ISSN 2090-3359 (Print)
ISSN 2090-3367 (Online)

Advances in Decision Sciences

Volume 28
Issue 2
June 2024

Published by Asia University, Taiwan and Scientific and Business World

Does Intellectual Capital Foster Deposit Growth in Banking System? Empirical Evidence from a Developing Economy

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Received: February 14, 2024; First Revision: February 18, 2024;

Last Revision: March 25, 2024; Accepted: June 13, 2024;

Published: November 10, 2024

Abstract

Objective: This study investigates the relationship between intellectual capital (IC) efficiency and deposit growth in Vietnamese banks. IC refers to intangible knowledge-based assets like employee competencies, processes, and customer relationships.

Methodology: The paper analyzes a sample of 26 commercial banks in Vietnam from 2006 to 2020 and uses the Value-added Intellectual Coefficient model to measure IC efficiency.

Findings: The results indicate a positive influence of overall IC on deposit growth. However, the effect of individual IC components varies, with human and structural capital enhancing deposits while capital employed efficiency reducing deposits. The findings suggest smaller banks leverage IC more effectively for deposit mobilization than larger banks.

Implications: The research offers insights for bank executives on utilizing IC to attract deposits and for policymakers on regulating IC investment. Practical strategies for developing IC and theoretical directions for future research are discussed.

Novelty: The study provides the first empirical evidence of the linkage between IC and bank deposit growth.

Keywords: Knowledge-based Management; Intellectual Capital; Deposit Growth; Banking Industry; Developing Country.

JEL codes: G21, G28, O31

1. Introduction

When most economies over the globe have faced increasing uncertainty springing from the poly-crisis, such as the global supply chain disruption and unstable risks related to geopolitical hazards, many organizations nowadays have to be forced to find ways in which they can sustain their buoyant markets (Lu & Nguyen, 2023; Nguyen & Lu, 2023b). In this vein, the implementation of the knowledge-led business strategy can be deemed as a pivotal step to stay ahead of the curve because it can assist firms in accomplishing higher competitiveness and sustainable growth (Alvino, et al., 2020; Nguyen & Lu, 2023a; Suciu & Năsulea, 2019). At the same time, it is argued that the business operations of banks rely primarily on intellectual resources instead of other tangible assets to offer market-oriented products and services, which will play a crucial role in satisfying the rapid changes in their clientele's demands and requirements (Adesina, 2019). In addition, intellectual capital (IC) can become a vital herald to indicate whether the performance of a bank is effective in comparison with its counterparts (Meles, et al., 2016; Stewert, 1999).

It is not surprising that implementing IC (including human capital efficiency, structural capital efficiency, and capital employed efficiency) in banking operations has been paid much attention by both scholars and regulators in recent times. While number of studies in this field has focused mainly on the correlation between IC and banks' productivity (Alhassan & Asare, 2016; Yalama, 2013), IC and one's profitability (Le & Nguyen, 2020; Poh, et al., 2018), IC, and one's risks (Dalwai, et al., 2021; Nguyen, et al., 2021), or technical, allocative, and cost efficiencies (Adesina, 2019; Le, et al., 2022), the aspect of deposit growth in the banking system seems to remain an undiscovered area. Inspired by this unknown gap, this research aims to tackle the critical issue of whether or not the implementation of IC has fostered deposit growth in the banking system. In other words, the study will address two following questions: (i) Do banks leverage IC for their deposit growth? and (ii) What IC's components leverage banks' deposit growth? In this sense, Vietnam may provide one of the ideal countries for finding a clear answer and filling this vital gap in the literature for the following reasons.

Vietnam's economic growth has witnessed a fast-paced pace in the ASEAN region, and it is hoped that this country will be the next tiger in Asia (Le & Nguyen, 2020). According to the statistics from World Bank Data, from 2006 to 2019, the Gross Domestic Product growth of Vietnam nearly stood at an average of around 6.5% before dropping to about 2.9% in 2020 due to the adverse consequences of COVID-19. Notwithstanding, since the financial market seems to remain undeveloped, sustainable economic growth and development have relied mainly on the effective operations of the banking system, which is also deemed as the backbone of the Vietnamese economy (Lu & Nguyen, 2023; Nguyen & Lu, 2023b; Phan. The statistics revealed by World Bank Data illustrate that the economic indicators of domestic credit over the private sphere supported by banks jumped from about 65% to over 116% from 2006-2020. This remarkable escalation means that the development of the banking sector plays an imperative role in ensuring and fostering the growth of the Vietnamese economy. Therefore, the growing banks' deposits have become a significant factor in ensuring sufficient economic resources and sustaining the developing economy. Additionally, the Vietnamese banking market may become fiercely competitive, resulting from the appearance of foreign banks, followed by participating in the World Trade Organization in 2007. Consequently, domestic banks must find new ways to adapt to changing conditions. In this regard, digging more into intellectual resources may be an underlying strategy for thriving in business activities. On the

other hand, as et al. (2019) implied, banks traditionally act as financial producers and servicers; they are regularly forced to provide up-to-date products to satisfy their customers' demands, by which they can flourish in today's economic climate. Such a landscape underlines the primary driver of IC in generating effective remedies for these requirements. In short, discovering the link between IC and deposit growth would be a requisite study for the Vietnamese banking sector and other emerging countries where the sound operations of banks are seen as the prerequisite for economic development.

To tackle the concern above, the research utilizes the annual data of 26 commercial banks in Vietnam from 2006-2020. It approaches different regression analyses, including the ordinary least squares (OLS), the fixed-time effect, and the generalized method of moments (GMM) estimation, as well as controlling specific characteristics of banks and macro conditions. To calculate IC in the banking industry, the research employs the Value-added Intellectual Coefficient (VAIC) model, which is propounded by Pulic (2000, 2004). Overall, the consistent evidence indicates that implementing IC can assist domestic banks in fostering deposit growth. This central finding seems to survive when conducting a variety of robustness tests. The evidence regarding the impact of IC's components is mixed. In particular, while the human capital (skills, experiences, knowledge, and other abilities of staff) and structural capital (policies, strategies, technologies) positively affected the deposit growth, the capital employed efficiency (also physical capital) may hurt the growing deposits of banks. Also, the role of IC appears more unequivocal in smaller banks than in bigger ones.

