

INTELLECTUAL CAPITAL AND BANKING PERFORMANCE: EXAMINING THE MODERATING EFFECT OF FIRM SIZE IN INDONESIA

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ABSTRACT

This study's overarching goal is to learn how intellectual capital affects banks' bottom lines and how company size moderates that effect. This study takes a quantitative tack by sifting through the 2020–2024 annual reports of Indonesian commercial banks for secondary data. The OJK has registered 105 commercial banks, making them the population. Value Added Intellectual Coefficient (VAIC) is used to assess intellectual capital, ROA is used as a proxy for financial success, and the natural logarithm of the total number of workers is used to measure business size. We used EViews 14's panel data regression to examine the data. The FEM was determined to be the best suitable model after conducting model selection using the Chow and Hausman tests. MRA was used to test the moderating impact. Intellectual capital does not significantly impact the financial performance of banks, according to the data. A moderating effect of company size is shown in the correlation between IP and bottom-line results. While these results do not show that intellectual capital improves financial performance on its own, they do suggest that it works better when a company is bigger. The correlation between IP and banks' bottom lines is, thus, completely moderated by business size.

Keywords: Intellectual Capital, Financial Performance, Return on Assets, Firm Size, Banking.

1. INTRODUCTION

The banking industry in Indonesia is currently struggling to navigate difficult times due to rapid shifts in customer behavior in the digital age. Although banks continue to expand their physical networks and assets, data shows that *Return on Assets* (ROA) is under pressure and unstable (Panjaitan et al., 2025). This makes us realize that relying on physical assets such as large branch offices or simply piles of capital is no longer sufficient to guarantee success in competition. This uncertainty is compounded by the fact that even experts still hold differing

views on which factors are actually most critical to a bank's financial resilience today (Wahyuningtias & Kusumawardhani, 2024).

In these challenging times, there is a growing recognition that These days, a company's capacity to handle intangible assets is just as important as its physical and financial capital when it comes to determining the banking industry's trajectory. Knowledge, creativity, and the quality of human resources are essential for banks to produce value in the face of business change, industry competitiveness, changing client requirements, and technology improvements, and effective organizational systems (Ekaputra et al., 2020). These conditions make *intellectual capital* a key factor in enhancing banking financial performance. In accordance with the *Resource-Based View* theory, an organization will possess far greater competitiveness if it is able to manage knowledge, smart work systems, and the expertise of its employees (Barney, 1991).

Intellectual capital serves as the primary driving force because, in the modern banking world, technological sophistication and analytical acumen often determine the final outcome (Osman & Yilmaz, 2025). Therefore, this intangible asset is believed to be the key to improving a bank's financial performance so that it remains relevant in the future. Various studies, such as those conducted by (Fitri & Nuraini, 2023) and (Cahyaningrum & Atahau, 2021), indicate that intellectual capital management is the primary key to a bank's future financial health. The findings of these studies demonstrate that intellectual capital can enhance corporate efficiency through knowledge-based resource management, thereby increasing the bank's profitability.

However, in reality, not all banks are able to reap the same benefits from their intellectual capital, and this is where *firm size* is considered to have a decisive influence. Banks with large assets typically have greater financial resilience and more comprehensive resources to fully develop their intellectual capital potential (Kartika et al., 2021). With strong financial backing, large banks can provide the latest technology and significantly higher-quality employee training compared to smaller banks. It is this role of firm size that is believed to strengthen the relationship between organizational intelligence and a bank's ability to generate higher profits.

Differences in business scale among banks lead to the assumption that physical asset capacity remains a crucial foundation for supporting the effectiveness of knowledge capital. Banks with substantial resources tend to be more stable in the face of economic shocks, allowing the process of value creation through intellectual capital to proceed more consistently (Wahyudi & Lydia, 2023). The integration of intellectual capital and firm size as a moderator is expected to shed clearer light on the secrets behind a bank's financial success (Fitri & Nuraini, 2023). This is crucial so that bank management no longer has to merely guess which strategies are most effective for sustainably improving their profitability. (This shows that managing a bank's intellectual capital is crucial to its long-term viability. This discussion forms the basis of the study, which intends to analyse the influence of intellectual capital on ROA across 105 commercial banks registered with the OJK, with company size serving as a moderating variable.

