

THE IMPACT OF INTELLECTUAL CAPITAL ON BANKS' PERFORMANCE: CASE IN VIETNAM

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ABSTRACT

The research analyzes the impact of intellectual capital on the performance of commercial banks in Vietnam from 2014 to 2024. The study uses secondary data sources, including financial statements from 26 joint-stock commercial banks in Vietnam and macroeconomic data from the World Bank. The research model uses two financial indicators, return on total assets (ROA) and return on equity (ROE), as dependent variables to measure bank performance. The independent variables are the value-added coefficient of intellectual capital (VAIC), including three components: human capital efficiency (HCE), structural capital efficiency (SCE), and capital efficiency (CEE); and control variables such as bank size (SIZE), equity ratio (CAP), loan ratio (LOAN), deposit ratio (DEP), economic growth (GDP), and inflation (INF) are also included in the model. The author uses the Feasible Generalized Least Squares (FGLS) method, and the results indicate that intellectual capital is closely related to banking performance. Specifically, the research results show that HCE and CEE have a positive impact on ROA and ROE, with CEE having a more significant impact. On the contrary, SCE has a negative impact on banking performance. Control variables such as SIZE, CAP, LOAN, GDP, and INF have a positive impact on banking performance, whereas DEP has a negative impact. In addition, the study proposes managerial implications, including maintaining investment in intellectual capital (IC), capital efficiency (CEE), and enhancing financial and physical resources to optimize bank performance.

Keyword: Intellectual capital, Performance, VAIC, Commercial banks.

1. INTRODUCTION

With the rapid advancement of digital transformation, competition among commercial banks has intensified, requiring banks to enhance competitiveness and operational performance. Beyond investing in physical assets, intellectual capital has become a critical intangible resource that promotes innovation, improves efficiency, and creates sustainable competitive advantages. Previous studies have identified intellectual capital as a key determinant of firm performance and competitiveness (Bontis et al., 2000; El-Bannany, 2008; Kujansivu, 2005; Mondal & Ghosh, 2012; Pulic, 2004). In the banking sector, higher investment in intellectual capital is associated with better financial performance (Pulic, 2004).

In Vietnam, however, research has primarily focused on tangible resources and traditional financial factors, while the role of intellectual capital has received relatively limited attention. Existing studies mainly examine intellectual capital measurement or its relationship with specific aspects of banking performance, without

providing a comprehensive assessment under the current context of digital transformation (Le Ha Nhu Thao, 2014; Le Hong Nga & Nguyen Thanh Dat, 2021; Le Do Quynh Tu & Nguyen Thanh Dat, 2020). To address this gap, this study investigates the impact of intellectual capital on the performance of Vietnamese commercial banks and proposes managerial implications for improving the effective utilization and development of intellectual capital.

2. LITERATURE REVIEW

2.1. Concepts and components of intellectual capital

In recent years, intellectual capital (IC) has attracted increasing attention in both academic research and business practice. Although there is no universally accepted definition, IC is generally regarded as a collection of intangible assets that create organizational value. Stewart (2010) defines IC as the knowledge, intellectual property, and skills that generate value, while Pires and Alves (2011) emphasize employees' knowledge,

experience, technology, and customer relationships. Similarly, Brooking (1998) and Akpinar and Akdemir (2000) view IC as the difference between a firm's market and book value, reflecting intangible resources not fully captured in financial statements.

In this study, IC refers to intangible resources, including employees' knowledge and skills, organizational systems, and stakeholder relationships, that enhance innovation, operational efficiency, and competitive advantage. This definition is supported by recent studies demonstrating the positive effect of IC on bank performance (Hang Nga, 2024; Barak et al., 2023). Following Edvinsson and Malone (1997), IC is classified into three dimensions: human capital (HC), structural capital (SC), and relational capital (RC), a framework widely adopted in previous studies (Bontis, 1998; Cabrita & Vaz, 2005; Khalique et al., 2013).

Human capital represents employees' knowledge, skills, and experience, which are essential for value creation and organizational performance (Becker, 1975; Bontis, 1998; Edvinsson & Malone, 1997). Structural capital includes organizational processes, databases, technologies, patents, and management systems that support knowledge utilization and operational efficiency (Roos et al., 1997; Ismail, 2005). Relational capital reflects an organization's relationships with customers, suppliers, investors, and other stakeholders, contributing to reputation, customer loyalty, and long-term competitiveness (Ismail, 2005; Arabiyat & Hasoneh, 2019).

