the presence of female directors, educational background and age were found to have no significant effect on firm value. Meanwhile, another study by Darmadi [10] showed an increase in the number of female directors to reduce the company's performance, while the decline in the average age of directors improves the performance of the company.

One of the contributions of this study is related to the influence of the board of commissioners. Previous research mostly uses the context of a one-tier system, so the focus is more on the board of directors. Meanwhile, in Indonesia the current governance system is two-tier in which there is a board of commissioners and a board of directors. The results of this study will provide insight into the role of the board of commissioners compared to the board of directors.

The rest of the paper is organized as follows. Section 2 reviews relevant studies about the effects of age, gender, and educational background on risk-taking. Section 3 discusses the methodology. Section 4 describes the data and presents the empirical results. Section 5 concludes the paper.

## II. LITERATURE REVIEW

### A. Age and Risk Taking

Executives have different attitudes toward risk at various stages of their career, so risk taking is thought to be influenced by one's age. Some empirical studies try to see the effect of age on risk taking. Regarding investment behavior, Campbell (2001) reported an adverse age effect on participation in equity

investment decision making. Agarwal et al. [11] analyzed life-cycle patterns in financial decisions relating to credit behavior. This study concludes the U curve relationship between age and mismanagement of financial management in credit. The Bucciol and Miniaci [12] studies show that tolerance to risk decreases with age. Surveys conducted by Sahm [13] and Grable et al. [14] also found similar results which indicate that older people tend to be less tolerant of risk.

Some researchers have used banking industry data to understand the effect of age on risk level taken by directors. Berger et al. [8] show board changes that lead to a decrease in the average age of board members significantly raising the risk of bank portfolio.

### *B. Gender and Risk Taking*

The term gender is used to describe the characteristics of men and women in society. Empirical evidence of differences in the behavior of boards of directors differentiated by sex on the executive level is small. One of them is due to the small number of female board of directors in the leadership position of the company. Generally, men will be more confident about their ability to make financial decisions than women (Barber and Odean (2001)). Research by Adams and Ferreira [5], concluded that the influence of gender diversity is highly dependent on the company's management system. If the management system is not good, the increase of female directors will increase the company's performance, but if the governance system is good, the additional women will lower the company's value.

Adams and Funk [15] outline some explanations using an extensive survey of the board of directors in Sweden. The results show that female and male board of directors are systematically different in risk behavior. Female board of directors are more cautious and universal, but less oriented than male. Male board of directors, on the other hand, are more risk tolerant than the female board of directors. Ahern and Dittmar [6] use company data in Norway. In 2013 there is a policy that requires companies to have at least 40% female board of directors. The policy was considered to have an impact on the decline in the value and performance of the company in the next year. Female board of directors are associated with lack of experience.

The influence of sex on risk-taking in banking was also investigated by Berger et al. [8], which explains that the increase in the number of female board of directors significantly positively affects the portfolio risk. Berger et al. [8] revealed that banks in Germany have a separate picture of the female's presence in council members. The results show that after the increase in representation of female board of directors, portfolio risk increases. This result suggested that female executives have less experience than male.

Other research in the banking industry by Agarwal and Wang [11] and Beck et al. [16] indicate that credit approval level given by female loan officer is relatively less than the male loan officer. These results suggested that women are less risk tolerant than men.

### *C. Education and Risk Taking*

The level of education of the board members is considered not only to affect the knowledge possessed, but also the degree of risk acceptance. Results of research on the influence of educational background on risk taking are varied. A study conducted by Graham and Harvey (2001) shows that boards of directors who have an MBA degree tend to use more complicated methods and tools to try to lower corporate risk. Research by Berger et al. [8] indicates that the background of the board's education level further reduces portfolio risk. The argument put forward for this result is a board of directors with higher education able to apply better risk management techniques.

Bertrand & Schoar [4] instead reported that executive boards with MBA degrees tend to be more aggressive and run firms with higher levels of leverage or are more willing to engage in risky corporate policy. Another study by Bucciol and Miniaci [12] found no significant association between educational background and risk-taking attitudes.