The research is anticipated to contribute to the knowledge gap in this field in the following ways. First and foremost, regarding the theoretical view, to the best of the writers' horizon, the research may provide the first empirical investigation into the correlation between IC and banks' deposit growth, at least in a developing country context. While the majority of related papers emphasize the connection between IC and some business aspects such as productivity, profitability, risk-taking, or technical, allocative, and cost efficiencies (Adesina, 2019; Le, et al., 2022; Le & Nguyen, 2020; Meles, et al., 2016)The research makes a difference to the extant studies by digging deeper into the influence of IC on growing deposits in the banking sector. Moreover, most studies in this area mainly take the landscape of the industrialized countries to perform, notably the US and China, which are the most influential economies over the globe (Alvino, et al., 2020). Hence, by conducting an investigation in Vietnam, which has been seen as a pivotal part of the ASEAN region, the paper will bring more profound insight into the driver of IC in rebuilding business strategies of domestic banks to not only economists but also decision-makers in developing economies. In addition, the result indicates that while small banks tend to harness intellectual resources effectively, there is 'a quiet life' in large banks, which are regularly less incentive to develop creativity and innovativeness (Scherer, 2001)This means that managers in big banks should re-evaluate and refocus on IC-based management if they want to reap a good harvest from these precious resources. Last but not least, based on the findings, the study will provide productive implications for both managers and regulators in the Vietnamese banking system, which has targeted major realignments to meet the requirements of Basel III.

The paper consists of the following main sections: Section 2 reviews the relevant literature, and Section 3 describes the methodology. The next Section analyses the central empirical findings and the various robustness tests. Finally, Section 5 depicts the conclusions.

2. Literature Review

2.1. Interpretations of Intellectual Capital

It could be argued that the definitions of IC vary in the literature depending on different disciplines (Le & Nguyen, 2020; Poh, et al., 2018). Notwithstanding, there is an overall consensus among researchers and practitioners on the chief driver of knowledge-based resources in bolstering an organization's business operations. For instance, Stewert (1999) defines IC as valuable substances, including experiences, knowledge, intellectual property, and information, that an organization may harness these useful materials to construct wealth and propensity. Similarly, Edvinsson & Malone (1997) suggest that IC is a non-physical appearance and can bring certain values to a firm. Oliveira, et al. (2010) indicate that IC is deemed as an invisible power consisting of the capability of individuals in learning, namely the human capital; organizational culture known as the structural capital; and the interactions with extrinsic factors named the relation capital. Identifying components of IC seems to remain the subject of debate (Keong Choong, 2008). Fundamentally, IC comprises three key ingredients: human capital, relational capital, and structural capital. The first ingredient, human capital, is usually defined as the distinctive characteristics such as skills, knowledge, and experiences that individuals and teams possess. By tapping into this resource, a company can gain competitive advantages (Harris, 2000). Meanwhile, structural capital entails a company's internal factors, such as data, patents, policies, inventions, strategies, and technology. Harris (2000) considers that structural capital may be the bedrock of IC that would ensure the smoothness of knowledge transmission within a company. The last component, relational capital, is usually related to multi-stakeholders, including customers, suppliers, and other relevant stakeholders (Meles, et al., 2016).

There are specific endeavours to propound various IC measures in the extant literature. For instance, various typical measures comprise the intangible asset monitor, IC index, and the economic value-added, which are propounded by Sveiby (1997), Roos & Roos (1997), and Stewert (1999), respectively. The VAIC model propounded by Pulic (2000, 2004) can be seen as a productive tool to measure the efficiency of IC in the financial literature (Adesina, 2019), because this measure is recognized as a suitable device for calculating IC efficiency in both the banking sphere and others (Poh, et al., 2018)The model captures an organization's three main resources: the efficiency of human capital (HC), capital employed (CE), and structural capital (SC). This method assumes that these resources have been pivotal in significantly contributing to the process of value creation in an organization.

It is necessary to acknowledge that, naturally, the VAIC model contains some drawbacks. For instance, it cannot capture all aspects of intellectual capital efficiency. In other words, many ingredients of IC cannot be presented in such a model, especially the relational capital efficiency (Adesina, 2019; Meles. However, three main points lead us to employ the VAIC model in this research. First, it has been used widely in the financial literature recently, especially in the banking industry (Nguyen & Lu, 2023a, 2023b). Second, compared to other measures, the VAIC model is quite simple for calculating IC efficiency since researchers can rely on the available financial information of banks to formulate it (Adesina, 2019). Third, some prior studies suggest that it can be seen as a helpful measure to calculate IC efficiency in the financial sector and others (Poh. Therefore, in the study, the VAIC method is employed to measure banks' IC efficiency, and the detailed

calculation will be depicted in Section 3 after a variety of empirical studies in the banking sector will be analysed in the following subsection.

2.2. Relevant Empirical Studies in Banking Industry

The link between VAIC and banking performance has been captivated by many academics in recent years. Overall, while various studies find that VAIC significantly contributes to remarkable improvement in the business operations of banks, the impact of its components seems to be mixed. For instance, based on the panel data of 18 Ghanaian banks from 2003 to 2011, Alhassan & Asare (2016) employ the panel-corrected standard error estimation and find that VAIC, HC, and CE assist banks in enhancing productivity. Similarly, by utilizing the panel data regression analysis based on the sample of 17 banks in Turkey from 1995 to 2006, Yalama (2013) finds that VAIC has positively affected banks' profits, market values, and productivity. For profitability, Poh, et al. (2018) utilize the data set of 10 banks in Malaysia between 2007 and 2016, and indicate that VAIC positively correlates with banking performances, specifically ROE and ROA ratio. At the same time, the results show that while HC and CE fuel performances of banks during the period 2011-2016, a similar impact is found in the case of SC and CE from 2007 to 2016. These authors conclude that the effects of VAIC and its components have certain differences, which depend on the approaches of banking performances and the years that a study selects. Meles, et al. (2016) employ the OLS regression based on a large sample of around 5.750 commercial banks in the US from 2005 to 2012, and find that IC has contributed to the remarkable improvement in banking performances, in which the impact of HC is the most obvious compared to other components. In a similar way, Buallay, et al. (2020) utilize the database of 59 listed banks in the Gulf countries from 2012 to 2016 and perform the OLS regression to analyse the correlation between VAIC, its ingredients, and some financial indicators such as return on assets (ROA), return on equity (ROE) and Tobin's Q. The results indicate that VAIC positively affects both ROE and Tobin's Q indicators, while HC is the most imperative component enhancing all ROA, ROE, Tobin's Q ratios. Meanwhile, the relationship between SC and these indicators is statistically insignificant, and CE only fosters financial performances instead of the banking market values. By using 339 commercial banks in 31 African nations from 2005 to 2015 and performing the Tobit and one-system GMM methods, the recent study of Adesina (2019) finds that VAIC has a positive effect on bank technical, allocative, and cost efficiencies, and HC is a unique factor that fuels these efficiencies.