2.2.Theories on the impact of intellectual capital on the performance of commercial banks

The Resource-Based View Theory, initiated by Wernerfelt (1984), is considered an important foundation for research on enterprise competitive advantage. A resource only truly brings long-term advantage when it converges on the following four characteristics: it must be valuable, scarce, difficult to copy, and able to maintain a competitive advantage over time. IC is considered one of the intangible assets with strategic value for businesses because of its uniqueness and the difficulty of imitation, as well as its ability to deliver outstanding efficiency (Stewart, 2010).

The Resource Dependence Theory, developed by Pfeffer & Salancik (2003), states that

organizations do not operate independently but must rely on resources to maintain their operations, including physical, financial, human, and information resources. In addition, the theory states that an organization's performance depends mainly on the resources it has and its ability to access additional resources from outside. According to Abeysekera (2010) research on this theory indicates that the interaction between performance and the external environment is an important factor in long-term business development.

The organizational learning theory describes an organization that consistently encourages individuals and groups to continuously learn, develop personal capacity, and share knowledge to improve adaptability and make effective decisions in the working environment (Senge, 1990). Organizational learning capabilities contribute significantly to the creation of quality products, processes and services, thereby providing value and meeting customer needs and desires (Bustinza et al., 2010; Njuguna, 2009).

3.VARIABLES, DATA AND METHODOLOGY

3.1.Measuring intellectual capital (IC)

In this paper, we use the Value-Added Intellectual Coefficient (VAIC) model developed by Pulic (2000) which offers a new perspective on measuring business performance, especially as intangible resources become increasingly important in creating value. This model is based on two basic assumptions: (1) The efficiency of using financial capital and intellectual capital can create added value for the enterprise, and (2) This added value is closely related to the overall performance of the enterprise. The VAIC model comprises Capital Employed Efficiency (CEE) and Intellectual Capital Efficiency (ICE), two primary components that generate added value (VA) for the enterprise (see Figure 1).

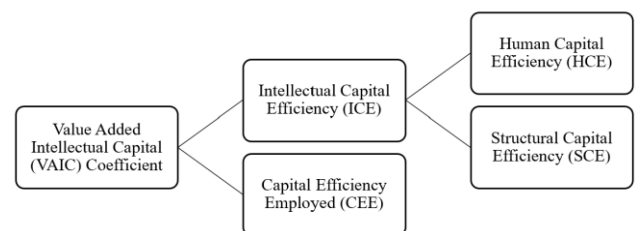


Figure 2. Value Added Intellectual Capital (VAIC) Coefficient Model

Source: (Pulic, 2000)

The VAIC model is highly appreciated for its simplicity in calculation and the ability to easily access and collect data from financial statements and annual reports of enterprises. Therefore, the results from the VAIC model are objective and can be used to compare between enterprises or across different stages of the same enterprise (CIMA, 2001). The VAIC model is used in several studies (see Alhassan & Asare, 2016; Al-Musali & Ismail, 2014; Dai Binh Tran & Duc Vo Hong, 2018; Le Do Quynh Tu & Nguyen Thanh Dat, 2020; Le Hong Nga & Nguyen Thanh Dat, 2021; Majumder et al., 2023; Meles et al., 2016; Mondal & Ghosh, 2012; Ozkan et al., 2017; Phan Anh & Nguyen Nhat Minh, 2023; Rehman et al., 2022; Tahir et al., 2018; Vo Hong Duc & Tran Ngoc Phu, 2021), includes 3 components: HCE, SCE and CEE. The formula for calculating VAIC is as follows:

$$VAIC = HCE + SCE + CEE \quad (1)$$

Human Capital Efficiency (HCE)

HCE is an index reflecting the level of exploitation and effective use of human resources in an organization, HC can be seen as the total cost of business investment in human resources, or labor costs. The following formula calculates the HCE index:

$$HCE = \frac{VA}{HC} \quad (2)$$

$$VA = OP + EC + D \quad (3)$$

In which:

HC is the employee cost including salary cost and investment for employees.

