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Article

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Cogent Business & Management

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Suggested Citation: Nguyen, Dat T; Le, Tu DQ; Tran, Son H (2023) : The moderating role of income diversification on the relationship between intellectual capital and bank performance evidence from Viet Nam, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 10, Iss. 1, pp. 1-19,
https://doi.org/10.1080/23311975.2023.2182621

This Version is available at:
https://hdl.handle.net/10419/294307

Cogent Business & Management

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oabm20

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To cite this article: Dat T Nguyen, Tu DQ Le & Son H Tran (2023) The moderating role of income diversification on the relationship between intellectual capital and bank performance evidence from Viet Nam, Cogent Business & Management, 10:1, 2182621, DOI: 10.1080/23311975.2023.2182621

To link to this article: https://doi.org/10.1080/23311975.2023.2182621

Published online: 06 Mar 2023.

Nguyen et al., *Cogent Business & Management* (2023), 10: 2182621
https://doi.org/10.1080/23311975.2023.2182621

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BANKING & FINANCE | RESEARCH ARTICLE

The moderating role of income diversification on the relationship between intellectual capital and bank performance evidence from Viet Nam

Dat T Nguyen[1,2*], Tu DQ Le[1,2*] and Son H Tran[1,2]

Abstract: This study investigated whether income diversification moderates the relationship between Intellectual Capital and bank performance in Vietnamese commercial banks period 2007–2020 using the system generalised method of moments (GMM)." The results indicate that the value added intellectual coefficient (VAIC) and its components ("human capital efficiency (HCE), " capital employed efficiency (CEE), and "structural capital efficiency (SCE)) have positive effects on bank performance. Second, the study examines that income diversification (ID) has a negative and considerable impact on bank performance. Finally, the findings show that income diversification, as a moderating element, lowered the overall impact of IC (Value Added Intellectual Capital (VAIC)) efficiency on bank performance. The role of income diversification in modulating the link between the distinct components of VAIC (HCE, SCE and CEE). While revenue diversification improved the

Received: 21 August 2022
Accepted: 16 February 2023

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Reviewing editor:
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PUBLIC INTEREST STATEMENT

Policymakers and management should consider these findings' importance. When analysing income diversification techniques, bank administration should consider intellectual capital and bank performance. More regulatory control of non-lending activity is necessary.

influence of SCE on bank performance, it weakened the impact of HCE. Furthermore, income diversification had little effect on bank performance in terms of mitigating the effects of CEE. Therefore, this finding highlights the contribution by suggesting that non-traditional banking activities influence the relationship between Intellectual Capital and bank performance in Vietnam

Subjects: Economics; Finance; Business, Management and Accounting

Keywords: bank performance; income diversification; intellectual capital; Vietnam

1. Introduction

As the world shifts from production-based to knowledge-based economies (Lin & Edvinsson, 2008), knowledge assets and information will be the dominant resources at the corporate level and for a nation's competitiveness and wealth generation (Kramar & Steane, 2012). Therefore, strategists, practicing managers, and policymakers emphasize building, and *utilizing* knowledge – basedresources forsustained company performance and economic growth. Researchers have also discovered that intangible resources, such as intellectual capital, are just as crucial to modern economies as financial and physical capital (IC; Chen et al., 2013; North & Kumta, 2018). According to proponents of the resource-based and knowledge-based views, IC is a firm-specific resource that is priceless, uncommon, unique, and non-substitutable. As a result, IC has a greater positive impact on an organization's financial performance and competitive advantage than real resources (Barney, 1991; Khan et al., 2019; Valaei et al., 2021). As a result, managers and stakeholders are now demonstrating a stronger interest in monitoring, appraising, and disclosing their stock of intangible assets as crucial performance indicators and sources of long-term competitive advantage. Indeed, IC is much more important for the banking industry because it identifies a bank's performance level in relation to its competitors (Meles et al., 2016; Ting et al., 2021). Additionally, Tran and Vo (2018) gave some justifications for why IC is appropriate in the banking sector. Banks must provide the best quality and a wide range of services to consumers in order to thrive because banking operations are strongly dependent on customers and bank products are not produced items. Banks have made significant investments in their employees, brands, systems, and operations. Since IC is a multifaceted resource of expertise, information, and practical skills, it would assist banks in improving their efficacy and efficiency and preserving their long-term competitive advantage.

The evidence supporting a link between IC and bank performance is mixed. Early research focused on bank performance. Several studies employing bank data in developed markets have found that IC is a strong predictor of bank performance (Bollen et al., 2005; Clarke et al., 2011; Joshi et al., 2013; Meles et al., 2016; Mention & Bontis, 2013; Riahi-Belkaoui, 2003; Ståhle et al., 2011; Tan et al., 2007; Youndt et al., 2004; Zeghal & Maaloul, 2010). Similarly, other studies in emerging markets have reached the same conclusion (Firer & Williams, 2003; Goh, 2005; Le et al., 2020; Mondal & Ghosh, 2012; Singh et al., 2016; Smriti & Das, 2018; Tran & Vo, 2018).

Furthermore, previous research on the effect of income diversification on bank performance has produced mixed results. Several studies show that income diversification has a positive impact on bank performance (Doan et al., 2018; Meslier et al., 2014; Paltrinieri et al., 2021). However, others indicate the opposite (Delpachitra & Lester, 2013; DeYoung & Roland, 2001; Stiroh & Rumble, 2006). However, studies show that revenue diversity has no effect on bank performance (Lee et al., 2014; L. Li & Zhang, 2013).