From a related angle, some studies do not find a connection between VAIC and banking operations. For instance, by using the database of 16 listed banks in Thailand between 1997 and 2016 and employing three econometric methods, including the fixed-effects, random-effects model, and GMM estimator, the study of Tran & Vo (2018) shows that VAIC does not fuel banking profitability. Also, the empirical evidence indicates that a decrease in profitability is partly associated with the HC component, while the CE component is a key driver in bolstering banking performance. Similarly, by employing the data set of 44 Turkish banks from 2005-2014 and the fixed-effects and random-effects model, the findings of Ozkan indicate that VAIC does not strengthen banking performance. Also, the results consider that while both CE and HC are the most critical factors in spurring banks' performances, the SC component has the opposite impact. By utilizing the data set of 26 Pakistani banks from 2012-2016 and the GMM estimator, Haris find an inverted U-shaped connection between VAIC and banks' profitability in this country. Besides, regarding the impacts of VAIC's ingredients, the findings are virtually in line with the research of Ozkan, et al. (2017) as mentioned above.

Some recent studies for the Vietnamese banking industry also manifest a mixed relationship between VAIC and banking operations. Specifically, Le & Nguyen (2020) find that although VAIC and HC components can foster the profitability of Vietnamese banks, particularly foreign and state-owned banks, an inverse U-shaped appearance may exist in the cases of VAIC and its two ingredients: HC and CE. Another effort attempts to find out the risk-taking of banks. Notably, Nguyen, et al. (2021) approach the quantile regression method and find that an increase in VAIC investment may adversely impact banks' stability in the short run. However, this investment may consolidate banks' stability if it reaches a specific threshold. Also, the evidence shows that the banks' instability may result from the SC component. For the technical, allocative, and cost efficiency of banks, the research carried out by Le, et al. (2022) shows almost similar findings to the prior study conducted by Adesina (2019) mentioned before. The latest paper of Nguyen & Lu (2023b) focuses on the driver of IC in the financial intermediation of banks and finds that VAIC and CE components significantly contribute to this business activity. Under the relevant angle, Lu & Nguyen (2023) find that the VAIC and SE components positively affect banks' non-interest incomes. Meanwhile, smaller banks tend to harness SE more effectively than bigger ones.

Notably, the role of IC, as measured by VAIC, has enchanted many academics in the banking sector. However, whether IC has fostered the banks' deposit growth has not yet reached a clear answer. In this regard, the central aim of the research is to bridge this knowledge gap in the extant financial literature. To some degree, the findings of the study will be close to and contribute to the prior results of Nguyen & Lu (2023b).

2.3. Building Hypotheses

To some extent, the evolution of theories related to IC in the extant literature supports the implementation of intellectual resources as the main vehicle that helps an organization achieve competitiveness. The first theory is the resources-based theory propounded by Dierickx & Cool (1989) and Penrose & Penrose (2009). This theory highlights that exploring internal resources, particularly intangible assets, can assist an organization in sustaining competitive advantages and stable growth and development. The following view, labeled as the knowledge-based theory, may be seen as the extension of the theory above because this theory focuses on not only endogenous sources but also external ones (Khalique, et al., 2013). In a wave of evolution, the IC theory finally developed to focalize multidimensional aspects such as the skills of employees, the reputation of an organization, and multi-stakeholders. The IC theory suggests that most companies can reap a good harvest from harnessing these resources effectively. To sum up, the theoretical view underscores the bright side of implementing IC in fostering the competitiveness of organizations, and therefore, it is anticipated that IC can spur banks' deposit growth. Along with many empirical findings that support the chief driver of IC in banking operations, the following hypothesis is constituted:

Hypothesis 1: VAIC will improve the banks' deposit growth.

Prior studies have found no association between IC and banks' business operations, while the impact of VAIC's components tends to be mixed. The subsequent hypotheses are built as follows.

Hypothesis 2: VAIC will not support the banks' deposit growth.

Hypothesis 3: The relationship between VAIC's components and the deposit growth will be mixed.

3. Methodology

3.1 Data

Banks' financial information has been collected directly from the financial statements audited by commercial banks, which are disclosed annually according to the accounting standards of Vietnam. To calculate VAIC, some relevant detailed costs are amassed from the notes to the financial statements. At the same time, a bank will be removed if the necessary information is not announced in a particular fiscal year. We have tried to collect as much financial data as possible. However, we have been forced to eliminate banks that have missed some relevant information. Eventually, the annual data of the research includes 26 domestic commercial banks, with the period spanning from 2006 to 2020. The total assets of all banks selected comprise around 70% of the Vietnamese banking system. Compared with 35 local banks and market shares of the banking system, the research sample may account for over 70%. Hence, it can be said that the sample that was conducted is widely representative. Moreover, the macro indicators are amassed directly from the database publicized by the World Bank during the same period.

The period is selected due to the following reasons. First, it contains some memorable events, such as the global financial crisis and the onset of Covid-19. Second, it has observed significant reforms in the banking industry, such as adjusted regulations to meet the required standards of Basel, the emergence of foreign banks, technology-oriented development (Lu & Nguyen, 2023; Nguyen & Lu, 2023a, 2023b; Phan, et al., 2022). Therefore, the findings will provide a complete picture of the possible exertion of IC on the business operations of the Vietnamese banking system based on this period.