VA is the added value, calculated according to the formula (3)

OP: Net profit from business activities

EC: All expenses for employees

D: Depreciation costs of fixed assets

Structural Capital Efficiency (SCE)

SCE is determined based on the ratio between SC and VA, calculated by using the following formula:

$$SCE = \frac{SC}{VA} \quad (4)$$

In which: SC (structural capital) is calculated as follows:

$$SC = VA - HC \quad (5)$$

Capital Employed Efficiency (CEE)

CEE is an index that reflects the efficiency of capital use by enterprises, measuring the value created per unit of currency invested in physical assets or financial capital. The higher the CEE index, the more effectively the enterprise uses financial capital, and vice versa. The formula for calculating CEE is as follows (CE- capital equity):

$$CEE = \frac{VA}{CE} \quad (6)$$

3.2. Measuring bank performance

The performance of banks, assessed using various financial ratios, helps compare results across banks and indicate the level of efficiency in resource use. Common indicators in measuring operational efficiency include return on total assets (ROA), return on equity (ROE), net interest margin (NIM), and net profit margin (NPM). These indicators help banks assess their ability to generate profits from resources without increasing costs or risks too much (see Abdu Mohammed Assfaw, 2018; Dao My Hang et al., 2024; Sofi, 2023; Ton That Vien, 2018).

3.1.1. Return on total assets (ROA)

The first indicator, which measures the ability to generate profits from existing assets (also called ROA), is important for reflecting the quality of banking operations. ROA is a profitability indicator that shows the level of profitability per unit of assets the bank manages. Many previous studies have confirmed the role of ROA in evaluating bank performance, including those by Anbar & Alper, (2011); Gul et al. (2011); Khalid (2019); Mogusu et al. (2022); Tan (2016). A notable point raised by Musiega et al. (2017) is that large-scale banks are not necessarily efficient, as their ROA is often lower than that of smaller banks. According to the CAMEL evaluation criteria, a bank is considered well-operated when its ROA exceeds 1.5% (Rozzani & Rahman, 2013).

$$\text{Formula for calculating ROA: } ROA = \frac{\text{Profit after tax}}{\text{Average total assets}} \quad (7)$$

3.1.2. Return on equity (ROE)

Another indicator used to evaluate a bank's performance from an investor's perspective is ROE. This indicator shows the level of profit the bank generates per dollar of shareholders' capital (Adefeya et al., 2015; Khrawish, 2011). According to studies by Alshatti (2015); Farooq & Masood (2016), ROE is a measure of the ability to generate profits from equity, indicating whether the bank is effectively utilizing capital. The higher the ROE, the greater the profit after tax, which increases investment value and attractiveness to shareholders.

Formula for calculating ROE:
$$\text{ROE} = \frac{\text{Profit after tax}}{\text{Average equity}}$$
 (8)

In this study, we choose both ROA and ROE for analysis, due to their popularity as well as their ability to directly reflect the profitability of banks, in which ROA reflects the profitability of total

assets, consistent with the nature of the banking industry mainly relying on interest-bearing assets such as credit and investment, ROE represents the profit that shareholders receive, reflecting the efficiency of equity management and the ability to bring value to investors. Therefore, the combined use of ROA and ROE helps ensure objectivity in both the asset use and profitability aspects for shareholders, which are of particular interest to bank managers and investors.

3.3. Control variables

Other variables include the logarithm of total assets (SIZE), the equity-to-total-assets ratio (CAP), the deposit-to-total-assets ratio (DEP), the loan-to-total-assets ratio (LOAN), the inflation rate (INF), and the GDP growth rate. The description and measurement of the control variables are shown in Table 1.