## III. RESEARCH METHODOLOGY

### *A. Data*

This study uses data of all commercial banks in Indonesia which have a complete Annual Report in the period 2011-2017. The number of commercial banks in Indonesia is 115 banks. Of these, there are 41 banks whose data are incomplete, leaving 74 banks in the study sample. This research data is balanced panel, with a total of 518 observation — secondary data in the form of annual reports from 2011 to 2017 obtained from financial statements published in the Financial Services Authority and each bank's website.

### *B. Empirical Model*

This research model refers to the research of Rachdi and Ben Ameer [7] and Berger et al. [8]. The dependent variable is the level of risk, measured by using risk-weighted assets divided by total assets. This ratio is widely used as a standard measure of risk in banking supervision and regulation. The advantages of this measure as the dependent variable are more likely to reflect changes in bank portfolio risk in the absence of time-lag. Also, since the sample consists of commercial banks, it is usually the main risk arising from the side of the balance sheet assets rather than the liability side [8].

While the independent variables of characteristics of the boards are board size (COMMSIZE & DIRSIZE), the age of board (AGE), the gender of board (FEMALE), educational background level of the board (EDUCATION), as well as the experience of the board while working at the bank (TENURE). Also added are control variables such as bank size (BANKSIZE), the return of equity (ROE), charter value (CHARTERVALUE), CEO power (CEOPOWER), and LDR. The definitions of each variable in the above research model can be seen in Table I.

This research conducts the panel data regression method for estimation. To ensure the available data are appropriate for the selected estimation method, standard assumption tests

**TABLE I: Definitions of Variables**

No.	Variable	Explanation
1	Risky asset ratio (ATMR/TA)	Risk-weighted assets divided by total assets.
2	Board size (COMMSIZE/DIRSIZE)	The number of personnel of the board of directors/board of commissioners in a company.
3	Age of board (AGE)	The average number of members of the board of directors/board of commissioners ages.
4	Female (FEMALE)	The percentage of the number of councils of female to the total number of members of the board of directors/board of commissioners.
5	Educational background (EDUCATION)	Percentage of the number of members of the board of directors/board of commissioners educated at least S2 level to the total members of the board.
6	Board member experience (TENURE)	The average years of experience the members of the board of directors/board of commissioners works in the bank.
7	Bank size (BANKSIZE)	Log of bank's total asset.
8	Profitability (ROE)	Percentage net income over total equity.
9	Charter value (CharterValue)	Total third-party funds consisting of the current account, savings account, and time deposit on total assets.
10	CEO power (CEOPOWER)	The average term of the board of directors/board of commissioners.
11	LDR	The level of the bank's ability to channel third-party funds collected by banks.

**TABLE II: Descriptive Statistics of Model 1**

Variable (unit)	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
<b>ATMRTA</b>	0,67056	0,67578	0,99943	0,12060	0,11721	518
<b>DIRSIZE</b>	555,599	500,000	1,200,000	200,000	224,594	518
<b>AGE</b>	5,233,784	5,200,000	6,100,000	4,300,000	335,976	518
<b>FEMALE</b>	0,15281	0,09100	0,75000	0,00000	0,18158	518
<b>EDUCATION</b>	0,50635	0,50000	100,000	0,00000	0,28934	518
<b>TENURE</b>	2,242,664	2,400,000	3,800,000	100,000	671,479	518
<b>BANKSIZE</b>	425,777	413,499	721,286	252,244	0,75821	518
<b>ROE</b>	0,11508	0,11390	0,57980	-142,480	0,16160	518
<b>CHARTERVALUE</b>	0,74431	0,77312	0,90098	0,06288	0,12951	518
<b>CEOPOWER</b>	334,942	200,000	3,300,000	0,00000	475,019	518
<b>LDR</b>	0,90961	0,87800	289,200	0,42020	0,22694	518

such as multicollinearity tests, heteroscedasticity tests, and autocorrelation were performed. Whereas to determine the panel data estimation model used (pooled least square, fixed effect, and random effect) the chow test and thirist test were carried out.