3.2. Variables

To measure the IC of banks, the study employs the VAIC model propounded by Pulic (2000, 2004). Although this method is still under debate and possesses some drawbacks (Keong Choong, 2008; Meles, et al., 2016), it is popularly performed in a vast number of research in the extant financial literature (Buallay, et al., 2020; Nguyen & Lu, 2023b). This research uses VAIC and its components as the primary explanatory variable in the empirical model. The calculation of VAIC and its components is constructed as the following steps:

$$VAIC_{it} = CE_{it} + HC_{it} + SC_{it}, \quad (1)$$

where, $VAIC_{it}$, CE_{it}, HC_{it}, SC_{it} are the measures of the intellectual capital efficiency, capital employed efficiency, human capital efficiency, and structural capital efficiency, respectively, of bank *i* at year *t*.

$$VA_{it} = OP_{it} + PC_{it} + A_{it}, \quad (2)$$

where, VA_{it} is the total value added of bank *i* at year *t*. The calculation of VA_{it} is the sum of operating profits (OP_{it}), personnel costs (PC_{it}), and amortization and depreciation costs (A_{it}).

$$CE_{it} = VA_{it}/EB_{it}, \quad (3)$$

where, CE_{it} is the capital employed efficiency of bank *i* at year *t*, VA_{it} is the total value added of bank *i* at year *t*, and EB_{it} is the equity book value of bank *i* at year *t*.

$$HC_{it} = VA_{it}/HE_{it}, \quad (4)$$

where, HC_{it} is the human capital efficiency of bank *i* at year *t*, HE_{it} is staff costs of bank *i* at year *t*, and VA_{it} is the total value added of bank *i* at year *t*.

$$SC_{it} = (VA_{it} - HE_{it})/VA_{it}, \quad (5)$$

where, SC_{it} presents the structural capital efficiency of bank *i* at year *t*. VA_{it}, HE_{it} are the total value added and staff costs, respectively, of bank *i* at year *t*.

It should be recognized that naturally, VAIC model also obtains some demerits. First and foremost, this model does not yet capture all aspects of IC efficiency as the theoretical views suggest (Adesina, 2019). More specifically, this approach seemingly ignores the third component of IC, namely relational capital. Furthermore, as Meles, et al. (2016) indicate, the formulation of VAIC seems to mistake "cash flow and capitalized entities". In this light, many researchers have endeavored to fulfill these drawbacks by proposing an extended or modified VAIC model. Accordingly, various studies have added expenses related to marketing or research & development into VAIC to extend this model and dig more into other neglected aspects (Buallay, et al., 2020).

Regardless of the limitations above, VAIC model still stands in the existing literature since it has had some main merits as follows. First, its computation is relatively straightforward because researchers can rely mainly on the financial information publicized by banks to calculate (Adesina, 2019; Nguyen & Lu, 2023b; Poh, et al., 2018). While it is true that there is an absence of necessary information to formulate IC efficiency, especially in the landscape of emerging markets, the VAIC model has appeared to bridge this gap. Moreover, this measure can be seen as a suitable tool to estimate IC efficiency in both the banking sector and other industries (Lu & Nguyen, 2023; Poh, et al., 2018). This may be why numerous studies have applied this method to evaluate the role of IC based on both developed and developing countries in the extant literature. At the same time, the VAIC approach can help academicians to make a comparison of IC performance with other financial indicators of an organization (Meles, et al., 2016; Stewert, 1999). Based on these merits, the VAIC model will be used in the current study to evaluate the role of IC in banks' deposit growth in Vietnam. Also, due to limited data, it is hoped that future research can utilize other alternative measures to fulfill the demerits of this model, as mentioned above.

For the dependent variable, the study utilizes the annual deposit growth of banks (DEPOSITGR) to investigate the influences of VAIC and its ingredients on growing deposits in the banking system. For the control variables, the study controls the bank-specific characteristics, including the ratio of capital to total assets (CAP), the ratio of total income before taxes, provisions recognized in income to total gross assets (RETURN), the (natural logarithm) total assets (ASSET), and the loan loss reserve ratio (LLRR). Also, the research controls macro conditions such as the annual GDP growth (GDP) and the inflation rate (IFNLR). These control variables are commonly performed in the financial literature (Le & Nguyen, 2020; Lu & Nguyen, 2023; Nguyen & Lu, 2023a, 2023b).

Table 1. Variables Definition

Variables	Definitions
Dependent variable	
DEPOSITGR	The annual deposit growth of banks.
Main explanatory variables	
VAIC	The model propounded by Pulic (2000, 2004) is the sum of capital employed efficiency, human capital efficiency, and structural capital efficiency.
CE, HC, and SC	CE, HC, and SC variables measure capital employed efficiency, human capital efficiency, and structural capital efficiency, respectively.
Control variables	
ASSET	ASSET, the control variable, is the natural logarithm of the total assets of each bank.
CAP	CAP, the control variable, is the ratio of the book value of equity to the total assets of each bank.
LLRR	LLRR, control variable, is the ratio of the loan loss reserve of each bank.
RETURN	RETURN, control variable, is the ratio of total income before taxes, provisions recognized in income to total assets of each bank.
GDP	GDP is the macro-control variable, which is the ratio of the GDP growth in Vietnam per year.
INFLR	The annual inflation rate in Vietnam

Note: This table defines all the main variables used in the current analysis. DEPOSITGR is the dependent variable, and VAIC and its components (CE, HC, and SC) are the key explanatory variables. Others are control variables.

3.3. Empirical Method

To investigate the correlation between intellectual resources and growing deposits, the study performs the following regression:

$$DEPOSITGR_{it} = \alpha + VAIC_{it} + Bank_{it} + Macro_t + \theta_t + \varepsilon_{it}, \quad (6)$$

where, $DEPOSITGR_{it}$ presents the dependent variable, which is the deposit growth of bank *i* at year *t*, and VAIC is utilized as the primary explanatory variable in the empirical model. $Bank_{it}$ is the vector of controlling bank-specific variables comprising ASSET, CAP, RETURN and LLRR. $Macro_t$ presents the vector of controlling macro conditions comprising GDP and INFLR. Also, the empirical model will obtain the time-fixed effects (θ_t) to control the conditions of the macroeconomy and the popularity across banks. Finally, ε_{it} will present the error term in the model. The research also provides various robustness tests to ensure the findings, such as lagging one year for VAIC and performing different econometric approaches.