Vietnam ranks first in the Association of Southeast Asian Nations (ASEAN) in terms of economic performance, period 2007 to 2019, the economy increased at an average of 6.2% per year. It's no surprise that this country is dubbed "Asia's Next Dragon." As the financial market continues to flourish, the Vietnamese economy's notable growth is credited to the banking system. One of the key concerns of academics, practitioners, and Vietnamese authorities s maintaining efficiency.

Because the literature contends that IC is one of the increasingly important aspects influencing bank success, it is necessary to investigate if IC has any impact on bank performance in Vietnam. Since Vietnam's accession to the World Trade Organization(WTO) in 2007, the presence of foreign banks in the market has posed a greater challenge to the expansion of domestic banks' deposits and loans, potentially affecting bank performance.

The study adds to the existing literature in various ways. First, most research look at the influence of income diversification or IC on bank performance. Our study is the first to look at the combined effect of revenue diversification and IC on bank performance in Vietnam. Second, the study offers new insights by examining whether income diversity moderates the relationship between IC and bank perfrormance

The rest of our research is as follows." Section 2 follows this introduction and discusses pertinent studies and hypotheses. Section 3 describes the research approach, which includes the estimating method, models, and variable specification. The estimation results are shown in Section 4. Section 5 takes the paper to a conclusion".

2. Literature review and hypotheses development

2.1. The concept of intellectual capital(IC)

Although much research has been conducted to determine whether intellectual capital IC contributes substantially to firms' value generation,IC is defined differently across disciplines and perspectives, including economics, strategy, finance, accounting, human resources, reporting and disclosure, marketing, and communication. As a result of the varying definitions and data availability, multiple metrics have been established and employed in various industries.[1]

2.2. Relationship IC and bank performance

Previous research on the association between IC (as assessed by the value added intellectual coefficient, *VAIC*) and bank performance has yielded conflicting results. Ozkan et al. (2017) conducted a survey examining IC's influence on bank performance in Turkish. The *VAIC* was used to calculate IC, which was then disaggregated into human capital efficiency, structural capital efficiency, and capital-employed efficiency. The study discovered that HCE and CEE had a large and beneficial influence on bank profitability, but SCE had no effect. Ousama et al. (2019) examined the effect of IC on the bank performance of Islamicbanks. The study utilised a sample of 37 banks and annual financial data from 2011 to 2013 for its analysis. The results indicate that both HCE and CEE had a beneficial and statistically significant impact on performance. However, SCE had no appreciable effect on bank performance. Mohapatra et al. (2019) investigated the impact of IC on the performance of Indian banks. The study examined annual reports from 2011 to 2015, as well as a sample of 40 banks. According to the regression results, only human capital had a positive and substantial effect on performance; structural capital and finance capital had a negative impact. Soewarno and Tjahjadi (2020) investigated the impact of IC on the financial performance of publicly traded Indonesian banks in the same research field. The study results demonstrate that HCE had a negative, though slight, influence on *ROA*, whereas *SCE* and *CEE* had a positive on *ROA*. The study showed that physical capital is more important to Indonesian banking organisations than intangible assets like human capital. Alhassan and Asare (2016) investigated the impact of intellectual capital on bank productivity in the rising market of Africa. A sample of 18 Ghanaians and panel data from 2003 to 2011 were utilised. HCE and CEE had a good and significant influence on bank productivity. Furthermore, Maji and Hussain (2021), employing Indian banks, the results show that technical efficiency and intellectual capital (IC) positively impact bank performance.

The mentioned research above give empirical evidence that the relationship between IC and bank performance is inconclusive and warrants additional investigation. According to Pulic (1998), IC performance can be quantified using the *VAIC* approach, which has three components: *HCE*, *SCE*, and *CEE* (Ozkan et al., 2017; Pulic, 2000). Using financial data, *VAIC* calculates the value generation efficiency of

a company's tangible and intangible assets. Thus, using *VAIC* and the three constituent aspects, this study will investigate the influence of IC on bankperformance. The assumptions are written as follows:

Hypothesis 1: "intellectual capital and its decompositions have a positive impact on bank performance"

2.3. Relationship Income diversification(ID) and bank performance(PE)

Trade openness, competitiveness, and relaxing of bank regulation has led banks to investigate income diversification to sustain their profitability and competitive edge. Thus, banks participate in non-banking operations such as investment, advising, securities broking, and underwriting, which produce non-interest income (Doan et al., 2018). The basic theoretical rationale in favour of income diversification is that it results in steady operational income and decreased risk due to imperfectly correlated revenue streams, as established by current portfolio theory (Markowitz, 1952; Sharma & Anand, 2018). Studies suggest that non-interest operations boost bank earnings (Meslier et al., 2014; Paltrinieri et al., 2021), minimise risk (Pennathur et al., 2012), and improve bank performance (Doan et al., 2018). Conversely, research has shown that income diversification makes income less stable and puts banks at higher risk because non-traditional businesses are hard to predict. (Delpachitra & Lester, 2013; DeYoung & Roland, 2001; Stiroh & Rumble, 2006). However, studies show that revenue diversity has no effect on bank performance; so, banks should concentrate in lending (Lee et al., 2014; L. Li & Zhang, 2013). According to recent research, there is a considerable movement towards linked financial services, and non-interest income is rapidly becoming a larger share of banks' total revenues (Le, 2017; Sanya & Wolfe, 2011). In all in, given the conflicting results received from banks around the world, further research into the Income diversification(ID) and bank performance(PE) relationship between Vietnam banks is required to provide insight.