We have two regression models, first related to the Board of Directors and second related to the Board of Commissioners:

$$\begin{aligned}
 ATMRTA_{i,t} = & \alpha + \beta_1 DIRSIZE_{i,t} + \beta_2 AGE_{i,t} + \beta_3 FEMALE_{i,t} + \\
 & \beta_4 EDUCATION_{i,t} + \beta_5 TENURE_{i,t} + \\
 & \beta_6 BANKSIZE_{i,t} + \beta_7 ROE_{i,t} + \\
 & \beta_8 CHARTERVALUE_{i,t} + \beta_9 CEOPOWER_{i,t} + \\
 & \beta_{10} LDR_{i,t} + \varepsilon_{i,t}
 \end{aligned} \quad (1)$$

$$\begin{aligned}
 ATMRTA_{i,t} = & \alpha + \beta_1 COMMSIZE_{i,t} + \beta_2 AGE_{i,t} + \beta_3 FEMALE_{i,t} + \\
 & \beta_4 EDUCATION_{i,t} + \beta_5 TENURE_{i,t} + \\
 & \beta_6 BANKSIZE_{i,t} + \beta_7 ROE_{i,t} + \\
 & \beta_8 CHARTERVALUE_{i,t} + \beta_9 CEOPOWER_{i,t} + \\
 & \beta_{10} LDR_{i,t} + \varepsilon_{i,t}
 \end{aligned} \quad (2)$$

#### IV. RESEARCH RESULTS AND DISCUSSION

##### A. Data Description

Table 2 & 3 show the results of the descriptive statistical analysis for the independent variables and dependent variables. It reveals some interesting data. All the commercial banks in Indonesia have an average number of board of commissioner

members between 4-5 people, while the average number of board of director members are between 5-6 people.

The average age of board of commissioner members in the banks are 59 years, while the average board of director members in the banks are 52 years. The percentage of female commissioners in banks averaged 7.17% of the total board members, and the percentage of female directors in banks averaged 15.28%. These figures are still relatively small. The average percentage of the commissioner with a minimum educational background of Masters degree in the banks is 54%, and the average percentage of the director is 51%. The average experience of the board of commissioner of working in the bank are 20 years and board of director are 22 years.

##### B. Results

In this study, multicollinearity was tested using correlation test for each regression model. There is no correlation coefficient on variables, and the results show values of under 0.8. However, the Breusch-Pagan LM Test results show that both models are heteroscedastic. The autocorrelation test using Durbin-Watson Stat indicates that both models also contain autocorrelation problems. To overcome this problem Generalized Least Square (GLS) method is used. The results of the Chow Test and Hausman Test show that the more appropriate estimation model used is the Fixed Effect Model.

The  $R^2$  value for model 1 (director) is 0.4905. Based on the results of the regression model 1, the characteristics of the board of directors that significantly effect the risk level of the bank portfolio are the size of directors, the age of directors, the

**TABLE III: Descriptive Statistics of Model 2**

Variable (unit)	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
ATMRTA	0,67056	0,67578	0,999426	0,120603	0,117212	518
COMMSIZE	423,745	400,000	1,100,000	100,000	162,297	518
AGE	5,910,039	5,900,000	7,500,000	4,000,000	549,746	518
FEMALE	0,07171	0,00000	0,66700	0,00000	0,13871	518
EDUCATION	0,53867	0,50000	100,000	0,00000	0,29907	518
TENURE	1,980,405	2,000,000	4,700,000	0,00000	1,101,383	518
BANKSIZE	425,777	413,499	721,286	252,244	0,75821	518
ROE	0,11508	0,11390	0,57980	-142,480	0,16160	518
CHARTERVALUE	0,74431	0,77312	0,90098	0,06288	0,12951	518
CEOPOWER	462,162	300,000	3,300,000	0,00000	574,033	518
LDR	0,90961	0,87800	289,200	0,42020	0,22694	518