Additionally, all financial variables are winsorized at a 1% level on the top and bottom of their distribution to wipe out the possible influences of outliers. Table 2 below presents the descriptive statistics in Panel A, and the correlation matrix is depicted in Panel B. As Table 2 illustrates, the total observations in the study are about 380, in which among the three components of VAIC, the HC component possesses the highest value (2.46), which is in line with the previous papers (Le, et al., 2022; Lu & Nguyen, 2023; Nguyen & Lu, 2023b)The figures also show that the deposit growth of the Vietnamese banks was remarkable, with an average of around 42%. Furthermore, the correlation matrix presents a positive relationship between VAIC and DEPOSITGR but no statistical significance.

Table 2. The descriptive statistics and correlation matrix.

Panel A. Variables descriptive statistics

	Observation	Mean	Standard deviation	Minimum	Maximum
DEPOSITGR	376.00	0.42	0.84	-0.17	6.62
VAIC	378.00	3.41	1.01	0.77	6.65
CE	380.00	0.39	0.22	0.05	0.95
HC	378.00	2.46	0.78	1.00	5.47
SC	380.00	0.55	0.15	0.001	0.83
CAP	380.00	0.11	0.07	0.04	0.46
ASSET	380.00	24.9	1.5	20.8	27.9
LLRR	379.00	-0.01	0.04	-0.27	0.03
RETURN	380.00	0.02	0.01	0.001	0.06
GDP	390.00	0.06	0.01	0.03	0.07
INFLR	390.00	0.07	0.06	0.01	0.23

Panel B. Correlation matrix (pairwise)

	(DEPOSITGR)	(VAIC)	(ASSET)	(CAP)	(RETURN)	(LLRR)	(GDP)	(INFLR)
DEPOSITGR	1.000							
VAIC	0.077	1.000						
	(0.139)							
ASSET	-0.355*	0.209*	1.000					
	(0.000)	(0.000)						
CAP	0.248*	0.011	-0.710*	1.000				
	(0.000)	(0.831)	(0.000)					
RETURN	0.006	0.707*	0.037	0.291*	1.000			
	(0.902)	(0.000)	(0.471)	(0.000)				
LLRR	0.098	0.362*	-0.082	0.132*	0.287*	1.000		
	(0.057)	(0.000)	(0.110)	(0.010)	(0.000)			
GDP	0.064	0.014	-0.086	-0.011	-0.044	-0.026	1.000	
	(0.212)	(0.786)	(0.092)	(0.825)	(0.389)	(0.614)		
INFLR	0.058	0.061	-0.340*	0.325*	0.116*	0.302*	-0.112*	1.000
	(0.260)	(0.233)	(0.000)	(0.000)	(0.023)	(0.000)	(0.027)	

Note: These tables above depict the summary statistics (Panel A) and the correlation matrix (Panel B) of all employed variables in the research sample. The period of sample spans from 2006 to 2020. All financial variables are winsorized at 1% and 99% levels. * Significance at 10%; ** significance at 5% level; *** significance at 1%

4. Does Intellectual Capital Foster Deposit Growth in Banks?

4.1. Main Results

Table 3 elaborates on the central results of this research. Accordingly, OLS estimation will be applied from Model (1) to Model (3), while the fixed-effects estimator will be performed in Model (4)-(5). In the first model, bank-specific characteristics and macro conditions are controlled. In Model (2), the dummy variable (OWNER) is added to Model (1) to examine the effect of state-owned banks in the research sample. Investigating this effect is quite important because some existing studies have demonstrated that the role of VAIC in banks' business operations tends to differ depending on the private or state banks. For instance, both studies conducted by Singh, et al. (2016) and Tiwari and Vidyarthi (2018) have manifested that private banks seemingly harness intellectual resources more effectively than public ones. At the same time, adding this variable into the baseline model is seen as another way to retest our findings. Accordingly, the OWNER will equal one in the case of a bank that is state-owned, and it will equal zero otherwise. In Model (3), Model (1) is re-performed, and VAIC is split into its components. Finally, Model (1) and Model (3) are re-run

by approaching the fixed-time effects estimator, and the results are presented in Model (4) and Model (5), respectively.

Table 3. Main results

	(1)	(2)	(3)	(4)	(5)
	OLS estimation			Fixed-effects estimation	
	Baseline model	Dummy variable addition	VAIC's ingredients	Baseline model	VAIC's ingredients
VAIC	0.238**	0.216**		0.245**	
	(0.0947)	(0.106)		(0.113)	
CE			-0.865		-0.842**
			(0.580)		(0.411)
HC			0.146		0.151
			(0.204)		(0.211)
SC			1.103		1.133
			(0.912)		(1.002)
ASSET	-0.248***	-0.279***	-0.158***	-0.252***	-0.165**
	(0.0682)	(0.0842)	(0.0538)	(0.0719)	(0.0654)
CAP	0.303	0.0133	-0.210	0.343	-0.171
	(2.437)	(2.492)	(2.470)	(1.921)	(1.948)
RETURN	-15.43**	-13.29	-9.886	-15.68*	-10.30
	(7.843)	(8.789)	(8.611)	(8.688)	(8.276)
LLRR	0.828	0.790	1.618**	0.908*	1.634***
	(0.640)	(0.609)	(0.796)	(0.468)	(0.525)
GDP	0.438	0.0563	1.467	0.355	1.368
	(2.831)	(2.838)	(3.035)	(3.257)	(3.708)
INFLR	-1.450**	-1.623**	-1.613**	-1.521**	-1.673*
	(0.691)	(0.745)	(0.737)	(0.762)	(0.874)
OWNER		0.180			
		(0.143)			
Constant	6.111***	6.978***	3.970**	6.206***	4.114**
	(1.966)	(2.423)	(1.595)	(1.955)	(1.884)
Observations	373	373	373	373	373
R^2	0.174	0.176	0.203	0.1736	0.2026

Note: The table depicts regression estimations of the relationship between intellectual capital (measured by VAIC model) and bank deposit growth. From Model (1) to Model (3), the OLS method is employed, while the Fixed-effects estimation is performed in the rest of the models. Robust standard errors in parentheses: * Significance at 10%; ** significance at 5% level; *** significance at 1%.