2. LITERATURE REVIEW

Intellectual Capital and Financial Performance

Organization's ability to generate value and enhance its performance is directly correlated to its intellectual capital, an intangible asset. When properly managed, intellectual capital may increase a company's competitive edge, according to the RBV. Intellectual capital is gaining prominence in the banking sector as a whole. This is due to the fact that the quality of a bank's people resources, technology, information system, and innovative skills have a direct impact on the efficiency and effectiveness of the bank's operational activities. According to (Ur Rehman et al., 2022) "the banking business has become more knowledge-intensive due to globalisation. As a result, intellectual capital is seen as crucial for companies to be competitive and financially stable. Common methods for calculating intellectual capital include the VAIC a combination of VACA, VAHU, and STVA which stands for Value Added Capital Employed, Value Added Human Capital, and Structural Capital Validation" (Wahyudi & Lydia, 2023).

"Since ROA shows how profitable a firm is relative to its total assets, it is used as a proxy for financial success in this research. Because knowledge-based asset management may lead to operational efficiency and a rise in value contributed, intellectual capital is thought to improve a company's financial success" (Ardiantini et al., 2020). Human capital efficiency, structural capital efficiency, and relational capital efficiency are the main parts of intellectual capital that may boost a bank's performance (Osman & Yilmaz, 2025). "Research also shows a correlation between intellectual capital and the bottom line for banks" (Cahyaningrum & Atahau, 2021) "The study's findings also show that intellectual capital affects Islamic banking in Indonesia's profitability" (Fitri & Nuraini, 2023).

H1: "Intellectual capital has a positive effect on banking financial performance"

Intellectual capital may have a greater effect on a company's bottom line if the firm is larger. In order to enable optimum intellectual capital management, larger organisations often have more resources. "These resources might be used to increase technology capabilities, improve human resources, or reinforce organisational structures. A large firm's size in the banking industry also indicates its operational stability and capacity to grow commercial operations, which allows for better utilisation of intellectual capital. Management of knowledge-based resources is crucial to the success of financial institutions, according to research" (Ur Rehman et al., 2022). Furthermore, (Wahyudi & Lydia, 2023) states that intellectual capital, comprising VACA, VAHU, and STVA, plays a role in creating corporate value added through efficient resource management.

Large companies tend to have greater capacity to support the development of intellectual capital because they have access to funding, infrastructure, and stronger investment capabilities (Kartika et al., 2021). (Metalia, 2023) "also explains that large banks are better able to allocate resources to support innovation and improve operational efficiency, thereby strengthening the influence of intellectual capital on company performance". In line with this, (Viriany & Wirianata, 2021) "found that firm size strengthens the relationship between intellectual capital

and financial performance because companies with large total assets possess greater organizational stability and a better ability to convert intellectual capital into corporate economic value”. Additionally, (Cahyaningrum & Atahau, 2021) “explains that optimal management of intellectual capital can improve the financial performance of banking companies”. Intellectual capital affects the profitability of Islamic banking in Indonesia, according to the study (Fitri & Nuraini, 2023) as well. Consequently, it is believed that bigger corporations would be better able to maximise the use of intellectual capital in order to boost their financial performance. The following theories are developed from existing literature and theoretical frameworks:

H2: “Firm size amplifies the effect of intellectual capital on banking financial performance.”

3. METHODS

“The purpose of this quantitative study is to examine the relationship between intellectual capital and financial performance in the banking industry, with a particular focus on the moderating effect of business size”. Secondary data utilised in this study comes from yearly reports published on the websites of banks and the OJK. This research looks at the years 2020–2024 as an observational span. All Indonesian commercial banks that are members of the Financial Services Authority's registry are considered part of the study's population. One hundred and fifty-five commercial banks make up the study population, according to the OJK's 2025 SPI. This study employed a purposive sample strategy that adhered to the following guidelines:

- a. Commercial banks registered with the OJK.
- b. Banks that were not subject to a suspension of business operations or in bankruptcy during the study period.

The study employed a purposive sampling technique and obtained a final sample of 105 commercial banks registered with the OJK during the 2020–2024 period.

