

The Impact of Artificial Intelligence on Profitability: Does Firm Size Become a Determining Factor?

Nur Hidayah K Fadhillah¹, Adam Zakaria², IGKA Ulupui³

¹Nusa Putra University, Sukabumi, Indonesia, ^{2,3}Universitas Negeri Jakarta, Jakarta Timur, Indonesia
e-mail: ¹nhkfadhillah@nusaputra.ac.id, ²azdelima@yahoo.com, ³lgka-ulupui@unj.ac.id

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Abstract

This study examines the relationship between Artificial Intelligence (AI) disclosure and profitability and investigates whether firm size moderates this relationship among banking companies listed on the Indonesia Stock Exchange (IDX) in 2024. A quantitative causal research design was employed using a purposive sample of 46 banks. AI disclosure was measured through content analysis of annual reports using a binary indicator, where a value of 1 represents the disclosure of AI-related implementation and 0 represents the absence of such disclosure. Profitability was measured using Return on Equity (ROE), while firm size was measured using the natural logarithm of total assets. Moderated Regression Analysis (MRA) was performed after mean-centering the variables used to construct the interaction term. The simple regression results indicate that AI disclosure is positively associated with profitability. However, after firm size and the interaction term are incorporated into the full model, the direct effect of AI disclosure becomes statistically insignificant. Firm size has a positive and significant effect on profitability, whereas the interaction between AI disclosure and firm size is not statistically significant. The full model explains approximately 58.8% of the variation in ROE. These findings indicate that firm size contributes directly to differences in bank profitability but does not significantly moderate the relationship between AI disclosure and profitability. The results suggest that banks should focus not only on the presence of AI-related initiatives but also on their effective integration into operational processes, data governance, and value-generating business activities.

Keywords: Artificial Intelligence (AI), Profitability, Return On Equity (ROE), Company Size (Firm Size), Banking Sector

Abstrak

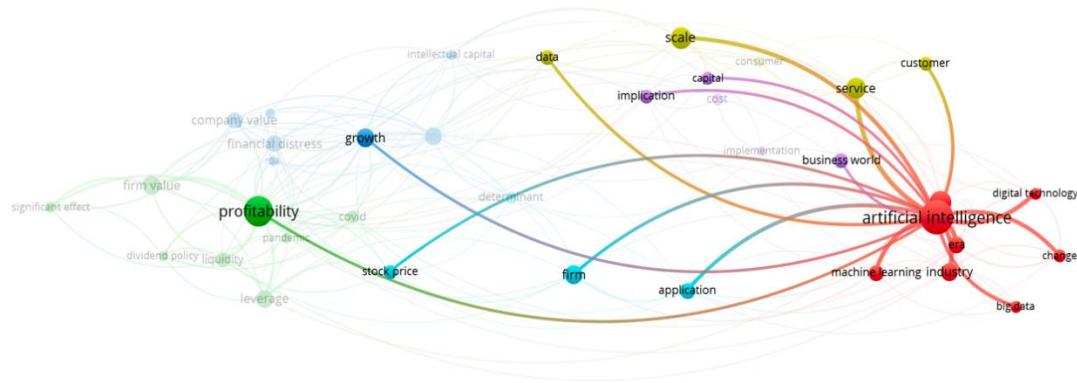
Penelitian ini mengkaji hubungan antara pengungkapan Kecerdasan Buatan (AI) dan profitabilitas, serta menyelidiki apakah ukuran perusahaan memoderasi hubungan tersebut pada perusahaan perbankan yang terdaftar di Bursa Efek Indonesia (BEI) pada tahun 2024. Desain penelitian kausal kuantitatif digunakan dengan sampel purposif sebanyak 46 bank. Pengungkapan AI diukur melalui analisis konten laporan tahunan menggunakan indikator biner, di mana nilai 1 mewakili adanya pengungkapan implementasi terkait AI dan nilai 0 mewakili ketiadaan pengungkapan tersebut. Profitabilitas diukur menggunakan *Return on Equity* (ROE), sedangkan ukuran perusahaan diukur menggunakan logaritma natural dari total aset. Analisis Regresi Moderasi (MRA) dilakukan setelah melakukan *mean-centering* pada variabel-variabel yang digunakan untuk menyusun suku interaksi. Hasil regresi sederhana menunjukkan bahwa pengungkapan AI berhubungan positif dengan profitabilitas. Namun, setelah ukuran perusahaan dan suku interaksi dimasukkan ke dalam model lengkap, pengaruh langsung pengungkapan AI menjadi tidak signifikan secara statistik. Ukuran perusahaan memiliki pengaruh positif dan signifikan terhadap profitabilitas, sedangkan interaksi antara pengungkapan AI dan ukuran perusahaan tidak signifikan secara statistik. Model lengkap tersebut menjelaskan sekitar 58,8% variasi dalam ROE. Temuan ini mengindikasikan bahwa ukuran perusahaan berkontribusi secara langsung terhadap perbedaan profitabilitas bank namun tidak memoderasi hubungan antara pengungkapan AI dan profitabilitas secara signifikan. Hasil penelitian menyarankan agar bank tidak hanya berfokus pada keberadaan inisiatif terkait AI, tetapi juga pada integrasi efektif inisiatif tersebut ke dalam proses operasional, tata kelola data, dan aktivitas bisnis yang menghasilkan nilai.