**TABLE IV: Correlation Matrix of Model 1**

	ATMRTA	DIRSIZE	AGE	FEMALE	EDUCATION	TENURE	BANKSIZE	ROE	CHARTERVALUE	CEOPOWER	LDR
ATMRTA	1	0,171853	0,072208	0,176108	-0,145378	0,146745	0,043593	-0,23304	-0,037808	0,068714	0,189018
DIRSIZE	0,171853	1	-0,04186	0,081348	0,133555	-0,219815	0,743978	0,124133	0,056243	0,007319	-0,08533
AGE	0,072208	-0,041858	1	-0,192094	0,149623	0,406252	0,06409	0,108364	0,261728	0,226741	-0,10209
FEMALE	0,176108	0,081348	-0,19209	1	-0,140774	0,002601	-0,056062	-0,07506	-0,136714	0,293043	0,107098
EDUCATION	-0,14538	0,133555	0,149623	-0,140774	1	-0,185527	0,334966	0,130176	0,150297	-0,08759	-0,04139
TENURE	0,146745	-0,219815	0,406252	0,002601	-0,185527	1	-0,231547	-0,08566	0,161174	0,165415	-0,13496
BANKSIZE	0,043593	0,743978	0,06409	-0,056062	0,334966	-0,231547	1	0,166614	0,09858	-0,087179	-0,07224
ROE	-0,23304	0,124133	0,108364	-0,075058	0,130176	-0,085656	0,166614	1	0,020352	0,05408	0,032303
CHARTER VALUE	-0,03781	0,056243	0,261728	-0,136714	0,150297	0,161174	0,09858	0,020352	1	0,100731	-0,71003
CEOPOWER	0,068714	0,007319	0,226741	0,293043	-0,08759	0,165415	-0,087179	0,05408	0,100731	1	-0,02984
LDR	0,189018	-0,085327	-0,10209	0,107098	-0,041388	-0,13496	-0,072235	0,032303	-0,710029	-0,029844	1

**TABLE V: Correlation Matrix of Model 2**

	ATMRTA	COMMSIZE	AGE	FEMALE	EDUCATION	TENURE	BANKSIZE	ROE	CHARTERVALUE	CEOPOWER	LDR
ATMRTA	1	0,095624	-0,04339	0,035347	-0,170449	0,233114	0,043593	-0,23304	-0,037808	0,112361	0,189018
COMMSIZE	0,095624	1	-0,00701	-0,037993	0,100185	-0,16398	0,672787	0,059179	0,069407	-0,134424	-0,04845
AGE	-0,04339	-0,007013	1	-0,248559	-0,182824	0,318535	-0,075908	0,037541	0,10002	0,385636	-0,09697
FEMALE	0,035347	-0,037993	-0,24856	1	-0,142136	0,10028	0,082822	-0,15465	-0,16146	-0,069313	0,039207
EDUCATION	-0,17045	0,100185	-0,18282	-0,142136	1	-0,35566	0,290726	0,205373	0,141458	-0,342763	-0,03212
TENURE	0,233114	-0,163979	0,318535	0,10028	-0,355656	1	-0,257691	-0,2729	0,0668	0,307472	-0,09123
BANKSIZE	0,043593	0,672787	-0,07591	0,082822	0,290726	-0,25769	1	0,166614	0,09858	-0,259349	-0,07224
ROE	-0,23304	0,059179	0,037541	-0,154645	0,205373	-0,2729	0,166614	1	0,020352	-0,027372	0,032303
CHARTER VALUE	-0,03781	0,069407	0,10002	-0,16146	0,141458	0,0668	0,09858	0,020352	1	0,063412	-0,71003
CEOPOWER	0,112361	-0,134424	0,385636	-0,069313	-0,342763	0,307472	-0,259349	-0,02737	0,063412	1	-0,07452
LDR	0,189018	-0,04845	-0,09697	0,039207	-0,032116	-0,09123	-0,072235	0,032303	-0,710029	-0,074519	1

**TABLE VI: Summary of Regression Results**

	<b>Model 1</b>			<b>Model 2</b>		
	<b>Dep. Var.: ATMRTA</b>			<b>Dep. Var.: ATMRTA</b>		
<b>Ind. Var.</b>	<b>Coefficient</b>	<b>t-Statistic</b>	<b>Prob.</b>	<b>Coefficient</b>	<b>t-Statistic</b>	<b>Prob.</b>
<b>DirSize</b>	0,027926	10,799,460	0,00000***	-	-	-
<b>CommSize</b>	-	-	-	-0,00253	-0,952332	0,34150
<b>Age</b>	0,005413	4,025,407	0,00010***	-0,00023	-0,287905	0,77360
<b>Female</b>	0,190253	6,732,538	0,00000***	0,037744	1,467,330	0,14300
<b>Education</b>	-0,034023	-2,473,707	0,01370**	0,045104	3,088,036	0,00210***
<b>Tenure</b>	0,000155	0,273458	0,784600	0,000948	1,737,334	0,08300*
<b>BankSize</b>	-0,070249	-7,959,153	0,00000***	0,001392	0,099125	0,92110
<b>ROE</b>	-0,27857	-9,713,148	0,00000***	-0,043741	-2,023,809	0,04360**
<b>CharterValue</b>	0,272179	4,396,098	0,00000***	0,143063	2,417,964	0,01600***
<b>CEOPower</b>	-0,001298	-1,558,863	0,11970	-0,000172	-0,201424	0,84050
<b>LDR</b>	0,265138	7,737,840	0,00000***	0,247092	8,739,235	0,00000***
<b>R<sup>2</sup></b>		0,490517			0,877479	
<b>Adjusted R<sup>2</sup></b>		0,480468			0,854047	
<b>F-statistic</b>		4,881,262			3,744,871	
<b>Prob (F-statistic)</b>		0,000000			0,000000	
<b>Total Observation</b>		518			518	
<b>Estimation Model</b>		Fixed Effect			Fixed Effect	