Table 1. Description and measurement of control variables

Variables	Description and Measuring
Bank characteristic variables	
<i>SIZE</i>	Bank size (<i>logarithm of total assets</i>) proxies for the impact of intellectual capital on banking performance. Large scale helps banks expand their product and service portfolio, reduce operating costs through scale effects, and increase access to attractive investment opportunities, thereby enhancing competitiveness and operational efficiency.
<i>CAP</i>	<i>CAP (Equity to Total Assets Ratio)</i> : A bank with a high equity ratio is considered to have a strong capacity to withstand financial risks and to be less dependent on external sources of capital.
<i>DEP</i>	<i>DEP (The ratio of deposits to total assets)</i> reflects the bank's ability to mobilize capital from customers. When this ratio is high, it indicates that the bank focuses on customer deposits as a source of capital rather than other mobilization channels. Deposits are a low-cost source of capital, thereby improving the bank's profitability.
<i>LOAN</i>	<i>LOAN (Loan to Asset Ratio)</i> : This is the core activity and an important source of income for banks. According to Anbar & Alper (2011), when outstanding loans increase, bank profits may increase and this may also be accompanied by high credit risk.
Macro variables	
<i>INF</i>	<i>INF (Inflation rate)</i> : Inflationary fluctuations directly affect the real value of costs and revenues. If banks can accurately forecast inflation trends and adjust interest rates accordingly, they can maintain profits. On the contrary, if input costs increase faster than revenues due to unexpected inflation, profits will be negatively affected.
<i>GDP</i>	<i>GDP (GDP growth rate)</i> As the economy grows, the demand for credit, investment and financial services will increase, creating a favorable environment for banks to expand their operations, increase revenue and improve profitability. However, if economic growth slows or declines, this can reduce the demand for loans, narrow investment activities, and increase operating costs and credit risks.

Source: Author's compilation

We use the following general research model:

$$\text{Bank performance}_{i,t} = \beta_0 + \beta_1 \text{IC}_{i,t} + \beta_2 \text{control variable}_{i,t} + u_{i,t} \quad (1)$$

Where:

Bank performance measured by ROA and ROE.

IC measured by VAIC together with the components of intellectual capital namely HCE, SCE and CEE.

Control variables include SIZE, CAP, DEP, LOAN, GDP and INF.

We collect data from the following sources: (1) information on the bank level from annual audited financial statements for the period 2014 – 2024. Our dataset includes 26 commercial banks in Vietnam; (2) GDP and INF data from the World Bank.

The above models are used to test the following four hypotheses:

Hypothesis H_1 : Value-added intellectual capital (VAIC) has a positive impact on bank performance.

Hypothesis H_{2a} : Human capital efficiency (HCE) has a positive impact on bank performance.

Hypothesis H_{2b} : Structural capital efficiency (SCE) has a positive impact on bank performance.

Hypothesis H_{2c} : Capital efficiency employed (CEE) has a positive impact on bank performance.

4.RESULTS AND DISCUSSIONS

4.1.Descriptive statistics

The study used a dataset of 286 observations collected from 26 joint stock commercial banks in Vietnam during the period 2014 - 2024. Descriptive statistical analysis was conducted to determine the basic characteristics of the variables in the model, including: mean value, standard deviation, minimum value and maximum value. The results are presented in Table 2 as follows:

Table 2. Descriptive statistics of variables in the research model

Variable name	Number of observations	Unit of measure	Average	Standard deviation	Minimum value	Maximum value
ROA	286	%	0.0099	0.0083	-0.0478	0.0365
ROE	286	%	0.1161	0.0998	-0.9169	0.3033
VAIC	286	%	4.3345	1.4684	-3.4301	8.0062
HCE	286	%	3.3404	1.2479	-4.0434	6.7682
SCE	286	%	0.6570	0.2277	-2.5496	1.2473
CEE	286	%	0.3371	0.1484	-0.6341	0.8063
SIZE	286		14.2655	0.4991	13.1993	15.4410
CAP	286	%	0.0865	0.0308	0.0406	0.2203
DEP	286	%	0.6735	0.0994	0.4201	0.8937
LOAN	286	%	0.6073	0.0925	0.2201	0.7881
GDP	286	%	0.0614	0.0178	0.0255	0.0812
INF	286	%	0.0294	0.0092	0.0063	0.0408

(Source: Results compiled by the authors using Stata 17.0 software)

The descriptive statistics indicate considerable variation in the variables, reflecting differences in

the operations and performance of Vietnamese joint-stock commercial banks during the study period. ROA averages 0.99% (SD = 0.83%), ranging from -4.78% to 3.65%, while ROE averages 11.61% (SD = 9.98%), ranging from -91.69% to 30.33%. These results suggest substantial differences in profitability and financial performance across banks.