Hypothesis 2: Incomediversification has a positive impact on bankperformance

2.4. The moderating role of income diversification on the relationship between intellectual capital and bank performance

"While the resource – based view and knowledge – based view theories hypothesise that IC has a substantial impact on business performance, empirical research have yielded varied results. Proponents of the DC argue that simply possessing intellectual capital resources is insufficient to generate a competitive advantage and achieve superior performance (Eisenhardt & Martin, 2000). Firms require dynamic tools to reinforce and restructure existing resources while developing new long-term competitive advantages. Furthermore, Penrose (1959) believes that gaining a competitive advantage requires moving beyond utilising current firm-specific resources and capabilities to developing new ones. Hsu and Wang (2012) and Prahalad (1993) underline the importance of exploiting firm-specific resources and competencies through business opportunities. The literature also suggested that diversification allows organisations to deploy and utilise their strategic assets and competencies (Chang & Wang, 2007; Nath et al., 2010; Ramanathan et al., 2016). Additionally, strategic management theorists advocate for enterprises to diversify into similar businesses in order to identify, develop, and harness resources and talents for competitive advantage and prosperity (M. Li & Wong, 2003; Merino et al., 2014; Neffke & Henning, 2013). Given the issues confronting the traditional lending sector, banks should plan on leveraging their IC resources to capitalise on nonlending operations in order to compensate for lost interest earnings. Similarly, expanding into similar fields improves the exploitation of a current resource and its capability configuration, but diversifying into unrelated businesses or markets necessitates the development of new resources and capability configurations (Eisenhardt & Martin, 2000). Furthermore, research have shown that revenue diversification improves bank performance(Ahamed, 2017; Luu et al., 2019) and increases lending activities through cross-subsidization and cross-selling (Abedifar et al., 2018; Valverde & Fernández, 2007). In other literature, it has also been stated that lending businesses can profit from informational and synergy advantages linked with nonlending activities. This study

examines whether income diversity moderates the relationship between IC and bank performance.

Hypothesis 3: Income diversification moderates the nexus between VAIC and bankperformance

3. Data and methodology

3.1. Data

Our sample consists of a panel of 29 Vietnamese commercial banks on a consolidated basis between 2007 and 2020. This dataset accounts for more than 80 percent of the industry's total assets. The majority of bank-specific data is obtained from bank financial statements and the Vietdata database, in accordance with Vietnamese accounting standards. World Bank macroeconomic indicators are utilised. In order to evaluate the impact of intellectual capital, banks with fewer than five years of data are omitted. In addition, only commercial banks are selected because they are the most active market participants, whereas foreign bank affiliates and joint-venture banks have limited ability to engage on the Vietnamese market. Due to various bank mergers over the study period, our final sample of 378 observations is an unbalanced panel.

3.2. Methodology

This study employs the Arellano and Bover (1995) GMM estimator due to the panel data structure. GMM aims to manage two significant issues: unobserved heterogeneity and endogeneity (Arellano, 2002). The GMM estimator takes unobserved heterogeneity and the persistence of the dependent variable into consideration. Consequently, this estimator produces consistent parameter estimations. Due to the employment of a range of instruments, the predicted coefficients are more accurate. As endogeneity instruments, the system GMM estimator employs lagged values of dependent variables (in levels and differences) and lagged values of extra regressors that may be endogenous. In accordance with Bond (2002), we use the lagged values of the endogenous variables as instruments, which are displayed in italics in the table of results. Except for exogenous regressors, all regressors in our method are represented by instruments. Using Arellano-Bond autocorrelation (AR) tests and the over-identifying constraints test, the number of delays is computed (Hansen, 1982). If the null hypothesis of the Hansen test is rejected, the required orthogonality constraints are not satisfied by the instruments. In addition, the moment conditions are only valid if there is no serial link between the idiosyncratic errors. If the null hypothesis at second-order autocorrelation (AR2) cannot be rejected, the moment conditions remain true. Based on the above considerations, a dynamic model of a bank's financial stability is employed, one that looks like this:

$$PE_{i,t} = \alpha_{i,t} + \beta_1 PE_{i,t-1} + VAIC_{i,t} + ID_{i,t} + Control\ variables_{i,t} \quad (1)$$

In the following model, we also include VAIC*ID to investigate the impact of the interaction between ***intellectual capital*** and income diversification on bank **performance**[2]:

$$PE_{i,t} = \alpha_{i,t} + \beta_1 PE_{i,t-1} + VAIC_{i,t} + VAIC * ID_{i,t} + Control\ variables_{i,t} \quad (2)$$

bankperformance$(\mathbf{PE})$: Business benefits are determined in terms of both tangible and intangible assets from a resource perspective(Cañibano, 2018). However, assessing financial performance remains the most prevalent paradigm for analysing corporate performance. Financial indicators are thought to indicate the achievement of a business entity's economic goals, and this property has led to their inclusion as a component of business performance indicators (Venkatraman & Ramanujam, 1986). The researchers used a variety of accounting and market-based measures as proxy measures for financial performance indicators, including profitability (ROE, ROA). *ROA* is a conventional measure of a company's profitability (Ozkan et al., 2017). A higher return on assets suggests that bank assets are being used more efficiently to create profits, whereas a lower *ROA* indicates wasteful asset use. *ROA* is computed by dividing the current year's net profit (loss) by

total assets. *ROE*: measured as the ratio of net income (minus preferred dividends) divided by the book value of total equity, it represents the earnings available to equity owners and is often regarded as an important financial indicator for investors (Najibullah, 2005).