Kata kunci: Kecerdasan Buatan (AI), Profitabilitas, *Return On Equity* (ROE), Ukuran Perusahaan, Sektor Perbankan

INTRODUCTION

Digital transformation is a fundamental shift driven by the use of technology to improve efficiency, productivity, and service innovation. One of its key technologies is Artificial Intelligence

Figure 1. Results of the Overlay Visualization Analysis



The extent to which companies benefit from AI implementation may differ according to organizational characteristics, particularly firm size. Large companies generally possess greater financial resources, technological infrastructure, data availability, and human capital that enable them to implement AI across multiple business functions. These capabilities may allow larger firms to integrate and scale AI more effectively (Davenport & Ronanki, 2018). In contrast, small and medium-sized firms often face limitations in funding, data quality, digital expertise, and technology management capabilities, which may constrain the effective utilization of AI (Jarrahi, 2018). These differences indicate that firm size may influence the relationship between AI implementation and corporate profitability.

From an organizational perspective, AI can be understood as a technological capability that supports learning, data analysis, decision-making, and problem-solving (Chatterjee et al., 2022; Dwivedi et al., 2021; Hendrayati et al., 2024). In business activities, AI can facilitate automation, improve operational efficiency, reduce costs, and enhance the quality of managerial decisions (Brynjolfsson & McAfee, 2014). Its development also represents a form of technological innovation that can transform organizational processes, competitive dynamics, and interactions between companies and their customers (Schumpeter, 1934). Therefore, the value generated by AI depends not only on the availability of the technology but also on the organization's ability to incorporate it effectively into its business processes.

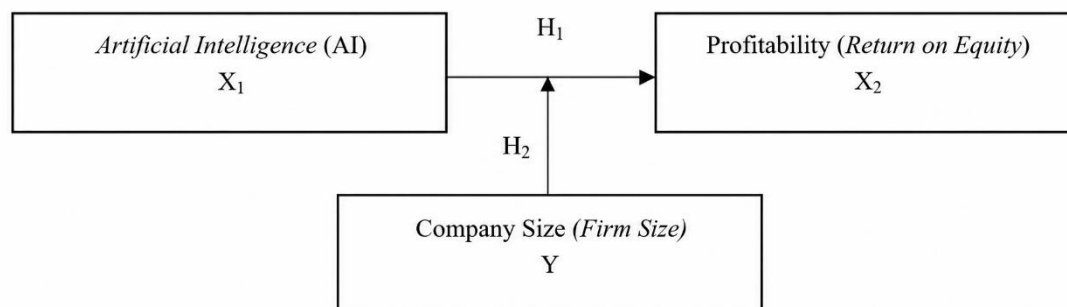
Profitability reflects a company's ability to generate earnings from its operational and financial resources and is commonly assessed using indicators such as Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin. In this study, profitability is represented by Return on Equity (ROE), which reflects the extent to which a company generates returns from shareholders' equity. AI-related implementation may contribute to profitability through greater operational efficiency, improved resource utilization, reduced process inefficiencies, and enhanced productivity. Previous studies suggest that effective utilization of digital technologies and AI can contribute to improved financial performance when these technologies are successfully integrated into organizational activities (Brynjolfsson & McAfee, 2017).

Firm size is also an important organizational characteristic in determining a company's ability to acquire, develop, and utilize technological resources. From the perspective of the resource-based view, firms with stronger financial resources, infrastructure, technological capabilities, and human capital are generally better positioned to integrate new technologies effectively (Barney, 1991). Large firms may therefore have greater capacity to support AI-related initiatives, whereas smaller firms may experience greater constraints in financing, infrastructure, data management, and specialized expertise (Jarrahi, 2018). Nevertheless, greater organizational resources do not necessarily guarantee that AI implementation will automatically generate superior financial outcomes.

