Journal of Finance – Marketing

COMMERCIAL BANKS LISTED ON THE HO CHI MINH CITY STOCK EXCHANGE: AN ANALYSIS OF DIVERSIFICATION, HUMAN CAPITAL, AND PERFORMANCE

Nguyen Kim Phuoc[1*], Phan Ngoc Thuy Nhu[1], Tran Thi Tuong Van[2]

[1]Ho Chi Minh City Open University

[2]FPT University Ho Chi Minh City

ARTICLE INFO	ABSTRACT
	Both portfolio diversification and the resource-based view theories advocate for firms to engage in the diversification of their activities to mitigate risks and enhance operational efficiency. Nevertheless, the subject at hand is a matter of contention due to the existence of a perspective that advocates for the superiority of specialization over diversification. The objective of this study is to determine the relationship between income diversification, human capital, and the financial performance of Vietnamese commercial banks. Based on an analysis of data obtained from 15 commercial banks listed on the Ho Chi Minh Stock Exchange from 2013 to 2022. Panel data regression method is used. The results indicate that diversification does not exert a significant influence on the performance of banks. However, it is seen that human capital positively impacts bank performance, suggesting a favorable relationship between human capital and bank performance. According to this result, income diversification has not had an impact on the efficiency of Vietnamese commercial banks. On the contrary, human capital is a factor that positively and strongly affects the performance of Vietnamese commercial banks. The findings of this study indicate that some management implications may be considered to enhance the operational efficiency of Vietnamese commercial banks.

*Corresponding author:

 Email: phuoc.nk@ou.edu.vn

1. Introduction

The income structure of banks has undergone a substantial transformation in recent years, particularly in the aftermath of the Covid-19 pandemic. In the past, banks relied primarily on interest revenue from traditional sources of income; however, non-interest revenue from non-traditional sources of income is currently trending upward (Addai et al., 2022). The finance sector experienced substantial repercussions in terms of revenue from workers, households, and businesses throughout the Covid-19 pandemic (Feyen et al., 2021; Maghyereh & Yamani, 2022; McKibbin & Fernando, 2021) (*see Appendix 4 online*).

The current study focuses on the examination of the operational efficiency, human capital, and diversification of commercial banks listed on the Ho Chi Minh City Stock Exchange (HOSE). This will fill in a research gap regarding the association between income diversification and performance and add to the body of empirical evidence on the subject. By reviewing studies on the banking business, this research attempts to address differences in industry, region, and diversity. Specifically, it focuses on commercial banks that are listed on stock exchanges and are publicly traded. The primary objective of the HOSE is to mitigate disparities arising from bank-specific attributes, as highlighted by Yildirim et al. (2021). Simultaneously, the existing research mainly concentrates on various income sources, namely income derived from interest and non-interest sources, while neglecting to investigate the numerous forms of revenue, assets, and deposits. The article is structured into several sections. Part 2 discusses the theoretical foundation and prior research, offering a comprehensive review of relevant literature. Part 3 outlines the model, hypotheses, and research methods employed in the study. The empirical findings are presented in Part 4. Lastly, the concluding section summarizes the conclusions drawn from the research and highlights the managerial implications.

2. Literature review

Diversification and operational efficiency

The concept of portfolio diversification was introduced by Markowitz (1952). Diversification is an investment strategy that aims to mitigate risk by integrating a variety of investments. According to Sanya & Wolfe (2011), amalgamating these elements results in a portfolio exhibiting multidirectional characteristics. According to Elsas et al. (2010), the idea of portfolio diversification posits that both individuals and businesses can enhance their investment portfolios by diversifying them, thereby reducing risks, and increasing earnings.

Ansoff (1957) posited that the diversification of business activities inside companies is contingent upon two primary criteria: product (or service) and market. According to the research conducted by Weichieh & Tsang (2015), the authors Grant & Jordan (2015) posit that diversification refers to expanding or diversifying a company's range of products, services, or areas of operation.

According to Stiroh & Rumble (2006), as well as Nguyen Minh Sang & Thai Thi Thuy Linh (2018), revenue diversification in commercial banks refers to the process of shifting focus from interest-based operations to fee-based business activities, receiving entrusted funds, generating income from business activities, and engaging in other non-interest-related endeavors. According to Nguyen et al. (2012) and Nguyen et al. (2016), income diversification refers to the strategic pursuit of banks to augment their revenue streams by expanding their sources of income derived from operational activities— the process of generating revenue from sources other than interest. According to Phan et al. (2022), the diversification of banks may be observed through three distinct tendencies, including financial product diversification, regional diversification, and the integration of geographic diversification with business operations. The income diversification activities

of commercial banks encompass the generation of income through creating and providing a range of products and services. These activities yield income from traditional and non-interest-based operations, independently or in combination. Simultaneous engagement in these two tasks has been explored in previous studies (Mercieca et al., 2007; Saghi-Zedek, 2016; Doumpos et al., 2016). This study evaluates commercial banks' diversity level through financial product diversification analysis.