Overall, it is clear that all coefficients of VAIC in all models are positive at 5% of statistical significance. More specifically, all coefficients of VAIC in Models (1), (2), and (4) are over 0.2. The R^2 values in these three models are above 17%, meaning that the causal effect of employed variables can be explained by over 17%. This evidence indicates that an increase in VAIC will assist banks in enhancing their deposit growth. Hence, this finding supports Hypothesis 1, which suggests that VAIC can improve the growing deposits in banks. For the three components of VAIC, the results in Model (3) and Model (5) show that although both HC and SC influence on the deposit growth is positive, it is statistically insignificant. Also, the impact of CE is negative and only has statistical significance at a 5% level in Model (5) when the fixed-effects estimation is applied. The values of R^2 in both models stand at above 20%, indicating that the analysis models can explain the relationships between variables at over 20%. Therefore, this evidence advocates Hypothesis 3, which considers that the blended results will be found in the case of

VAIC's components. It should be noted that the coefficient of the dummy variable (OWNER) in Model (2) is positive, however, it is not statistically significant, meaning that the evidence cannot yet conclude the effect of state-controlled banks on the primary concern.

4.2. A Variety of Robustness Tests

Various robustness tests are applied in this subsection to ensure the findings mentioned above. In the first stage, the main explanatory variables, including VAIC and its components, lagged by one year in all models. This approach may be helpful because banks usually need a certain time to absorb changes in their business strategies and then transform them into daily business operations (Lu & Nguyen, 2023; Nguyen & Lu, 2023b). At the same time, this method may help to minimize the problems related to the endogeneity in the empirical analysis model (Nguyen & Lu, 2023a; Tran, et al., 2021). The results are illustrated in Table 4. Accordingly, the OLS regression is employed in the first two models, and the fixed-time effect estimator is performed in the last two. Generally, the results demonstrate a positive connection between VAIC and the banks' deposit growth and the unexpected impact of the CE component on increasing bank deposits. Specifically, both coefficients of VAIC in Model (1) and Model (3) are positive and statistically significant at a 5% level, although their magnitude is lower than the previous findings. Similarly, the R^2 values in these models are also lower, standing at nearly 15% compared to over 17% in Table 3. Meanwhile, the unintended influence of CE and its magnitude seemingly remain unchanged compared to the result depicted in Table 3 and has statistical significance at 5% and 1% in Model (2) and Model (4), respectively. Interestingly, when approaching the fixed-time effects estimation in Model (4), the evidence indicates a positive impact of SC on the deposit growth with a statistical significance of 10% level.

The GMM estimator is performed in Table 5 at the next stage to test the results mentioned further. Approaching this method can help to address various biased estimations resulting from applying OLS regression because it contributes to the elimination of issues related to endogeneity, heteroscedasticity, autocorrelation, and correlation between all independent variables (Arellano & Bond, 1991; Blundell & Bond, 1998; Phan, et al., 2022). More specifically, when using VAIC as the key independent variable in the first model, the evidence indicates that VAIC's coefficient is positively and statistically significant at a 1% level. This means that the level of statistical significance of VAIC in this robustness test is higher than that in the initial and preceding test results. At the same time, when dividing VAIC into the three components in Model (2), the evidence continues to prove a negative relationship between CE and deposit growth with a statistical significance of 1% level. Meanwhile, HC and SC positively affect the banks' deposit growth and stand at a 5% level of statistical significance.

To sum up, the empirical analysis manifests the primary driver of IC in enhancing banks' deposit growth. This finding seems to survive various robustness tests, and therefore, it is consistent with Hypothesis 1. Additionally, the evidence considers a blended relationship between VAIC's components and increasing deposits. Notably, while the CE component may drain banks' deposit growth, the HC and SC components may strengthen this indicator. Hence, these findings support Hypothesis 3.

Compared to the existing studies, the supportive role of both HC and SC components in the current research is in line with the previous study by Tiwari & Vidyarthi (2018), find that both HC and SC significantly contribute to Indian banks' performance. Meanwhile, the negative role of CE is also

found in some studies, such as the work of Ul Rehman, et al. (2023), which indicates that the impact of CE on the financial performance of ASEAN banks is either negative or not found. Also, the mixed impacts of VAIC's components again reaffirm the recent findings based on listed banks in Indonesia conducted by Soewarno & Tjahjadi (2020).

Some key points explain the positive impacts of both HC and SC on bank deposit growth. For the former component, by effectively harnessing the skills, experiences, knowledge, and other abilities of employees who have a particular understanding of the changing needs and demands of depositors as well as the constant fluctuation of the deposit market, banks can immediately propose updated services and products to satisfy these requirements. Additionally, structural capital can stimulate banks' deposit growth, meaning that banks need to tailor and refine deposit policies, promotions, and strategies in suitable and market-oriented ways to promote their deposits. Taken together, it can be said that the combination of human and structural capital becomes a vital catalyst for advancing competition and growing deposits of banks. Besides, the possible explanation of the unexpected impact of capital employed is that along with implementing Basel I & II, the Vietnamese commercial banks tend to consolidate their physical capital to meet the strict requirements and standards of Basel, meaning that they have to spend a large part of their physical capital on the required capital buffer, higher loan-loss reserve ratio, and other similar items. Another compelling reason is that Vietnam's banking operation management in capital management seems to be not yet effective, especially against the backdrop of technology-led products and services. Indeed, the preceding evidence found by Phan, et al. (2022) shows that technological investments may hurt Vietnamese banks' cost-effectiveness. Hence, domestic banks cannot yet use capital employed to enhance their deposit expansion.