The average VAIC is 4.3345 (SD = 1.4684), highlighting the importance of intellectual capital. Among its components, HCE has the highest mean (3.3404) and the greatest variation, indicating differences in human capital efficiency. SCE and CEE have average values of 0.6570 and 0.3371, respectively, with relatively lower variability.

Regarding the control variables, bank size (SIZE) averages 14.2655, reflecting differences in operational scale. CAP, DEP, and LOAN average 0.0865, 0.6735, and 0.6073, respectively, indicating variation in capital adequacy, deposit mobilization, and lending strategies among banks. At the macroeconomic level, GDP growth averages 6.14% per year, while inflation averages 2.94%,

providing a relatively stable economic environment during the study period.

4.2. Correlation analysis

Based on the correlation matrix, it can be seen that most of the pairs of variables in the model have correlation coefficients below the threshold of 0.8 (See Table 3), indicating no worrying signs of multicollinearity. Some pairs of variables have high correlation coefficients such as CEE – ROE 0.8117, and HCE – VAIC is 0.9876. However, these relationships can be reasonably explained theoretically, when reviewing the calculation formula, CEE and ROE are related through structural capital, that is, $CEE = VA/CE$, in which CE is equity; and HCE is the largest component in VAIC and $VAIC = HCE + SCE + CEE$, so HCE and VAIC are also closely related to each other. Therefore, the high correlation coefficients between these pairs of variables are higher than those of the remaining pairs of variables in the model.

Table 3. Correlation coefficient matrix between variables in the model

	ROA	ROE	VAIC	HCE	SCE	CEE	SIZE	CAP	DEP	LOAN	GDP	INF
ROA	1.0000											
ROE	0.8826	1.0000										
VAIC	0.7410	0.7179	1.0000									
HCE	0.7309	0.6942	0.9876	1.0000								
SCE	0.3506	0.2957	0.6230	0.5150	1.0000							
CEE	0.6474	0.8117	0.6340	0.5725	0.2990	1.0000						
SIZE	0.4773	0.5222	0.5957	0.5664	0.3215	0.6382	1.0000					
CAP	0.3433	0.0047	0.1693	0.2024	0.1193	-0.2100	-0.2588	1.0000				
DEP	-0.4257	-0.2770	-0.3098	-0.3141	-0.2010	-0.1158	-0.0322	-0.2528	1.0000			
LOAN	0.1678	0.2242	0.2324	0.2086	0.1349	0.3382	0.3533	-0.0214	0.3794	1.0000		
GDP	-0.1087	-0.0980	-0.1049	-0.1078	-0.0209	-0.0991	-0.0856	-0.0001	-0.0014	-0.0603	1.0000	
INF	0.0687	0.0438	0.0537	0.0562	0.0297	0.0129	0.0785	-0.0195	-0.0885	0.0322	0.1713	1.0000

(Source: Results compiled from Stata 17.0 software)

4.3. Research results

4.3.1. Regression analysis with intellectual capital model and performance

According to the results from Table 4, we see that the variables VAIC, SIZE, CAP, LOAN and GDP have a positive impact on ROA with coefficients of 0.00178, 0.00603, 0.0637, 0.00870 and 0.0197 respectively, with statistical significance at the level of 0.001. On the contrary, DEP has a negative impact on ROA, coefficient -0.0120 and also reaches statistical significance at the level of 0.001.

Table 4. VAIC regression results with dependent variable ROA and ROE

	ROA (Model 1)	ROE (Model 2)
VAIC	0.00178*** (11.50)	0.0224*** (10.53)
SIZE	0.00603*** (10.32)	0.0718*** (8.06)
CAP	0.0637*** (7.13)	0.0761 (0.88)
DEP	-0.0120*** (-5.66)	-0.106*** (-3.59)
LOAN	0.00870*** (3.66)	0.106** (3.21)
GDP	0.0197*** (4.13)	0.218*** (3.29)

INF	0.00669 (0.82)	0.00987 (0.09)
_cons	-0.0888*** (-11.13)	-1.022*** (-8.07)

Note: *, **, *** represent $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively.