Accordingly, firm size may function as a moderating factor in the relationship between AI-related implementation and profitability. Larger firms may have greater capacity to integrate AI applications across business functions and support them with sufficient technological and organizational resources, whereas firms with more limited resources may experience greater difficulties in realizing the financial benefits of AI (Chen et al., 2020). Thus, the relationship between AI and profitability may differ according to organizational scale. Examining firm size as a continuous moderating variable therefore provides a means of assessing whether differences in organizational resources strengthen or weaken the relationship between AI and financial performance.

Previous studies have associated AI with improvements in operational efficiency, productivity, service quality, competitive advantage, and corporate performance (Brynjolfsson & McAfee, 2014), (Brynjolfsson & McAfee, 2017), (Makridakis, 2017), and (Huang & Rust, 2018). Other studies emphasize that the benefits of AI depend on organizational resources, technological infrastructure, and the ability to integrate AI into business processes (Davenport & Ronanki, 2018), (Chen et al., 2020), (Jarrahi, 2018). Nevertheless, empirical evidence regarding the role of firm size in shaping the relationship between AI and profitability remains limited. Therefore, this study examines the relationship between AI disclosure and profitability, measured by Return on Equity (ROE), and investigates whether firm size moderates this relationship among banking companies listed on the Indonesia Stock Exchange.

Figure 2. Conceptual Framework



Previous studies have examined the relationship between AI and various organizational outcomes, including productivity, innovation, service quality, growth, firm value, and competitive advantage. Bibliometric mapping using VOSviewer also indicates that AI research is increasingly connected with themes such as profitability, firm size, growth, scale, big data, machine learning, customers, and service. These patterns suggest that research on AI has gradually expanded from predominantly technical discussions toward broader analyses of its economic, organizational, and strategic implications.

Despite these developments, empirical evidence regarding the financial consequences of AI remains inconclusive, particularly when organizational characteristics are taken into account. Existing studies have largely emphasized the direct effects of AI on firm performance, while the extent to which firm size influences the relationship between AI-related implementation and profitability remains insufficiently examined. This issue is particularly relevant in the banking sector, where firms differ substantially in financial resources, technological infrastructure, data capabilities, and organizational scale. Accordingly, further empirical investigation is needed to determine whether firm size changes the relationship between AI disclosure and profitability.

Given these gaps, this study aims to examine the relationship between AI disclosure and firm profitability, measured by Return on Equity (ROE), and to investigate whether firm size moderates this relationship among banking companies listed on the Indonesia Stock Exchange. Firm size is treated as a continuous organizational characteristic rather than as a categorical distinction between large and small firms. Theoretically, this study extends the literature on digital transformation and organizational resources by examining firm size as a potential boundary condition in the relationship between AI disclosure and financial performance. Practically, the findings are expected to provide insights for bank management regarding the importance of aligning AI-related initiatives with organizational capabilities, technological infrastructure, data governance, and core business processes.

RESEARCH METHOD

Research Type and Approach

This study employs a quantitative approach with an explanatory research design to examine the relationship between Artificial Intelligence (AI) disclosure and profitability, measured by Return on Equity (ROE), and to investigate the moderating role of firm size in this relationship. The study focuses on banking companies listed on the Indonesia Stock Exchange (IDX) in 2024.

The analysis is based entirely on secondary numerical data obtained from annual reports and financial statements. The data are analyzed using regression-based techniques to examine the relationship between AI disclosure and profitability, the direct effect of firm size, and the interaction between AI disclosure and firm size.

Population and Sample

The population of this study consists of banking sector companies listed on the Indonesia Stock Exchange (IDX) in 2024. The sample comprises 46 banking companies selected using purposive sampling. The banking sector was selected because banks regularly publish financial and annual reports, operate within a relatively standardized regulatory environment, and increasingly incorporate digital technologies into their business activities.

The sample includes banking companies that were listed on the IDX in 2024, published complete annual reports and financial statements for the observation period, and provided sufficient financial information to calculate Return on Equity (ROE) and firm size. The availability or absence of AI-related disclosure was not used as an exclusion criterion because banks without such disclosure were retained in the sample and assigned a score of 0. Based on these criteria, 46 banking companies were included in the final sample.

Definitions

The independent variable in this study is **AI disclosure**, measured through content analysis of the banking companies' annual reports. The analysis identifies references to Artificial Intelligence and related technologies, including terms such as *artificial intelligence*, *machine learning*, and *deep learning*, as well as descriptions of their implementation in activities such as data analysis, customer service, risk management, and product development. A binary scoring system is applied, where a score of 1 is assigned when the annual report contains information indicating the use or implementation of AI-related technologies and a score of 0 is assigned when no such disclosure is identified. Accordingly, this variable represents the presence of AI-related disclosure rather than the intensity or level of AI adoption.