Intellectual capital and its decompositions: Literature on *VAIC* provides many methods for measuring IC.[3] However, the typical VAIC methodology is utilised in this study as it gives standardised and consistent measures (Shiu, 2006). The conventional *VAIC* methodology is evaluated as a conceptually and methodologically new approach that does not contradict or modify any of the fundamental accounting principles (Iazzolino & Laise, 2013).

According to Pulic (2004), Meles et al. (2016), and Ozkan et al. (2017), (Tran & Vo, 2018), and Le et al. (2020), the value of *VAIC* is formulated as follows:

$$VAIC_{it} = CEE_{it} + HCE_{it} + SCE_{it} \tag{3}$$

Where $VAIC_{it}$ indicates the value-added intellectual coefficient; CEE_{it} denotes the capital employed efficiency; HCE_{it} represents the human capital efficiency; SCE_{it} is the structural capital efficiency.

To calculate the *VAIC* decompositions, first compute the total value added (VA). According to Le et al. (2020), the overall value contributed is as follows:

$$VA_{it} = OP_{it} + PC_{it} + A_{it} \tag{4}$$

Where OP_{it} is a bank's operating profit; PC_{it} denotes personnel expenses (salaries, wages, and other benefits), and A_{it} is the bank's amortization and depreciation.

Next, the $VAIC_{it}$ elements are calculated as follows: $CEE_{it} = VA_{it}/CE_{it}$, where CE_{it} is the bank's capital employed and is measured as thebookvalueofequity. $HCE_{it} = VA_{it}/HC_{it}$, where HC_{it} refers to staff cost. $SCE_{it} = SC_{it}/VA_{it}$, where SC_{it} represent structural capital and is calculated as $SC_{it}=VA_{it}/HC_{it}$.

Income diversification $(\mathbf{ID})$: The moderating variable is revenue diversification. The income of banks is made up of interest income (from lending activities) and non-interest income (earned from nonlending activities). The Herfindahl-Hirschman Index (HHI) of income specialisation is built from these two revenue streams (Chiorazzo et al., 2008; Nepali, 2018). As indicated below, HHI is computed.

$$HHI = \left[\left(\frac{NON}{NETOP}\right)^2 + \left(\frac{NET}{NETOP}\right)^2\right]$$

Where *NON* stands for non-interest income, *NET* stands for netinterestincome, and *NETOP* stands for net operating revenue, which equals noninterestincome$(NONE)$ plus *NET*. The bank gets more consolidated and less diverse as the *HHI* grows. *HHI* ranges from 0 to 1.0. (Mercieca et al., 2007; Stiroh & Rumble, 2006). As a result, the study defines income diversification as:

$$(ID) = 1 - \left[\left(\frac{NON}{NETOP}\right)^2 + \left(\frac{NET}{NETOP}\right)^2\right]$$

4. Control variables

CAP, "the ratio of total equity of total assets" is used to control for bank capitalization. The signalling hypothesis posits that banks may provide information to the market on their profit potential and prospects. Thus, a signalling equilibrium may arise in which banks that anticipate superior future performance display a higher level of capital (Saona, 2016). Several studies, however, indicate that a bank with an extremely high capital ratio is overly cautious and disregarding profitable expansion prospects (Berger, 1995; Sharma et al., 2013)

LATA, "the ratio of liquid assets/total assets", is employed to control liquidity risk (Sharma et al., 2013); Le (2017). According to a number of research, banks that maintain more liquid assets typically generate a smaller profit (Sharma et al., 2013). Other research, however, contend that an increase in banks' relative liquid assets lessens the likelihood of default, hence boosting bank profitability(Bordeleau & Graham, 2010; Bourke, 1989).

Lending specialisation is taken into account by using the *LOAN* ratio, which measures "the sum of all loans to all assets". According to several studies Saona (2016), bank loans have a positive effect on bank profitability. This suggests that risk-averse shareholders seek higher earnings to offset higher risk because loans have higher operational costs because they must be originated, serviced, and monitored. Bank loans and earnings before taxes do not, however, have a positive relationship, according to Demirgüç-Kunt and Huizinga (1999).

(*SIZE*) "the natural logarithm/total assets"/ is employed to account for bank size. Because greater activities are riskier, huge banks may charge higher margins, improving their performance (Maudos & Solís, 2009). Other research, on the other hand, suggests that smaller banks can lessen asymmetric information concerns, hence enhancing their profitability (Dietrich & Wanzenried, 2014).

(*GDP*), "the growth rate" is used to account for the effects of economic growth (Haris et al., 2019). "the inflation rate", (INF), is used to account for the consequences of inflation(Perry, 1992).

5. Empirical results

5.1. Descriptive statistics

Table 1 provides descriptive statistics on the paper's variables' values. The bank performance (*ROA*) mean is 0.091 and (*ROE*)meanis0.097 . VAIC has an average value of 4.661. Besides, SCE, HCE, and CEE have mean is 0.67; 3.69; 0.30. ID has a mean value of 0.99, suggesting a high level of income diversification.