(Source: Results compiled from Stata 17.0 software)

The variable INF alone is not statistically significant in the model and can be removed from the model. Based on the results of the regression analysis, after removing the variables that do not have a significant impact on ROA, we get the following model:

$$\begin{aligned} ROA = & -0.0888 + 0.00178VAIC_{i,t} \\ & + 0.00603SIZE_{i,t} \\ & + 0.0637CAP_{i,t} - 0.0120DEP_{i,t} \\ & + 0.00870LOAN_{i,t} \\ & + 0.0197GDP_{i,t} + u_{i,t} \end{aligned}$$

Based on the results in Table 4, we can see that the variables VAIC, SIZE and GDP all have a positive impact on ROE with the coefficients of 0.0224, 0.0718 and 0.218 respectively, with statistical significance at the 0.001 level. In addition, the variable LOAN also has a positive impact on ROE with a coefficient of 0.106 and a significance level of 0.01. On the contrary, DEP has a negative impact on ROE, with a coefficient of -0.106 and also a statistical significance level of 0.001. Only CAP and INF are not statistically significant in the model and can be removed from the model. Based on the results of the regression analysis, after removing the variables that do not have a significant impact on ROE, we get the following model:

$$\begin{aligned} ROE = & -1.022 + 0.0224VAIC_{i,t} \\ & + 0.0718SIZE_{i,t} - 0.106DEP_{i,t} \\ & + 0.106LOAN_{i,t} + 0.218GDP_{i,t} \\ & + u_{i,t} \end{aligned}$$

4.3.2. Regression analysis with component model of intellectual capital and and performance

Based on the results in Table 5, the variables HCE, CEE, SIZE, CAP, GDP and INF all have positive correlations with ROA with coefficients of 0.00141, 0.0251, 0.00458, 0.116, 0.00991 and 0.0183 respectively, with statistical significance at the 0.001 level, while the variables GDP and INF are statistically significant at the 0.05 level. On the contrary, the variables SCE and DEP have a

negative impact on ROA, with coefficients of -0.00317 and -0.0119, both reaching statistical significance at the 0.001 level. The variable LOAN is not statistically significant in the model and can be removed from the model.

Table 5. Component regression results of intellectual capital with dependent variable ROA and ROE

	ROA (Model 3)	ROE (Model 4)
HCE	0.00141*** (6.44)	0.0192*** (7.70)
SCE	-0.00317*** (-3.71)	-0.0603*** (-5.15)
CEE	0.0251*** (12.00)	0.379*** (15.99)
SIZE	0.00458*** (6.72)	0.0329*** (4.65)
CAP	0.116*** (12.52)	0.462*** (5.49)
DEP	-0.0119*** (-5.92)	-0.121*** (-5.47)
LOAN	0.000177 (0.07)	-0.0263 (-1.00)
GDP	0.00991* (2.01)	0.152* (2.51)
INF	0.0183* (2.17)	0.116 (1.09)
_cons	-0.0693*** (-7.47)	-0.458*** (-4.70)

Note: *, **, *** represent $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively.

(Source: Results compiled from Stata 17.0 software)

Based on the regression analysis results, after removing the variables that do not have a significant impact on ROA, we get the following model:

$$\begin{aligned} ROA = & -0.0693 + 0.00141HCE_{i,t} \\ & - 0.00317SCE_{i,t} + 0.0251CEE_{i,t} \\ & + 0.00458SIZE_{i,t} + 0.116CAP_{i,t} \\ & - 0.0119DEP_{i,t} \\ & + 0.00991GDP_{i,t} + 0.0183INF_{i,t} \\ & + u_{i,t} \end{aligned}$$

According to the results in Table 5, the variables HCE, CEE, SIZE, CAP and GDP all have positive correlations with ROE with coefficients of 0.0192, 0.379, 0.0329, 0.462 and 0.152 respectively, with statistical significance at the 0.001 level, while the