The dependent variable is profitability, proxied by Return on Equity (ROE). ROE is calculated as net income divided by shareholders' equity and multiplied by 100 percent. The required financial data were obtained from the 2024 financial statements of the sampled banks.

The moderating variable is firm size, measured using the natural logarithm of total assets reported in the 2024 financial statements. The logarithmic transformation is applied to reduce substantial differences in asset scale across banks and to minimize the influence of extreme observations. Prior to constructing the interaction term, AI disclosure and firm size are mean-centered. The interaction variable is then calculated by multiplying the centered AI disclosure variable by the centered firm size variable. This procedure is used to reduce non-essential multicollinearity associated with the interaction term in the moderation model.

Data Collection Techniques

This study employs purposive sampling based on criteria aligned with the research objectives. The selected companies were required to be banking companies listed on the Indonesia Stock Exchange in 2024, publish complete annual reports and financial statements, and provide the financial information required to calculate ROE and firm size. Banks were retained regardless of whether AI-related disclosure was identified in their annual reports, because the absence of such disclosure constitutes a valid value of 0 in the AI disclosure variable.

Data were collected through documentary analysis using secondary sources, including annual reports, audited financial statements, the official Indonesia Stock Exchange website, and the official websites of the respective banks. The data collection process involved identifying eligible banks, obtaining their official reports, conducting content analysis using AI-related keywords, assigning binary AI disclosure scores, and extracting financial information on net income, shareholders' equity, and total assets. The collected data were subsequently checked for completeness, consistency, and duplication before being processed using SPSS 27, Stata, and Microsoft Excel.

Data Analysis Techniques

Data analysis consists of descriptive statistics, classical assumption testing, simple linear regression, and Moderated Regression Analysis (MRA). Descriptive statistics are used to summarize the characteristics of AI disclosure, ROE, and firm size through measures such as minimum, maximum, mean, and standard deviation.

Prior to estimating the final moderation model, the regression assumptions are evaluated using residual normality, multicollinearity, heteroscedasticity, and autocorrelation tests. Multicollinearity is assessed using tolerance and Variance Inflation Factor (VIF) values for all predictors included in the full moderation model, including the interaction term. Firm size is transformed using the natural logarithm of total assets, and the variables used to construct the interaction term are mean-centered before the interaction variable is generated.

The regression analysis is conducted hierarchically. Model 1 examines the relationship between AI disclosure and ROE. Model 2 introduces firm size as an additional predictor, while Model 3 includes the interaction between AI disclosure and firm size. The moderation model is specified as follows:

$$ROE = \beta_0 + \beta_1 AI_c + \beta_2 SIZE_c + \beta_3 (AI_c \times SIZE_c) + \varepsilon$$

where AI_c represents mean-centered AI disclosure, $SIZE_c$ represents mean-centered firm size measured using the natural logarithm of total assets, and $AI_c \times SIZE_c$ represents the interaction term. A moderating effect is considered statistically supported when the interaction coefficient is significant at the 5% level. Changes in R^2 across the hierarchical models are also examined to assess the additional explanatory contribution of firm size and the interaction term.

RESULTS AND DISCUSSION

Data Description

Table 1. Data Description

Bank	AI Adoption	Return on Equity	Total Assets (IDR Trillion)
PT Bank Raya Indonesia Tbk	Not Available	1.41%	12.80
PT Bank IBK Indonesia Tbk	Not Available	4.97%	20.47
PT Bank Amar Indonesia Tbk	Not Available	6.24%	4.60
PT Bank Jago Tbk	Yes	1.02%	26.84
PT Bank MNC Internasional Tbk	Not Available	1.99%	19.31
PT Bank Capital Indonesia Tbk	Not Available	2.85%	21.25
PT Bank Aladin Syariah Tbk	Yes	-2.54%	8.60
PT Bank Central Asia Tbk	Yes	22.88%	1,433.70
PT Allo Bank Indonesia Tbk	Yes	6.18%	14.06
PT Bank KB Bukopin Tbk	Yes	15.08%	83.70
PT Bank Mestika Dharma Tbk	Not Available	6.10%	16.25
PT Bank Negara Indonesia (Persero) Tbk	Yes	16.28%	1,129.00
PT Bank Rakyat Indonesia (Persero) Tbk	Yes	19.53%	1,961.92
PT Bank Tabungan Negara (Persero) Tbk	Yes	7.37%	455.10
PT Bank Neo Commerce Tbk	Not Available	1.13%	19.06
PT Bank Jtrust Indonesia Tbk	Not Available	6.94%	41.78
PT Bank Danamon Indonesia Tbk	Yes	7.02%	221.30
PT Bank Pembangunan Daerah Banten Tbk	Not Available	0.93%	7.13
PT Bank Ganesha Tbk	Not Available	5.57%	9.54
PT Bank Ina Perdana Tbk	Not Available	4.56%	22.44
PT Bank Pembangunan Daerah Jawa Barat Tbk	Yes	10.24%	210.00