Note: \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

percentage of female, and educational background. However, the tenure does not affect the risk level of the bank portfolio. The size of directors, the age of directors, and the percentage of female variables have a significant positive relation to the dependent variable of risky assets ratio. In line with Ahmadi et al. [17] companies with gender diversity present high-level financial performance, as measured by ROE and ROA. Having at least one female director made banks outperform other banks without a female director. Gender diversity on the board of directors adds value by bringing more perspectives, increasing collaboration and mentoring managers and enhancing relationships with stakeholders. Similarly, Smith et al. [18] states that the presence of female directors can better understand certain market conditions than male, which can bring more creativity and quality to make decisions. Higher gender diversity in the council can produce a better public image and improve company performance.

The  $R^2$  value for model 2 is 0.8775. Based on the results of the regression model 2, we can see that the characteristics of the board of commissioners that significantly effect the risk level of the bank portfolio are the educational background and tenure. The educational background and tenure have a significant positive influence on the risky assets ratio. These results are different from those of Berger et. al. [8] which indicates that an increase in the educational background of the board of directors leads to an increased level of risk for a bank, and suggests that an increase in the education level of members of the board of directors will cause them to be more moderate to risk. The results of this study further reflect that directors with higher education levels are relatively more aggressive and tend to be more daring to take a riskier strategy which is also shown in research by Bertrand and Schoar (2003).

The risk level of the banking portfolio is more influenced by the specific variables of the bank, which is the ROE that

positively affects the bank portfolio risk, as well as the Charter value and LDR variables that also have a significant and positive influence. This result is in line with previous research by Berger et al. [8].

Overall, the result of data analysis shows that the influence of the diversity characteristics of the board of directors to the level of banking risk in Indonesia is still relatively small. This result is in line with the research of Kusumastuti et al. [9] indicating that the characteristics of the board of directors such as sex and education level do not affect company performance in Indonesia. The level of banking risk in Indonesia is more affected by the characteristics of the bank itself, namely the size, the level of intermediation and profitability.

The limited influence of the characteristics of the boards such as sex and age may be due to the less diversity found in terms of these characteristics. The portion of the female commissioner is about 7,17%, while the age of commissioners is 59 years.

## V. CONCLUSION

This study aims to determine the effect of characteristics of the board of director on the level of risk in Indonesian banking. Characteristics of the board are proxied with age, number of female directors and the level of education of the board of directors. The Model 1 results of data analysis indicate the influence of characteristics of the board of directors to the level of risk in a bank is relatively limited. Only the educational background has a positive effect on the level of risk. Meanwhile, the results of data also shows that the level of bank risk is more influenced by the characteristics of the bank namely the size, intermediation level, and profitability.

This study has several limitations, including (1) The number of samples used is limited to banks in Indonesia, the number of which is still less than half of the commercial banks operating

in the research year, namely 115 commercial banks. (2) The use of the GLS method causes the  $R^2$  value of the estimation to be relatively large at 92%. Although the value of  $R^2$  shows how much the independent variables affect the dependent variable, the use of the GLS method causes this number to become “overestimated”. (3) The variable characteristics of the members of the board of directors may not be able to capture the ability of the members to make decisions. We need to see the commitment and capacity of the members of the board of directors themselves. One variable that is widely used in measuring this is the board meeting which influences the ability of members of the board of directors to solve problems faced by the company (Al-Musali and Ismail 2015; Brick and Chidambaram 2010).

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