GDP variable is statistically significant at the 0.05 level. On the contrary, the variables SCE and DEP have negative correlations with ROE, with coefficients of -0.0603 and -0.121, both reaching statistical significance at the 0.001 level. The variables LOAN and INF are not statistically significant in the model and can be removed from the model. Based on the regression results and statistical significance analysis, after removing the variables that do not have a significant impact on ROE, we get the following model:

$$\begin{aligned} \text{ROE} = & -0.458 + 0.0192\text{HCE}_{i,t} - 0.0603\text{SCE}_{i,t} \\ & + 0.379\text{CEE}_{i,t} + 0.0329\text{SIZE}_{i,t} \\ & + 0.462\text{CAP}_{i,t} - 0.121\text{DEP}_{i,t} \\ & + 0.152\text{GDP}_{i,t} + u_{i,t} \end{aligned}$$

4.4. Research results discussion

The estimation results in Tables 6 and 7 show that the VAIC coefficient is positive and statistically significant at the 1% level in both models (0.00178 for ROA and 0.0224 for ROE), confirming that intellectual capital (IC) positively affects the performance of Vietnamese joint-stock commercial banks during 2014–2024. Specifically, a 1% increase in VAIC leads to a 0.178% increase in ROA and a 2.24% increase in ROE. This finding supports the resource-based view (Wernerfelt, 1984) and is consistent with numerous previous studies (Alhassan & Asare, 2016; Meles et al., 2016; Ozkan et al., 2017; Ousama et al., 2020; Le Hong Nga & Nguyen Thanh Dat, 2021; Phan Anh & Nguyen Nhat Minh, 2023). It suggests that investment in IC enhances operational efficiency and strengthens banks' sustainable competitive advantage.

Regarding the individual IC components (Tables 9 and 10), both human capital efficiency (HCE) and capital employed efficiency (CEE) positively affect bank performance, whereas structural capital efficiency (SCE) has a negative effect. HCE has positive coefficients of 0.00141 (ROA) and 0.0192 (ROE), indicating that a 1% increase in HCE raises ROA by 0.141% and ROE by 1.92%. This finding highlights the importance of employee knowledge and skills in improving bank performance and is consistent with previous research (Al-Musali & Ismail, 2014; Meles et al., 2016; Le Hong Nga & Nguyen Thanh Dat, 2021).

CEE exhibits an even stronger positive impact, with coefficients of 0.0251 for ROA and 0.379 for ROE. These results suggest that efficient

utilization of financial and physical capital, together with strong stakeholder relationships, significantly enhances profitability and competitiveness. Similar evidence has been reported in earlier studies (Majumder et al., 2023; Mondal & Ghosh, 2012; Ozkan et al., 2017). Compared with HCE, CEE has the strongest effect, particularly on ROE, implying that Vietnamese commercial banks should continue improving the efficiency of both tangible and financial capital.

In contrast, SCE has a negative and statistically significant impact on bank performance, with coefficients of -0.00317 (ROA) and -0.0603 (ROE), leading to the rejection of the corresponding hypothesis. This result can be explained by the VAIC methodology (Pulic, 2004), where substantial investment in structural capital, such as technology, infrastructure, and internal systems, increases depreciation and implementation costs in the short run, thereby reducing value added and measured efficiency. Furthermore, because $SC = VA - HC$, greater investment in human capital may temporarily reduce SCE before productivity gains are realized. During 2014–2024, Vietnamese banks also made significant long-term investments to upgrade digital technologies and comply with Basel II and Basel III standards. Although these investments are strategically important, their benefits require time to materialize, resulting in a short-term negative effect of SCE on bank performance.

5. CONCLUSION AND IMPLICATIONS

Using data from the financial statements of 26 joint-stock commercial banks in Vietnam for 2014 - 2024, our study found that IC has a positive impact on bank performance. IC and its components play an essential role in improving performance and advancing stable development. Both HCE and CEE have a positive impact on performance, with CEE showing a more substantial impact, although it accounts for the smallest proportion of total IC. On the contrary, SCE hurts performance, so over-investment in organizational structure can reduce bank performance. These results are synthesized and analyzed to propose managerial implications to effectively use IC as a strategic tool to improve the performance of joint-stock commercial banks in Vietnam. In detail, human capital efficiency (HCE) and capital efficiency (CEE) should be the focus to improve bank performance. However, structural capital efficiency (SCE) is necessary to control the

expansion when a bank improves IC. In addition, the study analyzed the role of control variables SIZE, CAP, LOAN, GDP, and INF, all of which have a positive impact on performance, while DEP has a negative impact.

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