PT Bank Pembangunan Daerah Jawa Timur Tbk	Yes	10.21%	106.63
PT Bank QNB Indonesia Tbk	Not Available	1.46%	11.75
PT Bank Maspion Indonesia Tbk	Not Available	0.82%	22.38
PT Bank Mandiri (Persero) Tbk	Yes	23.20%	1,850.52
PT Bank Bumi Arta Tbk	Not Available	1.80%	8.30
PT Bank CIMB Niaga Tbk	Yes	13.59%	354.30
PT Bank Maybank Indonesia Tbk	Yes	5.77%	189.30
PT Bank Permata Tbk	Yes	12.16%	254.64
PT Bank Syariah Indonesia Tbk	Yes	17.59%	371.00
PT Bank Sinarmas Tbk	Yes	2.63%	52.70
PT Bank of India Indonesia Tbk	Not Available	2.02%	6.64
PT Bank BTPN Tbk	Yes	3.71%	235.80
PT Bank BTPN Syariah Tbk	Yes	13.77%	21.36
PT Bank Victoria International Tbk	Yes	2.63%	29.32
PT Bank Oke Indonesia Tbk	Not Available	1.00%	11.26
PT Bank Artha Graha Internasional Tbk	Not Available	16.53%	26.10
PT Bank Multiarta Sentosa Tbk	Not Available	4.54%	29.26
PT Bank Mayapada Internasional Tbk	Not Available	0.49%	9.05
PT Bank China Construction Bank Indonesia Tbk	Not Available	3.27%	32.16
PT Bank Mega Tbk	Yes	5.51%	129.43
PT Bank OCBC NISP Tbk	Yes	14.65%	266.50
PT Bank Nationalnobu Tbk	Not Available	9.43%	30.71
PT Bank Pan Indonesia Tbk	Not Available	4.52%	230.60
PT Bank Panin Dubai Syariah Tbk	Yes	5.09%	16.72
PT Bank Woori Saudara Indonesia 1906 Tbk	Yes	0.91%	54.82

Source: Data Analysis by Author's (2026)

Table 1 presents the distribution of AI disclosure, profitability, and total assets among the 46 banking companies included in the sample. Of the 46 banks, 24 disclosed information related to the use or implementation of Artificial Intelligence (AI) in their annual reports, while 22 did not provide such disclosure. This corresponds to approximately 52.2% and 47.8% of the sample, respectively. AI disclosure is observed across banks with varying levels of assets and profitability, although several large banks, including PT Bank Central Asia Tbk, PT Bank Mandiri (Persero) Tbk, and PT Bank Rakyat Indonesia (Persero) Tbk, reported the use of AI-related technologies. The ROE values also vary considerably across the sample, indicating substantial differences in financial performance among the observed banks. Therefore, the descriptive data suggest that AI disclosure and profitability vary across banks and should be examined further through regression analysis rather than interpreted solely from their descriptive patterns.

Total assets in Table 1 also indicate substantial differences in the scale of the sampled banks. For descriptive purposes, the sample can be broadly characterized as consisting of banks with relatively large, medium, and small asset bases. However, these categories are not employed as separate groups in the hypothesis testing. In the regression analysis, firm size is treated as a continuous variable and measured using the natural logarithm of total assets. This approach is intended to capture differences in organizational scale while reducing the influence of extreme variations in total assets across the sampled banks. Accordingly, the descriptive categorization is used only to illustrate the heterogeneity of bank size within the sample and should not be interpreted as a formal subgroup classification.

Descriptive Analysis

Descriptive analysis is a statistical method used to systematically describe, summarize, and

organize data to make it easier to understand. In descriptive analysis, the primary focus is on measuring and interpreting data characteristics without drawing broader inferences or conclusions. This aims to provide a clear picture of data distribution and help identify existing patterns. The following table presents the descriptive analysis for this study:

Table 2. Descriptive Statistical Analysis

Variable	N	Min	Max	Mean	Standard Deviation
AI Disclosure	46	0.000	1.000	0.522	0.505
Profitability (ROE)	46	-2.540	23.200	7.023	6.380
Firm Size (Ln Total Assets)	46	1.526	7.582	3.962	1.641

Source: Data Analysis by Author's (2026)

Table 2 presents the descriptive statistics of the variables used in this study. AI disclosure is measured using a binary indicator, where a value of 1 indicates that a bank disclosed the use or implementation of Artificial Intelligence (AI) in its annual report, while a value of 0 indicates otherwise. The mean value of AI disclosure is 0.522, indicating that approximately 52.2% of the sampled banks disclosed the use of AI.