Table 2 gives the pair-wise correlation coefficients of the variables. In general, VAIC and Income diversification are positively correlated with bank performance. Besides, all of the control variables

Table 1. The descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	378	0.091	0.069	0.001	0.400
ROE	378	0.097	0.084	−0.820	0.363
VAIC	378	4.661	1.925	0.702	12.846
SCE	378	0.672	0.179	−0.202	1.049
HCE	378	3.693	1.804	0.702	12.846
CEE	378	0.307	0.141	0.049	0.696
ID	378	0.997	0.007	0.941	1.000
SIZE	378	32.182	1.327	28.420	35.168
CAP	378	0.097	0.054	0.021	0.462
LATA	378	0.314	0.126	0.049	0.816
LOAN	378	0.560	0.133	0.114	0.852
GDP	378	0.060	0.011	0.029	0.071
INF	378	0.073	0.061	0.006	0.231

Note(s): ROA is the return on the asset, ROE is the return on the equity; VAIC is the value added intellectual coefficient; CEE is the capital employed efficiency; HCE is the human capital efficiency; SCE is the structural capital efficiency; ID is income diversification; SIZE, the natural logarithm/total assets; CAP, the ratio of total equity to total assets; LATA, the ratio of liquid assets/total assets; LOAN, loan to total assets; GDP, the real growth rate of gross domestic products. INF, the inflation rate. Robust standard errors are in parentheses.*,** and *** Significant at 10,5 and 1% levels, respectively.

Table 2. The correlation matrix of variables

	ROA	ROE	VAIC	SCE	HCE	CEE	ID	SIZE	CAP	LATA	LOAN	GDP	INF
ROA	1												
ROE	0.765	1											
VAIC	0.432	0.486	1										
SCE	0.368	0.452	0.803	1									
HCE	0.383	0.402	0.991	0.747	1								
CEE	0.407	0.747	0.207	0.237	0.104	1							
ID	0.069	−0.158	0.015	0.043	0.051	−0.432	1						
SIZE	0.085	0.325	−0.059	−0.021	−0.107	0.516	−0.570	1					
CAP	0.224	−0.159	0.147	0.181	0.178	−0.462	0.359	−0.646	1				
LATA	0.205	0.251	0.175	0.142	0.161	0.041	0.169	−0.156	0.013	1			
LOAN	0.027	0.044	−0.220	−0.136	−0.247	0.284	−0.412	0.328	−0.097	−0.714	1		
GDP	−0.199	−0.059	0.067	0.039	0.062	0.052	−0.023	−0.045	−0.009	−0.012	0.036	1	
INF	0.173	0.198	0.300	0.183	0.295	0.100	−0.118	−0.249	0.175	0.280	−0.272	−0.072	1

Note(s): ROA is the return on the asset, ROE is the return on the equity; VAIC is the value added intellectual coefficient; CEE is the capital employed efficiency; HCE is the human capital efficiency; SCE is the structural capital efficiency; ID is income diversification; SIZE, the natural logarithm/total assets; CAP, the ratio of total equity to total assets; LATA, the ratio of liquid assets/total assets; LOAN, loan to total assets; GDP, the real growth rate of gross domestic products. INF, the inflation rate. Robust standard errors are in parentheses.*,** and *** Significant at 10,5 and 1% levels, respectively.

are strongly linked to the variables that matter. Also, the pairwise correlation matrix indicates that all coefficients are less than 0.8. This proves that there is no multicollinearity.

5.2. The base models

In this section, the empirical findings of our investigation are reported. The outcomes of our baseline models are presented in Table 3. In an effort to limit the amount of moment conditions, the lagged value of a dependent variable is limited to one value. This is consistent with Le (2020), and Le and Ngo (2020). All models contain statistically significant coefficients for the lagged dependent variable (PE_{t-1}), indicating that system GMM estimation is adequate. Because the p-value of the Hansen test is not statistically significant, the null hypothesis cannot be rejected, as shown by the findings. This shows that there are no over-identification restrictions, indicating that the moment criteria have been met and the instruments are genuine. Even if the null hypothesis of no first-order autocorrelation between first residual differences is rejected due to the significant p-value of the *AR*1 test, the moment conditions of our model are met in all models due to the insignificant p-value of the *AR*2 test. In light of the findings, diagnostic testing is warranted.

Beginning with the *VAIC* variable, the coefficients of *VAIC* variables is positive and significant associated with bank performance, in Table 3. This indicates that a greater capacity for *IC* management assists banks to create sustainable operations and consequently boost performance. This result is consistent with our Hypothesis 1 and the findings are consistent with those of Maji and Goswami (2016). For *VAIC* components are decomposed, the positive effects of *SCE*, *HCE*, and *CEE* are also evident in both measures, as shown in Table 3. Specifically, CEE has a significant positive impact on bank performance. The findings imply that banks with higher CEE report more good financial performance than banks with lower *CEE*. This supports the findings of Soewarno and Tjahjadi (2020) and Tran and Vo (2018). Furthermore *HCE* has a positive and significant effect on bankperformance. The results are consistent with earlier research Asare et al. (2017); Mohapatra et al. (2019), however they contradict Soewarno and Tjahjadi (2020), who found a negative association. Thus, by investing in human capital, banks can increase their financial performance. Finally, *SCE* has a significant positive impact on bank performance. As a result, banks with higher *SCE* are anticipated to perform better. The findings are consistent with those of Nadeem et al. (2019) and Hamdan (2018), but contradict those of Ozkan et al. (2017) and Ousama et al. (2019).