Table 4. Various Robustness Tests

	(1)	(2)	(3)	(4)
	OLS estimation		Fixed-effects estimation	
	Baseline model	VAIC's ingredients	Baseline model	VAIC's ingredients
L.VAIC	0.100**		0.104**	
	(0.0436)		(0.0485)	
L.CE		-0.879**		-0.879***
		(0.372)		(0.286)
L.HC		0.0177		0.0177
		(0.128)		(0.118)
L.SC		1.016		1.016*
		(0.732)		(0.608)
ASSET	-0.310***	-0.219***	-0.317***	-0.219***
	(0.0738)	(0.0508)	(0.0839)	(0.0773)
CAP	-3.569**	-3.671***	-3.587**	-3.671***
	(1.398)	(1.377)	(1.397)	(1.162)
RETURN	0.925	4.816	1.166	4.816*
	(3.332)	(3.867)	(2.924)	(2.764)
LLRR	1.272**	1.696***	1.285**	1.696***
	(0.527)	(0.587)	(0.507)	(0.658)
GDP	-0.00907	-0.244	-0.0379	-0.244
	(2.637)	(2.547)	(2.398)	(2.474)
INFLR	-1.228**	-1.662***	-1.299*	-1.662**
	(0.587)	(0.630)	(0.674)	(0.760)
Constant	8.270***	6.063***	8.431***	6.063***
	(1.982)	(1.390)	(2.166)	(1.899)

Observations	351	351	351	351
R^2	0.148	0.179	0.1483	0.1793

Note: The table illustrates regression estimations of our main concern in which the key explanatory variables (VAIC and its components: CE, HC, and SC) are lagged one year, and we employ the OLS estimation and the Fixed-effects estimation in Model (1)-(2) and Model (3)-(4), respectively. Robust standard errors in parentheses: * Significance at 10%; ** significance at 5% level; *** significance at 1%.

Table 5. Alternative econometric approach: the GMM method

	(1)	(2)
	Baseline model	VAIC's ingredients
L.DEPOSITGR	0.354***	0.339***
	(0.0226)	(0.0242)
VAIC	0.206***	
	(0.0346)	
CE		-0.403***
		(0.143)
HC		0.149**
		(0.0664)
SC		0.681**
		(0.297)
ASSET	-0.231***	-0.188***
	(0.0257)	(0.0241)
CAP	-1.774***	-2.567***
	(0.504)	(0.452)
RETURN	-5.877***	-1.918
	(2.164)	(2.229)
LLRR	1.535***	1.737***
	(0.306)	(0.330)
GDP	0.626	1.134**
	(0.522)	(0.453)
INFLR	-3.754***	-3.527***
	(0.552)	(0.550)
Constant	5.829***	4.851***
	(0.654)	(0.585)
AR (2)	0.112	0.131
Wald chi^2	6461.70	4540.28
Prob > chi^2	0.000	0.000
Observations	349	349
Number of banks	26	26

Note: The table shows our analysis results in which we approach the system GMM method's dynamic panel to test our previous findings further. Specifically, Model (1) presents the impact of VAIC on the deposit growth of banks, while Model (2) depicts the effects of VAIC's components (CE, HC, SC). Standard errors in parentheses: * Significance at 10%; ** significance at 5% level; *** significance at 1%.

4.3. Evaluation of Bank Size

In this subsection, the research will evaluate whether the bank size has affected the correlation between VAIC, its ingredients, and the banks' deposit growth. Theoretically, two main views explain the role of bank size in banks' operations. The first view points out that large organizations may be trapped in *"the quiet life"*, meaning that they do not possess enough incentives to innovate or re-innovate their business to satisfy the changing demands of customers (Scherer, 2001). Hence, it is expected that big banks tend to harness intellectual resources ineffectively. Meanwhile, the second

opinion considers that when organizations become more extensive, they can use the economic scale to amplify and re-innovate their business activities (Carter & McNulty, 2005). Based on this argument, it is anticipated that large banks can use these resources more effectively. From an empirical perspective, many studies have endeavored to determine the impact of the bank size factor, although the results tend to be mixed. For instance, Nguyen & Lu (2023b) point out that small banks utilized intellectual capital in financial intermediation activities more effectively than their counterparts. By contrast, Lu & Nguyen (2023) find that large banks can advance their non-interest incomes by paying especially attention to these resources. Taken together, it is reasonably necessary to investigate the effect of this factor on these findings above.

First, the research sample is segregated into two subsamples comprising bigger and smaller banks. Accordingly, the former group includes banks that possess total assets above the median value, and the latter group consists of the rest of the banks in the sample. Afterward, for each subsample, we regress Equation (6) in which the critical, independent variable is respectively VAIC and its ingredients. Table 6 below elaborates on the detailed results. Accordingly, the first two models present the results based on the bigger banks, and the final two models illustrate the findings by relying on the smaller ones.

Overall, the evidence indicates that while the positive impact of VAIC remains unaltered in both big and small banks, it only has statistical significance at 10% in small banks. Similarly, the CE component is only negatively and statistically significant at 5% in these banks. Besides, the positive relationship between the SC component and the deposit growth is also observed with a 10% level of statistical significance in this group. At the same time, it is observed that the R^2 indicator in the two analysis models based on small banks has a higher value. Besides, these models' VAIC, CE, and SC coefficients are also higher than the preliminary results and preceding robustness tests, indicating that the magnitude of impacts of the three factors is more significant in small banks. Therefore, it could be said that the role of IC and its ingredients tends to be more evident in smaller banks than in bigger ones. In other words, these banks seem to explore intellectual resources more effectively than their peers. This finding is aligned with the empirical evidence of Nguyen & Lu (2023b), suggesting that small banks harness intellectual capital effectually in their financial intermediation activities.

There are some potential reasons why smaller banks in Vietnam tend to use these pivotal resources more effectively than their counterparts. First, it can be said that these banks seem to have limited resources, such as the branch network, technological capacity, and other physical capital. Hence, they must be forced to lean mainly on intellectual resources to optimize their performance and cost-effectiveness and expand their market share. This argument may be advocated by the theoretical view suggesting that smaller organizations have higher incentives to stimulate their innovative business, while larger ones are regularly in the ‘silent environment’, meaning they lend themselves to slow progress (Scherer, 2001). In this vein, as the evidence shows, the structural capital, such as policies and campaigns, has been tailored well by small banks to attract more depositors. Another compelling reason may spring from the cultural aspect. It is a fact that managers in large Vietnamese banks seemingly focus much on serving big depositors with sizable deposits instead of individual clients with minor deposits. Also, large banks in Vietnam have a huge customer base, making them overconfident. Hence, they do not have enough encouragement to expand their depositor base, especially minor customers. Therefore, unsurprisingly, despite increasingly intensive competition,

small banks in Vietnam lend themselves to using intellectual resources as the driving force of their deposit growth more effectively than large ones.