Profitability, measured using Return on Equity (ROE), ranges from -2.54% to 23.20%, with a mean value of 7.02% and a standard deviation of 6.38. These figures indicate considerable variation in profitability across the sampled banks. Firm size is measured using the natural logarithm of total assets. The logarithmic transformation is employed to reduce substantial differences in asset scale across banks and to minimize the influence of extreme values in the regression analysis.

Moderated Regression Analysis (MRA)

Moderated Regression Analysis (MRA) is employed to examine whether firm size moderates the relationship between AI disclosure and bank profitability. Considering the substantial differences in total assets among the sampled banks, firm size is transformed using the natural logarithm of total assets.

Prior to constructing the interaction term, AI disclosure and firm size are mean-centered to reduce non-essential multicollinearity associated with the interaction model. The interaction variable is subsequently calculated by multiplying the centered AI disclosure variable by the centered firm size variable. The moderation model is specified as follows:

$$ROE = \beta_0 + \beta_1 AI_c + \beta_2 SIZE_c + \beta_3 (AI_c \times SIZE_c) + \varepsilon$$

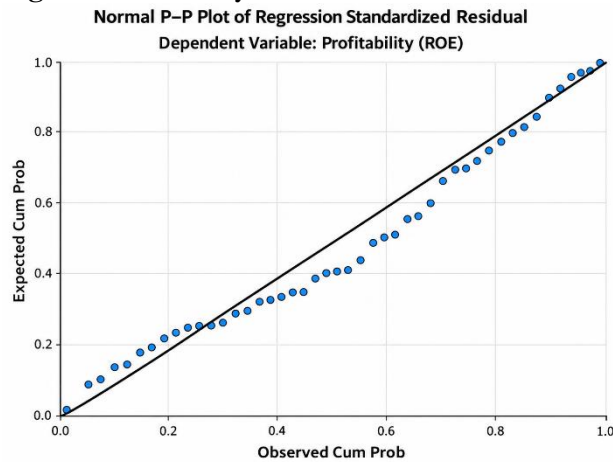
where AI_c represents mean-centered AI disclosure, $SIZE_c$ represents mean-centered firm size measured by the natural logarithm of total assets, and $AI_c \times SIZE_c$ represents the interaction between AI disclosure and firm size.

Classical Assumption Tests

Normality Test

The normality test aims to ensure that the regression residuals are normally distributed so that the results of the t-test and F-test are valid. The test can be performed using the Shapiro–Wilk, Kolmogorov–Smirnov, or P–P Plot tests in SPSS 27.

Figure 3. Normality Test



Source: Data Analysis by Author's (2026)

The normality of the residuals was reassessed using the residuals generated from the revised moderation model. The Shapiro-Wilk test produced a significance value of 0.065, which is slightly above the conventional threshold of 0.05. Therefore, there is insufficient statistical evidence to reject the assumption of residual normality.

Nevertheless, because the significance value is relatively close to the 0.05 threshold, the result should be interpreted cautiously. The statistical result should therefore be considered together with the visual distribution of residuals in the Normal P-P Plot rather than being interpreted as definitive evidence of perfect normality.

Multicollinearity Test

The multicollinearity test is used to determine whether there is a high correlation among the independent variables in the regression model. Excessively strong correlations can make it difficult to determine the effect of each individual variable. The following are the results of the multicollinearity test using SPSS 27.

Table 3. Multicollinearity Test

Variable	Tolerance	VIF
AI Disclosure _c	0.458	2.181
Firm Size _c	0.392	2.553
AI Disclosure _c × Firm Size _c	0.668	1.497

Source: Data Analysis by Author's (2026)

As presented in Table 3, all tolerance values are greater than 0.10, while the VIF values range from 1.497 to 2.553. These values are well below the commonly applied threshold of 10, indicating that the revised moderation model does not exhibit problematic multicollinearity. The logarithmic transformation of firm size and mean-centering of the variables therefore substantially reduce the multicollinearity associated with the interaction term.

Heteroscedasticity Test

Heteroscedasticity is an issue that must be addressed in regression analysis because it can affect the validity of significance tests and the efficiency of estimates. Conducting a heteroscedasticity test and taking steps to address it if necessary will improve the accuracy of the model and the results of the regression analysis. The following is the SPSS 27 output regarding the heteroscedasticity test:

Table 4. Heteroscedasticity Test

Variable	t-Value	Significance
AI Disclosure _c	1.086	0.284
Firm Size _c	-0.019	0.985
AI Disclosure _c × Firm Size _c	-0.790	0.434

Source: Data Analysis by Author's (2026)

Table 4 shows that the significance values for AI disclosure, firm size, and their interaction term are 0.284, 0.985, and 0.434, respectively. Since all significance values exceed 0.05, there is no statistical evidence of heteroscedasticity in the revised regression model. Thus, the variance of the residuals can be considered sufficiently homogeneous across observations.