Regarding Income diversification (ID) variables, the coefficients of Income diversification (ID) is negative and significant in performance. Based on the results in Table 3, Hypothesis 2 is rejected. The results are in line with prior research that found an income diversification impact (Alhassan, 2015; Duho et al., 2019; Elyasiani & Wang, 2012). But in contrast, the finding of Chiorazzo et al. (2008) and Paltrinieri et al. (2021) found a favorable correlation between Income diversification and bank performance. Consequently, the study demonstrates that diversified banks are less profitable.

The interaction terms between Income diversification(ID) and VAIC(its decompositions) on bank performance in Table 3. The results suggest that income diversification moderates negatively the link between VAIC and bankperformance. For highly diversified banks, the impact of *VAIC* on bank performance is low, indicating that non-lending activities degrade *IC* performance. Income diversification affects the link between *HCE* and bank performance in a negative and significant way. There are two possible explanations for these findings. First, there is a lack of complementarity between the abilities required for lending activities and the diverse set of highly adaptive talents required for nonlending activities. Second, Vietnam has a low human capital. Income diversification moderates the association between *SCE* and bank performance in a positive and significant way. Banks increase their performance by diversifying into non-interest earning activities. Diversifying income doesn't change the relationship between *CEE* and bank performance. One possible reason for this is that banks must keep a certain amount of capital on hand based on how risky their assets are. So, trying to use *CEE* to get more income from different sources could cause

Table 3. Regression estimates

PE	ROA				ROE			
PE_{t-1}	0.468*** (0.111)	0.870*** (0.103)	0.324** (0.134)	0.858*** (0.103)	0.550*** (0.112)	0.171** (0.072)	0.167** (0.070)	0.277*** (0.036)
VAIC	0.100*** (0.033)	0.090* (0.047)			1.261*** (0.380)	2.994*** (0.731)		
CEE			3.012*** (0.742)	4.124*** (0.590)			45.497*** (5.995)	48.267*** (4.461)
HCE			0.325*** (0.103)	0.319*** (0.076)			1.782*** (0.449)	4.293*** (1.001)
SCE			3.458*** (1.219)	1.178** (0.472)			6.855* (3.520)	20.257 (5.161)
ID	−31.421*** (5.834)		−35.924** (16.667)		−182.77*** (37.987)		−358.806*** (87.766)	
ID*VAIC		−1.978* (0.987)				−65.078** (28.040)		
ID*CEE				−4.046 (7.700)				−13.191 (9.146)
ID*HCE				−13.175*** (3.369)				−77.540* (41.024)
ID*SCE				35.124** (14.590)				42.573 (32.357)
SIZE	0.083 (0.052)	0.085 (0.053)	0.383*** (0.098)	0.313*** (0.068)	2.712*** (0.604)	2.367** (0.852)	0.999 (0.593)	0.373 (0.657)
CAP	−1.086 (1.123)	−1.161 (1.124)	13.229*** (3.272)	9.400*** (1.306)	57.249*** (6.718)	−38.520 (33.580)	4.263 (11.646)	−11.213 (26.761)
LATA	1.278** (0.599)	1.279** (0.600)	−1.448 (1.879)	−0.178 (0.453)	13.812*** (7.235)	−3.119 (13.959)	−4.318 (6.156)	4.022 (9.405)
LOAN	3.071*** (0.419)	3.072*** (0.419)	−0.469 (1.155)	2.410** (1.041)	15.528** (5.516)	22.768** (10.605)	−6.016 (5.406)	24.621*** (6.739)
GDP	−3.378** (1.498)	−3.379** (1.499)	−7.517** (2.843)	−5.116** (1.995)	22.351 (13.525)	−30.595 (18.705)	−54.145*** (17.086)	−22.104 (13.451)

(*Continued*)

Table 3. (*Continued*)

PE	ROA				ROE			
INF	1.231*** (0.335)	1.233*** (0.345)	−0.005 (0.773)	1.583*** (0.493)	21.630*** (3.594)	26.910*** (4.969)	3.214 (4.004)	20.209*** (4.202)
Constant	−4.979 (1.910)	−4.980 (1.912)	−11.505 (3.311)	−9.797 (2.131)	−106.429 (20.300)	−88.646 (32.493)	−33.925 (19.425)	−33.352 (21.106)
Observations	347	347	347	347	347	347	347	347
No of groups	30	30	30	30	30	30	30	30
AR(1)(p-value)	0.004	0.005	0.035	0.083	0.013	0.020	0.086	0.007
AR(2) (p-value)	0.121	0.123	0.975	0.412	0.161	0.547	0.638	0.319
Hansen test (p-value)	0.500	0.521	0.972	0.355	0.400	0.253	0.629	0.453

Note(s): ROA is the return on the asset, ROE is the return on the equity; VAIC is the value added intellectual coefficient; CEE is the capital employed efficiency; HCE is the human capital efficiency; SCE is the structural capital efficiency; ID is income diversification; SIZE, the natural logarithm/total assets; CAP, the ratio of total equity to total assets; LATA, the ratio of liquid assets/total assets; LOAN, loan to total assets; GDP, the real growth rate of gross domestic products. INF, the inflation rate. Robust standard errors are in parentheses.*,** and *** Significant at 10,5 and 1% levels, respectively.