Table 6. Evaluation of Bank Size

	(1)	(2)	(3)	(4)
	Larger banks		Smaller banks	
	Baseline model	VAIC's ingredients	Baseline model	VAIC's ingredients
VAIC	0.0304		0.325*	
	(0.0253)		(0.166)	
CE		-0.168		-2.621**
		(0.102)		(1.245)
HC		-0.0219		0.114
		(0.0552)		(0.289)
SC		0.364		2.712*
		(0.264)		(1.498)
ASSET	-0.0643***	-0.0531***	-0.517***	-0.342**
	(0.0197)	(0.0189)	(0.194)	(0.147)
CAP	-1.657**	-2.397***	-1.002	-1.732
	(0.652)	(0.747)	(3.283)	(3.069)
RETURN	-0.355	1.701	-33.70**	-29.04*
	(1.792)	(2.005)	(15.97)	(14.97)
LLRR	0.454*	0.636**	1.784	1.514
	(0.250)	(0.295)	(1.405)	(1.457)
GDP	-1.260*	-1.020	2.855	-0.331
	(0.739)	(0.759)	(10.37)	(9.682)
INFLR	-0.136	-0.137	-1.768	-2.451*
	(0.240)	(0.240)	(1.245)	(1.378)
Constant	1.988***	1.747***	12.57**	8.709**
	(0.498)	(0.484)	(5.276)	(4.250)
Observations	204	204	169	169
R^2	0.088	0.102	0.155	0.249

Note: The table illustrates the effect of bank size on the relationship between intellectual capital (measured by the VAIC model) and banks' deposit growth. Accordingly, Model (1)-(2) focuses on the large banks, while Model (3)-(4) determines the role of small ones. Robust standard errors in parentheses: * Significance at 10%; ** significance at 5% level; *** significance at 1%.

5. Discussions and Conclusions

It is noticeable that the role of intellectual resources in banks' business strategies has stimulated many researchers all over the globe because of the potential benefits of these intangible resources. As mentioned earlier, preceding studies have tried to explore the impacts of IC and its components on financial performance, productivity, financial intermediation, and non-interest incomes. However, the angle of banks' deposit growth seems to maintain 'a wild field'. Inspired by this vital research gap, our scientific endeavor is to bring a deeper insight into the primary driver of intellectual capital in the banking system by discovering the correlation between intellectual capital and the banks' deposit growth.

Our findings can be summarized as follows based on the context of a developing economy, namely Vietnam. First, the consistent research evidence affirms that IC (measured by the VAIC model) substantially impacts deposit growth in the banking industry. This finding is seemingly unchanging through some steps of robustness tests conducted. Regarding IC components, we find that human

capital and structural capital efficiency are the most critical factors enhancing banks' deposit growth. In contrast, the opposite result is found in the case of capital-employed efficiency. Furthermore, when evaluating the effect of bank size, the evidence indicates that small banks harness IC more effectively than large ones to stimulate deposit mobilization.

Through the aforementioned empirical findings, the current study makes some contributions. Regarding the theoretical view, this paper demonstrates the positive impact of IC on deposit growth in Vietnamese banks, contributing new empirical evidence on this relationship. Because the association between IC and deposit mobilization is not well explored, this research can be seen as the first empirical analysis broadening the understanding of IC's role in deposit activities in the banking industry. Moreover, the empirical findings of the study, therefore, advocate the prior assertions, such as Alvino, et al. (2020) and Suciu & Năsulea (2019) which suggests that IC is considered the imperative source of competitiveness, sustainability, and development of most organizations nowadays. At the same time, the regression results advocate some related theories about knowledge-based or IC-based management, which underline the primary driver of intellectual resources in the business strategies of an organization. Additionally, the paper finds that the effects of VAIC's ingredients are mixed, which is in line with prior findings of some researchers, as mentioned in Section 2. To some extent, the findings can be seen as a direct response to the calls of Lu & Nguyen (2023) and Nguyen & Lu (2023b) who assert that future studies should discover different aspects of IC's role in banking operations.

Regarding the practical view, the results have practical implications for bank managers in leveraging different dimensions of IC, like staff competencies and organizational processes, to mobilize greater deposits. Developing IC emerges as a viable strategy for smaller banks to enhance performance. The findings indicate a need for larger banks to re-evaluate their IC investments and focus on teaching a culture of innovation. Because the CE component may hurt deposit growth, while, to some extent, HC and SC may assist in enhancing the deposit activities of banks, managers of domestic banks in Vietnam should consider the CE factor carefully before constructing any business strategy for expanding deposit activities. On the other hand, along with continuous training for employees to improve their skills and knowledge, building market-oriented policies to meet the changing demands of depositors is a necessary step for local banks in the coming time because the evidence demonstrates that both HC and SC will contribute to growing deposits of the domestic banks. To a certain degree, focalizing IC-based management may build up banks' resistance to unprecedented risks in the changes-rapid technological era. Meanwhile, it is believed that bank regulators can promote IC development through supportive policies and programs for training and technology adoption to encourage deposit mobilization.

Irrespective of the findings in this field, there are some drawbacks to this paper that future research can address. First, because VAIC does not obtain all aspects of IC as mentioned in Section 3, researchers can apply the VAIC-extended or VAIC-modified model (Buallay, et al., 2020) to reevaluate the regression results in this study. Second, future researchers can expand the research sample and/or use a cross-country sample to reexamine the study's findings. Third, the different aspects of banking operations, such as income and asset diversification, should be scrutinized to dig deeper into the central role of implementing IC in constituting the business strategies of commercial banks in Vietnam. Additionally, the possible impacts of the foreign-controlled ratio in banks on their IC-based strategy also need to be paid special attention to. This is because some studies indicate that

the higher this ratio, the lesser related risks (Suu, et al., 2023). Finally, focusing on other sectors, such as non-bank financial institutions in Vietnam, may need to be considered. The study's findings are anticipated to trigger more researchers in the years ahead.

Acknowledgment

We would like to thank the anonymous reviewers and the Editor for their invaluable comments, which helped us significantly enhance the quality of our study.

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