“The dependent variable in this study is financial performance, proxied using ROA. ROA is used to measure a company’s ability to generate profit based on its total assets.”

$$ROA = \frac{\text{Laba Bersih}}{\text{Total Aset}}$$

Intellectual capital, as evaluated by the VAIC approach, serves as the independent variable in this study. Pulic devised the VAIC approach to evaluate the efficacy of a business's value creation process by analysing the following factors: capital employed, human capital, and structural capital.

$$VAIC = VACA + VAHU + STVA$$

Explanation:

- VACA = Value Added Capital Employed

- VAHU = Value Added Human Capital
- STVA = Structural Capital Value Added

This study uses company size as its moderating variable. The size of a firm is determined by the natural logarithm of its employee count. This is because a large workforce is indicative of a well-run business and an efficient use of resources. Here is the formula for calculating the size of a firm:

$$\text{Ln (Total Employees)}$$

Panel data regression in EViews 14 was the method of choice for this study's data analysis. Statistical descriptive analysis of the study data is the first step in the analysis process. “The Chow and Hausman tests were then used to choose the best panel data regression model. The t-test, the F-test, and the (R2) were used to test the hypotheses. The impact of intellectual capital and business size on financial performance was tested for moderation using MRA”. An interaction variable was created for this purpose.

4. RESULTS AND DISCUSSION

Descriptive Statistics

Financial performance proxies ROA and VAIC and Firm Size (the natural logarithm of the number of workers) are the variables utilised in this study. In the table below, you can see the descriptive statistics.

Table 1. Descriptive Statistics

Variable	Mean	Max	Min	Std. Dev
ROA	1.166296	11.43000	-14.11000	2.478450
VAIC	2.345212	17.65762	-196.0461	9.069026
FS	7.175275	11.38718	3.688879	1.386652

The descriptive statistics show that the ROA variable averages out at 1.166296. Over the course of the research period, some banks achieved very high levels of profitability (ROA > 11.43000), while others lost money (ROA < 14.11000). “There is a rather substantial amount of variance in ROA statistics between banking organisations, as seen by the standard deviation of 2.478450. The range of values for the intellectual capital variable, as measured by VAIC, is from -196.0461 to 17.65762. The mean value is 2.345212. Throughout the research period, there was a considerable variation in the amount of intellectual capital among banks, as shown by the standard deviation of 9.069026.” The range of values for the company size variable is from 3.688879 to 11.38718, with an average of 7.175275. Firm size in the banking industry is comparatively more stable than other variables, according to the standard deviation of 1.386652.

Selection of the Panel Data Regression Model

The CEM, the FEM, and the REM are the three best estimating models to choose from because this study employs panel data regression. Two tests, the Chow and the Hausman, were used to pick the models.

a. Chow Test

The Chow test is used to determine the best model between the CEM and the FEM. If the probability value is < 0.05 , the selected model is the Fixed Effect Model.

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.527383	(104,414)	0.0000
Cross-section Chi-square	453.621389	104	0.0000

Figure 1. Chow Test

The results of the Chow test show a probability value of 0.0000 for the cross-sectional F-statistic and 0.0000 for the cross-sectional chi-square statistic. “These values are less than 0.05, so H_0 is rejected. Therefore, the most appropriate model to use in this study is the Fixed Effects Model (FEM).”

b. Hausman Test

The Hausman test is used to determine the best model between the Fixed Effect Model (FEM) and the Random Effect Model (REM). If the probability value is less than 0.05, the selected model is the Fixed Effect Model.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.709634	2	0.0349

Figure 2. Hausman Test

The results of the Hausman test show a probability value of 0.0349. “This value is less than 0.05, so H_0 is rejected. Thus, the best model to use in this study is the Fixed Effect Model (FEM).”

Dependent Variable: Y				
Method: Panel Least Squares				
Date: 05/29/26 Time: 18:41				
Sample: 2020 2024				
Periods included: 5				
Cross-sections included: 105				
Total panel (unbalanced) observations: 521				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.129481	0.079857	14.14388	0.0000
X	0.015698	0.009647	1.627168	0.1045
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.602987	Mean dependent var	1.166296	
Adjusted R-squared	0.502538	S.D. dependent var	2.478450	
S.E. of regression	1.748075	Akaike info criterion	4.134346	
Sum squared resid	1268.143	Schwarz criterion	5.000199	
Log likelihood	-970.9970	Hannan-Quinn criter.	4.473505	
F-statistic	6.002921	Durbin-Watson stat	1.979196	
Prob(F-statistic)	0.000000			

Figure 3. Heteroscedasticity Test

The test results show that intellectual capital has a probability value of 0.1045, “which is greater than 0.05. This indicates that intellectual capital does not have a significant effect on banking financial performance”. Thus, the first hypothesis (H1) is rejected.