Several studies have examined the relationship between income diversification and performance, including the works of Chiorazzo et al. (2008), Elsas et al. (2010), Sanya & Wolfe (2011), Meslier et al. (2014), Hafidiyah & Trinugroho (2016), and Radojičić & Marinković (2023). These researchers have consistently identified the Herfindahl-Hirschman Index (HHI) as the most appropriate measure for assessing the level of functional diversification. The HHI is a metric for measuring concentration within an industry. In banking activities, a lower HHI value indicates a greater degree of diversification. To mitigate the occurrence of reverse explanatory logic, scholars have employed diversification techniques, which involve subtracting the HHI value from 1 (Stiroh & Rumble, 2006; Chiorazzo et al., 2008; Hafidiyah & Trinugroho, 2016; Radojičić & Marinković, 2023).

The measurement of income diversification, also known as the HHI, involves the division of a bank's operating income into two distinct components, namely interest income and non-interest income. Interest income refers to the revenue banks generate primarily through their credit activities. Non-interest income refers to the revenue generated by a bank from various operations such as providing services, engaging in stock investments, conducting foreign currency trading, and other sources of income. Operating income refers to a financial institution's comprehensive revenue from its core operational activities.

The present study employs a scale to assess the level of income diversification exhibited by bank i during year t

$$HHI_{it} = 1 - \left[\left(\frac{the\ interest\ income_{it}}{the\ operating\ income_{it}} \right)^2 + \left(\frac{the\ non-interest\ income_{it}}{the\ operating\ income_{it}} \right)^2 \right]$$

Within this context, lower HHIit values indicate banks that possess less diversity and are more concentrated. Conversely, higher values of HHIit suggest banks that are more diversified and less concentrated.

The evaluation of the operational effectiveness of commercial banks is gauged through the utilization of two key financial metrics, namely return on assets (ROA) and return on equity (ROE) (Ahamed, 2017; Chiorazzo et al., 2008; Radojičić & Marinković, 2023). The ROA index is frequently employed by scholars, as seen by its utilization in studies conducted by Petersen & Schoeman (2008), Lee & Kim (2013), Yang et al. (2018), and Le Ha Diem Chi (2022). The utilization of profit after tax as a metric for calculating Return on assets

(ROA) is employed in this article as a means to mitigate discrepancies arising from accounting and tax variations.

Based on the theoretical framework of the resource-based view, the augmentation of financial services is expected to enhance the operational efficiency of banks by the increased availability of resources, hence leading to economies of scale for the banks (Fiordelisi et al., 2011; Klein & Saidenberg, 2010). Khemani & Shapiro (1993) propose that by economies of scale, firms experience a reduction in average costs per unit of output as scale increases, primarily due to fixed expenses. The allocation is distributed uniformly for each unit of production. According to O'Sullivan, Sheffrin, and Swan (2003), a negative relationship exists

between size, costs, and prices per product unit. As the scale increases, costs and prices per unit decrease, leading to higher profits and enhanced competitiveness. Hence, banks should adopt a strategy of specialization rather than pursuing diversification.

Several empirical investigations conducted by Tabak et al. (2011), Jahn et al. (2013), and Šeho et al. (2021) have provided evidence to support the notion that diversity might lead to an increase in inefficiency. Hence, banks should leverage their competitive advantages inside a specific domain or operations rather than pursuing diversification. Diversification has resulted in higher agency costs due to managers' devaluation operations, which reduces their risk (Amihud & Lev, 1981). Additionally, diversification reduces incentives for competitive monitoring and diversification (Winton et al., 1999) and is associated with increased income volatility (De Jonghe, 2010). The studies conducted by Sun et al. (2017) and Noor & Siddiqui (2019) have provided evidence to support a non-linear association between non-credit revenue and the performance of banking institutions.

Nevertheless, further research has presented empirical findings supporting the diversification perspective. According to Shim (2019), a bank's financial strength is positively influenced by loan diversity. According to the study conducted by Kim & Kim (2020), which analyzed data from banks in the United States, it has been demonstrated that diversity plays a crucial role in enabling banks to establish a sustainable competitive advantage despite the potential initial loss of their comparative advantage. This implementation enhances the banks' ability to achieve sustainable operational efficiency. In the context of the Covid-19 pandemic, the diversification of income sources has been identified as a significant factor in aiding commercial banks in mitigating the crisis's adverse effects (Maghyereh & Yamani, 2022).