Autocorrelation Test

The Durbin-Watson statistic obtained from the revised regression model is 2.268. The value is relatively close to 2, indicating no substantial evidence of positive or negative autocorrelation among the regression residuals. Therefore, the independence-of-errors assumption is considered adequately satisfied.

Simple Linear Regression Analysis

Before estimating the moderation model, a simple linear regression analysis was performed to examine the bivariate relationship between AI disclosure and profitability.

Table 5. Simple Linear Regression Results

Variable	B	Std. Error	Beta	t	Sig.
Constant	4.026	1.225	–	3.286	0.002
AI Disclosure	5.744	1.696	0.455	3.386	0.002

R² = 0.207; Adjusted R² = 0.189

Source: Data Analysis by Authors (2026)

The simple regression results show that AI disclosure has a positive and statistically significant association with profitability (B = 5.744, t = 3.386, p = 0.002). Banks that disclose the use of AI therefore tend to exhibit higher ROE than banks that do not disclose AI when AI disclosure is examined independently. The model has an R² value of 0.207, indicating that AI disclosure alone explains approximately 20.7% of the variation in ROE. However, this result represents a bivariate relationship and does not account for differences in firm size. Therefore, the relationship is further examined in the moderated regression model after firm size and the interaction term are incorporated.

Moderated Regression Analysis Results

A hierarchical regression procedure was used to evaluate the contribution of firm size and the interaction between AI disclosure and firm size. Model 1 includes AI disclosure as the independent variable. Model 2 adds firm size, while Model 3 incorporates the interaction between AI disclosure and firm size.

Table 6. Hierarchical Regression Model Summary

Model	R ²	Adjusted R ²	ΔR ²
Model 1: AI Disclosure	0.207	0.189	–
Model 2: AI Disclosure + Firm Size	0.560	0.539	0.353
Model 3: AI Disclosure + Firm Size + Interaction	0.588	0.559	0.028

Source: Data Analysis by Authors (2026)

The explanatory power of the model increases substantially after firm size is included. The R^2 value increases from 0.207 in Model 1 to 0.560 in Model 2, indicating that the inclusion of firm size substantially improves the model's ability to explain differences in bank profitability.

After the interaction term is included in Model 3, R^2 increases from 0.560 to 0.588, representing an additional explanatory contribution of 2.8 percentage points ($\Delta R^2 = 0.028$). However, the change associated with the interaction term is not statistically significant at the 5% level ($\Delta F = 2.906$, $p = 0.096$). Therefore, the increase in R^2 cannot be interpreted as statistical evidence that firm size moderates the relationship between AI disclosure and profitability.

Hypothesis Testing

Table 7. Results of Moderated Regression Analysis

Variable	B	Std. Error	Beta	t	Sig.
Constant	5.897	0.909	—	6.484	<0.001
AI Disclosure _c	0.855	1.847	0.068	0.463	0.646
Firm Size _c	2.425	0.615	0.624	3.941	<0.001
AI Disclosure _c × Firm Size _c	2.152	1.263	0.207	1.705	0.096

Source: Data Analysis by Authors (2026)

The revised MRA results show that AI disclosure has a positive coefficient but does not have a statistically significant direct effect on profitability after firm size and the interaction term are considered ($B = 0.855$, $t = 0.463$, $p = 0.646$). This result indicates that the significant relationship observed in the simple regression becomes substantially weaker after differences in bank size are controlled.

In contrast, firm size has a positive and statistically significant effect on profitability ($B = 2.425$, $t = 3.941$, $p < 0.001$). This finding indicates that larger banks, as measured by the natural logarithm of total assets, tend to have higher profitability after controlling for AI disclosure and the interaction effect.

The interaction between AI disclosure and firm size produces a positive coefficient of 2.152 but does not reach statistical significance at the 5% level ($t = 1.705$, $p = 0.096$). Consequently, there is insufficient statistical evidence to conclude that firm size moderates the relationship between AI disclosure and profitability. In other words, although firm size has a significant direct association with profitability, the effect of AI disclosure on profitability does not significantly vary according to firm size.