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problems with risk management. Also, fee-based activities make banks' operating leverage higher, which reduces their capital efficiency and makes their earnings more volatile (DeYoung & Roland, 2001).

In terms of control variables, *SIZE* has a significant and positive relationship with bank performance, implying that big financial institutions use economiesofscopeandscale to drive performance. This finding is consistent with Githaiga (2022). The results suggest that *CAP* has a positive effect on bank performance, implying that banks with greater capitalisation are more lucrative than those with less capitalisation. This partially validates the results of Le et al. (2020) cross-national investigation. A positive correlation between *LOAN* and measures of bank performance suggests that Vietnamese banks utilise scale economies to increase their profitability. This partially validates Le (2020) preliminary findings in Vietnam. Furthermore, *LATA* is positively and strongly correlated with both measures, hence validating the opportunity costs argument. A greater proportion of liquid assets increases bank earnings because banks can charge higher margins to cover the additional costs associated with holding liquid assets. It is comparable to Le (2017) in Vietnam. This study demonstrates that economic growth has a negative impact on bank profitability(Tan & Floros, 2012). Finally, *INF* are positively and significantly related in bank performance. This means that a higher inflation rate will cause loan interest rates to go up, which will make banks more profitable (Le et al., 2020).

5.3. Robustness checks

The study employs ZSCORE as the proxy measure of bank risk-taking in line with earlier studies (Adu, 2022; Hunjra et al., 2020). ZSCORE is calculated as

" $\text{ZSCORE}_{i,t} = \frac{\text{ROA}_{i,t}+\text{EQUITY}_{i,t}}{\sigma_{\text{ROA}_i}}$ where $\text{ROA}_{i,t}$ and $EQUITY_{i,t}$ are the current value of ROA and the ratio of total equity to total assets, respectively while σ_{ROA_i} is the standard deviation of ROA over the sample period". Because of a highly skewed distribution of ZSCORE, we use the natural logarithm of Z-score to alleviate this problem. For ease of exposition, ZSCORE is still labeled as measured by the natural logarithm of ZSCORE in the rest of this study. A higher value of ZSCORE means greater bank stability or lower bank risk. It is important to perform our robustness tests with ZSCORE as the dependent variable. When ZSCORE is utilized, the same outcomes are still attained. We just interpret our primary variables in order to maintain clarity.

First, the results in Table 4 show that the higher the IC management capacity, the more bank stability. This result is line with the research of Alrashidi and Alarfaj (2020) in Saudi, Ghosh and Maji (2014) in Indian; Cenciarelli et al. (2018) in the US.

For VAIC components are shown in Table 3. Specifically, *HCE* has a significant positive impact on bank stability. The results line with those of Onumah and Duho (2019), who discovered a strong and positive correlation between *HCE* and ZSCORE. This show that the core of lending operations and credit management is human resources. Credit officers' abilities, expertise, and experience are crucial in evaluating and overseeing loans and other advances. Furthermore, CEE has a significant positive impact on bank stability. The finding contradicts the results of Onumah and Duho (2019). This implies that an attempt by shareholders to create value by injecting more financial capital will lead to reducing insolvency risks and increase the bank's stability.

Second, the finding show a negative association between ID and ZSCORE, the results show that banks with greater income diversification take excessive risks and are more likely to be in unstable finances. The results concur with the findings Akhtaruzzaman et al. (2021); Clark et al. (2022); Le (2021); Martynova et al. (2020). The three main explanations explain these results. First, a shift to non-traditional operations may force banks to invest more in technology and human capital, raising operating leverage and, ultimately, the volatility of revenues. Second, activities that are paid for might raise financial leverage, which is linked to income volatility. Collectively, this might

Table 4. Robustness test risk talking

ZSCORE				
$ZSCORE_{t-1}$	0.458*** (0.054)	0.447*** (0.045)	0.334*** (0.051)	0.316*** (0.099)
VAIC	0.214*** (0.051)	0.347*** (0.044)		
CEE			5.921*** (1.047)	7.762*** (1.434)
HCE			0.235*** (0.045)	0.365** (0.152)
SCE			−1.157 (1.038)	−2.296 (1.921)
ID	−45.288*** (10.296)		−76.010* (44.025)	
ID*VAIC		−7.715** (3.314)		
ID*CEE				−29.999 (27.670)
ID*HCE				−45.893* (29.087)
ID*SCE				59.327* (28.985)
SIZE	0.193 (0.116)	0.348*** (0.075)	0.282*** (0.079)	0.089 (0.153)
CAP	−2.200 (2.505)	3.422*** (1.167)	11.667*** (1.552)	6.208 (4.400)
LATA	4.319*** (1.328)	2.727*** (0.832)	2.218* (1.120)	−0.926 (2.212)
LOAN	4.476*** (1.357)	3.512*** (1.025)	1.347 (0.955)	0.881 (2.572)
GDP	−5.989* (3.332)	−12.464*** (3.099)	−11.793** (4.451)	−14.131* (7.373)
INF	3.516*** (0.831)	2.301*** (0.483)	0.715 (0.683)	1.450 (1.389)
Constant	−9.570 (4.449)	−14.255 (2.554)	−11.418 (3.039)	−4.367 (5.781)
Observations	341	341	341	341
No of groups	27	27	27	27
AR(1)(p-value)	0.011	0.002	0.008	0.008
AR(2) (p-value)	0.274	0.599	0.420	0.279
Hansen test (p-value)	0.357	0.840	0.999	0.946