The Herfindahl-Hirschman Index (HHI) is a metric used to assess the level of income diversification according to the HHI methodology. The calculation of the HHI is performed in the following manner: The HHI can be calculated using the formula 1 - [(NII/NOI)2 + (NON/NOI)2]. In this context, NII refers to revenue generated from interest and comparable interest-related sources. On the other hand, NOI represents the operating income, while NON denotes the non-interest income. Several studies conducted by Kim and Kim (2020), Alouane et al. (2022), Addai et al. (2022), as well as Radojičić & Marinković (2023), have provided evidence supporting the notion that revenue diversification has a beneficial effect on the financial performance of banks. The H_1 hypothesis posits that there is a favorable influence on Return on Assets (ROA) or income diversification that enhances the efficiency of banks.

Human capital and operational efficiency

Human capital, also known as human resources, holds significant significance inside organizations, particularly in the banking sector. The service business relies extensively on the expertise and skills of its workforce (Johan & Hapsari, 2020). In the contemporary landscape of an open economy, the progressive integration of international economic systems, and the swift advancement of technology, it is imperative for banks aspiring to sustain a competitive edge to allocate resources towards developing human capital (Yen et al., 2019).

Diverse interpretations exist regarding the concept of human capital. To be more precise: (i) Human capital pertains to the specialized expertise possessed by each individual within an organization, which distinguishes it from others (Gang & Fraumeni, 2014); (ii) Human capital comprises the competencies and knowledge acquired by each individual through training and accumulation (Balogh, 2013). Measuring human capital is multifaceted and comprehensive (Schultz, 1961). According to Oxley, Le & Gibson (2008) and Balogh (2013), human capital can be assessed using the income method, which involves calculating

the individual's earnings throughout their employment. Human capital is reflected in financial statements via employee expenditures, as viewed through the lens of accounting and finance (Lev & Schwartz, 1971; Morse, 1973; Johanson & Nilson, 1996). In financial statements, employee expenditures consist of the following: salaries, bonuses, training expenses, and employee benefits. Pedrini (2007) and Yusuf (2013) established a positive correlation between human capital and bank performance by utilizing the indicator "expenditure on employees" to assess human capital.

Some experimental studies have shown that human capital impacts the performance of organizations in general, especially banks. (Taleb & Khatib, 2016; Yen, Lee & Arokiasamy, 2019; Rosita et al, 2020; Johan & Hapsari, 2020). Based on data from Indonesian banks for the period 2015-2018, Johan and Hapsari (2020) concluded that human capital (total labor) has a significant positive impact on the performance of banks. (ROA). At the same time, Rosita et al. (2020) demonstrated a positive relationship between human capital (total expenditure per employee/total employee) and the performance of Indonesian state-owned banks in 2012-2016. Yen et al. (2019) affirmed that intellectual capital (employee expenditure) contributes significantly to the financial efficiency of banks (after physical capital).

Human capital (HC) is the quantifiable assessment of an individual's skills, knowledge, and abilities that contribute to their overall productivity and economic value. The human capital (HC) calculation is derived by dividing all employment expenses by the overall operating expenses, expressed as a percentage. According to Yusuf (2013), Yen et al. (2019), Rosita et al. (2020), Johan & Hapsari (2020), and Widarni & Bawono (2022), the allocation of financial resources towards workers' compensation, including pay, rewards, training, welfare, and other related expenses, signifies the extent of capital invested in the human resources of a bank. Increased investment

in employee compensation by the bank is positively correlated with enhanced operational efficiency, as it enables the workforce to leverage their knowledge, abilities, and overall job performance. Based on the premise mentioned above, the H2 hypothesis is posited as follows: HC has a negative relationship with ROA, implying that increased investment in human capital leads to enhanced operational efficiency within the banking sector.

The equity ratio, the value of ordinary stockholders' equity to total assets ratio (VCSH), is a financial metric used to assess the proportion of a company's assets financed by common stockholders' equity. Calculating the Equity Asset Ratio (EAR) involves dividing the entire equity by the total assets and expressing the result as a percentage. The findings of Batten & Võ (2016) study, Pham Quoc Viet, & Pham Tran Quang Phuc (2020) research, Phan et al. (2022) investigation, as well as Githaiga (2022) study, have provided evidence of a relationship between the VCSH ratio and ROA. Based on the information mentioned above, the H3 hypothesis is put forward, positing that there exists a positive impact of EAR on ROA. In other words, it suggests that the efficiency of banks' operations increases as the VCSH grows.