Output 1

Dependent Variable: Y				
Method: Panel Least Squares				
Date: 05/29/26 Time: 18:44				
Sample: 2020 2024				
Periods included: 5				
Cross-sections included: 105				
Total panel (unbalanced) observations: 521				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.134288	2.881586	1.434726	0.1521
X	0.014161	0.009758	1.451255	0.1475
Z	-0.418270	0.400964	-1.043162	0.2975
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.604028	Mean dependent var	1.166296	
Adjusted R-squared	0.502644	S.D. dependent var	2.478450	
S.E. of regression	1.747889	Akaike info criterion	4.135559	
Sum squared resid	1264.818	Schwarz criterion	5.009581	
Log likelihood	-970.3132	Hannan-Quinn criter.	4.477919	
F-statistic	5.957819	Durbin-Watson stat	1.973004	
Prob(F-statistic)	0.000000			

Figure 4. Output 1 Moderating Test

Output 2

Dependent Variable: Y				
Method: Panel Least Squares				
Date: 05/29/26 Time: 18:49				
Sample: 2020 2024				
Periods included: 5				
Cross-sections included: 105				
Total panel (unbalanced) observations: 521				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.249712	2.960293	0.422158	0.6731
X	0.783946	0.220175	3.560555	0.0004
Z	-0.039467	0.410166	-0.096223	0.9234
XZ	-0.100604	0.028747	-3.499584	0.0005
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.615432	Mean dependent var	1.166296	
Adjusted R-squared	0.515798	S.D. dependent var	2.478450	
S.E. of regression	1.724620	Akaike info criterion	4.110175	
Sum squared resid	1228.392	Schwarz criterion	4.992365	
Log likelihood	-962.7007	Hannan-Quinn criter.	4.455734	
F-statistic	6.176940	Durbin-Watson stat	2.015197	
Prob(F-statistic)	0.000000			

Figure 5. Output2 Moderating Test

The test results “show that the interaction variable between intellectual capital and firm size (XZ) has a probability value of 0.0005, which is less than 0.05. This indicates that firm size moderates the relationship between intellectual capital and banking financial performance.”

The Effect of Intellectual Capital on Financial Performance

Intellectual capital does not significantly affect the financial performance of banks, according to the study's conclusions. Based on these results, it appears that banks' efforts to manage intellectual capital have not yet resulted in increased profits for their clients. This situation may arise because not all banks possess the same capacity to optimally manage knowledge-based resources. Intellectual capital such as technology, human resource quality, and organizational systems requires adequate resource support to create efficiency and improve corporate profitability. These findings indicate that intellectual capital does not necessarily lead to an immediate increase in Return on Assets (ROA), particularly for banks with limited resources and smaller operational capacities.

The Role of Firm Size as a Moderating Variable

Intellectual capital and financial success in banking are mediated by business size, according to the study's conclusions. The usefulness of intellectual capital in boosting a corporation's profitability seems to be heavily influenced by corporate size. Larger financial

institutions are better able to invest in technology, cultivate high-quality people resources, and fortify their organisational structures, all of which contribute to better intellectual capital management. Such backing allows for better use of intellectual capital, which in turn boosts the company's bottom line.

The study's findings also show that the observed moderation is pure moderation. This is supported by the fact that although there is no substantial relationship between intellectual capital and financial success when looking at the two variables alone, there is a significant relationship when looking at the two variables in conjunction with business size. These findings suggest that intellectual capital does not automatically improve a company's financial performance, but its effectiveness is highly dependent on firm size. The larger the firm size, the more optimal the utilization of intellectual capital in improving banking profitability.

5. CONCLUSION AND LIMITATION

Research examining 105 Indonesian commercial banks between 2020 and 2024 found no statistically significant relationship between intellectual capital and ROA, a measure of financial success in the banking industry. The correlation between IP and bottom-line results was seen to be moderated by company size. Based on these findings, it seems that intellectual capital is still unable to boost financial performance on its own, but that a bigger organization will help it create more value and increase profits. So, the size of the organization is the only factor that modifies the relationship between leveraging intellectual capital and improved financial performance in the banking industry.

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