Note(s): ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of current period value of EQUITY; VAIC is the value added intellectual coefficient; CEE is the capital employed efficiency; HCE is the human capital efficiency; SCE is the structural capital efficiency; ID is income diversification; SIZE, the natural logarithm/total assets; CAP, the ratio of total equity to total assets; LATA, the ratio of liquid assets/ total assets; LOAN, loan to total assets; GDP, the real growth rate of gross domestic products. INF, the inflation rate. Robust standard errors are in parentheses.*,** and *** Significant at 10,5 and 1% levels, respectively.

make banks less stable. Finally, a lack of experience in nonlending activities results in a loss of concentration and inadequate loan monitoring, which eventually causes nonperforming loans to increase. The results are in line with earlier research on income diversification (Duho et al., 2019).

Finally, the interaction terms between Income diversification (ID) and VAIC (its decompositions) on bank stability in Table 4. The results show that ID*VAIC has a negative effect on ZSCORE.This

imply that banks with higher IC performance and more income diversification are less stable and more risk-taking. Furthermore, the variable ID*HCE has a negative effect on ZSCORE. This implies that banks with higher human capital efficiency and more diversified income tend to take excessive risks. In addition, the variable ID*SCE has a positive effect on ZSCORE. This shows that banks are more stable and have less exposure to instability risks when they have a high SCE and a high proportion of non-interest income. Due to the development of information and communication technologies, banks are merging lending and non-lending activities and applying financial technology for credit management. This has aided inefficient loan appraisal and monitoring, therefore improving bank stability. In summary, all of these findings support our main finding.

6. Conclusion

The study explores whether diversification of income moderates the relationship between IC and bankperformance(PE) for Vietnamese commercial banks from 2007 to 2020 using the system generalized method of moments (GMM). First, the results indicate that the value-added intellectual coefficient (VAIC) and its components (human capital efficiency (HCE), capital employed efficiency (CEE), and structural capital efficiency (SCE)) have positive effects on bank performance. Second, the research explores that income diversification has a negative and significant effect on the performance of banks. Finally, the findings show that *ID*(incomediversification), as a moderating element, lowered the overall impact of *VAIC* efficiency on bankperformance. Furthermore, the influence of incomediversification to adjusting the relationship between the various VAIC components (HCE, SCE,and CEE). In particular, incomediversification increased the impact of SCE on bankperformance, whereas it decreased the impact of HCE. In addition, the impact of revenue diversification on bank performance in moderating the impacts of capital employed efficiency was minimal (CEE). This study provides insights to bank managers and policymakers. First, the statistically significant positive correlation between VAIC and bank performance demonstrates that managers should see intellectual capital as a strategic advantage in their pursuit of superior bank performance. For the development of IC, supervisors should also explore the creation of banking-sector-specific regulations. In addition, there is a need for mandatory and regulated disclosure of IC performance, which could indicate to investors a bank's current value and future prospects. Second, the results of this study tend to reveal a discount for *ID*. Therefore, the regulator should limit the extent to which banks can diversify their income streams. Similarly, managers should identify the tipping point beyond which excessive income diversification diminishes the value of the organisation. Thirdly, the varying moderating effect of income diversification on the (HCE, SCE, and CEE) and bank performance demonstrates that management must evaluate the influence of nonlending operations on the value-creating potential of IC. Previous research has helped to clarify the theoretical implications of the relationship between IC, its aspects, and company performance. This research contributes to the body of knowledge in numerous ways. First, by investigating the impact of *VAIC* and dimensions *HCE*, *SCE*, and *CEE* on the performance of commercial banks in Vietnam, the study adds to the body of current empirical knowledge. Second, this study explores the correlation between ID and bankperformance, a correlation that has received over the years. This study contributes to the existing knowledge on IC and bank performance by analysing this association. By highlighting the critical role of the connection with intangible resources and diversity in understanding firm performance and competitive advantage, this study contributes to the resource-based perspective theory and modern portfolio theory.

The following are some potential restrictions on the study. Future research may use various methods to calculate how much IC banks need to invest because of the nonlinear connection (maybe, the quantile regression). Furthermore, while our study only examined one nation for a brief period of time, it suggests that future researches should investigate this connection in other developing nations with comparable banking structures for robust checks.

Funding
This research is funded by the University of Economics and Law, Vietnam National University, Ho Chi Minh city, Vietnam

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Citation information
Cite this article as: The moderating role of income diversification on the relationship between intellectual capital and bank performance evidence from Viet Nam, Dat T Nguyen, Tu DQ Le & Son H Tran, *Cogent Business & Management* (2023), 10: 2182621.

Notes
1. "'Please see, Abhayawansa and Guthrie (2010) and Bayraktaroglu et al. (2019) for a detailed discussion of IC definitions and components'".
2. "'Equation (2) does not include income diversification variables because of multicollinearity problem, which is evident through our Variance Inflation Factor test (not tabulated here)'."
3. ""Please see, Bayraktaroglu et al. (2019)for a more in-depth examination of several VAIC techniques".

Disclosure statement
No potential conflict of interest was reported by the authors.

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