DISCUSSION

The results of this study indicate that the implementation of Artificial Intelligence (AI) has not yet been able to exert a significant direct effect on the profitability of banking firms. This finding differs from the research by (Brynjolfsson & McAfee, 2017), which explains that the use of AI can improve financial performance through cost efficiency, productivity, and better decision-making. This discrepancy may stem from the fact that AI adoption among banking firms remains at varying stages of maturity. Some banks may have integrated AI into core business processes, while others are still using it primarily for support functions (Balan, 2022; Dhewanto et al., 2023). Consequently, the presence of AI does not necessarily translate into immediate benefits if its implementation is not effectively aligned with the firm's operational strategies and financial objectives.

These research findings align with the view of (Davenport & Ronanki, 2018) that the success of AI is determined not only by technology adoption but also by a company's ability to identify the right business problems, manage data, and integrate technology into operational activities. AI requires high-quality data, competent human resources, infrastructure readiness, and

process changes to create economic value. Thus, companies that have reported using AI do not necessarily achieve increased profitability if the technology is used only to a limited extent or has not yet contributed to cost efficiency, revenue growth, and service quality. These results underscore that AI adoption must be assessed based on the quality and intensity of its implementation, not merely on the presence or absence of the technology itself.

Company size has also not been proven to be a factor that directly determines profitability. These findings do not fully support the resource-based view proposed by (Barney, 1991), which states that companies with greater resources have a better chance of building a competitive advantage. Large companies do indeed have more adequate capital, infrastructure, data, and experts, but these resources do not automatically result in higher financial performance. Organizational complexity, high operating costs, outdated technology systems, and longer decision-making processes can reduce the effectiveness of resource utilization (Fares et al., 2023; Hilary & McLean, 2023). Conversely, smaller companies may have greater flexibility and innovation speed, enabling them to implement technology in a more targeted manner according to market needs.

The research results also indicate that company size does not strengthen or weaken the relationship between AI and profitability. This finding differs from (Chen et al., 2020), who states that large companies have a greater ability to scale AI usage across various business functions, thereby reaping greater economic benefits. In the banking sector, this difference may be influenced by relatively uniform regulations, high levels of digital competition, and increasingly easy access to cloud-based technology and third-party services. Small banks are not necessarily at a disadvantage, as they can partner with technology companies and develop digital services without having to build the entire infrastructure on their own. At the same time, large banks may face barriers to AI integration due to their more complex organizational structures and operational systems.

These findings expand upon (Jarrahi, 2018) research, which explains that small firms face resource and expertise constraints in implementing AI but still have the opportunity to reap benefits if the technology is used appropriately. The results are also consistent with (Makridakis, 2017) and Huang and Rust (Huang & Rust, 2018), who emphasize AI's potential to create competitive advantages and improve the quality of services for consumers. However, this potential can only be translated into profitability when companies are able to link AI to service innovation, operational efficiency, risk management, and customer experience. Thus, the more decisive factors are not company size, but rather digital maturity, the quality of data governance, organizational competence, and the alignment of AI implementation with the company's business strategy.

CONCLUSION

Based on the research findings, AI disclosure does not have a statistically significant effect on the profitability of banking companies after firm size and the interaction term are taken into account. In contrast, firm size has a positive and significant direct effect on profitability, indicating that differences in organizational scale are associated with differences in banks' financial performance. However, the interaction between AI disclosure and firm size is not statistically significant, suggesting that firm size does not moderate the relationship between AI disclosure and profitability. These findings indicate that the presence of AI-related initiatives alone may not be sufficient to generate improvements in financial performance, as their economic benefits may depend on organizational capabilities, data governance, technological integration, and the effectiveness of implementation within core business processes. Therefore, banking companies should focus not merely on adopting or disclosing AI-related technologies, but on ensuring that these technologies are strategically integrated into operational activities and value-generating processes.

SUGGESTION

Based on the empirical findings and limitations of this study, a key recommendation for bank management is to go beyond using Artificial Intelligence (AI) disclosures merely as a formality or supplementary feature in annual reports. Management should deeply integrate AI technologies into core business processes, data governance, and risk management framework, ensuring that AI investments and adoption directly contribute to enhanced operational efficiency and overall profitability (*ROE*).

Furthermore, as firm size was not found to significantly moderate the relationship between AI disclosure and profitability, banks across all asset scales should prioritize strengthening their internal capabilities. This optimization includes upgrading information technology infrastructure, enhancing digital readiness, and building human resource competencies to ensure that AI transformation translates into tangible financial performance.

For future researchers, it is recommended to evaluate AI adoption using more comprehensive measurement indicators, such as content analysis scores or adoption maturity levels, rather than relying solely on a binary proxy. Subsequent studies could also explore alternative moderating or mediating variables, such as data governance quality and operational efficiency (*BOPO*), while extending the observation period longitudinally or conducting cross-country comparative analyses within the Southeast Asian banking sector

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