The Loan Balance Ratio (LAR) is a financial metric that quantifies the proportion of a bank's total customer loan balance with its total assets. It is expressed as a percentage. Several studies conducted by Hafidiyah & Trinugroho (2016), Pham Quoc Viet & Pham Tran Quang Phuc (2020), Phan et al. (2022), as well as Githaiga (2022), have provided evidence supporting a positive correlation between loan projections and bank performance. Consequently, the fourth hypothesis (H4) posits that there exists a positive relationship between Loan-to-Asset Ratio (LAR) and Return on Assets (ROA), suggesting that higher loan balances contribute to greater operational efficiency in banks.

Cost-effectiveness is commonly assessed using the Cost-Effectiveness Ratio (CER). The Cost Income Ratio (CIR) calculation

divides the operating cost by the operating income expressed as a percentage. The cost efficiency of banks is assessed using the CIR, as demonstrated in the studies conducted by Hafidiyah & Trinugroho (2016), Pham Quoc Viet & Pham Tran Quang Phuc (2020), and Phan et al. (2022). The findings indicated an inverse correlation between the corporate income tax rate (CIR) and the Return on Assets (ROA). Thus, the H5 hypothesis posits that there is a negative relationship between CIR and ROA, suggesting that higher costs lead to reduced efficiency in banks.

Non-performing loans (NPLs) are a quantifiable metric that gauges the proportion of a bank's debt portfolio that has become delinquent or defaulted. It is expressed as a percentage, reflecting the ratio of non-performing loans to the total loan portfolio. The ratio above is derived by computing the proportion of debt balances in groups 3, 4, and 5 relatives to the overall debt balance of the bank, expressed as a percentage. The findings of several recent studies conducted by Lee et al. (2014), Khan et al. (2020), and Githaiga (2022) have consistently demonstrated a negative relationship between bad debt and bank performance. Consequently, the H6 hypothesis is posited, suggesting that non-performing loans (NPLs) negatively affect Return on Assets (ROA). In other words, a larger lousy debt ratio is expected to correspond to a lower efficiency level in banking institutions.

Assessed in natural logarithms of total assets, SIZE serves as a measure of the bank's scope. The research findings of Hafidiyah & Trinugroho (2016), Ahamed (2017), Nguyen Thi Thu Trang & Hoàng Anh Thư (2019), Octavio & Soesetio (2019), and Phan et al. (2022) have established that the statistical analysis of banks demonstrates a favorable influence on operational efficiency. Drawing upon the schematic economic advantage theory and the empirical investigations, we put forth the H7 hypothesis, which posits a positive relationship between the size of a bank (measured by its

assets) and its efficiency in terms of Return on assets (ROA).

3. Methodology

This research investigates the influence of revenue diversification and human capital on commercial banks' performance on the Ho Chi Minh Stock Exchange (HOSE). Drawing upon a range of empirical studies, including those conducted by Lee & Kim (2013), Yang et al. (2018), Le Ha Diem Chi (2022), Kim & Kim (2020), Alouane et al. (2022), Addai et al. (2022), Radojičić & Marinković (2023), Yusuf (2013), Yen et al. (2019), Rosita et al. (2020), and Johan & Hapsari (2020). The study model that has been presented is outlined as follows:

$$ROA_{it} = \alpha + \beta_1 HHI_{it} + \beta_2 HC_{it} + \beta_3 EAR_{it} + \beta_4 LAR_{it} + \beta_5 CIR_{it} + \beta_6 NPL_{it} + \beta_7 SIZE_{it} + \varepsilon_{it}$$

Within this context, Return on assets (ROA) is a metric used to assess the operational efficiency of a bank, serving as the dependent variable in this context. The Herfindahl-Hirschman Index (HHI) is a quantitative metric used to assess the level of income diversification, employing the HHI method. Human capital (HC) is the quantifiable assessment of individuals' skills, knowledge, and abilities within a particular population. The variable X denotes the control factors associated with the characteristics of the bank. The symbol α represents the constant of reversal. The regression coefficient, denoted as β, represents the relationship between the bank i in year t and the random error term εit (*see Appendix 1 online*).

This study utilizes annual data from the accounting and interest balance sheets of banks listed on the HOSE, specifically focusing on audited reports. The research encompassed 15 consecutive financial statements of banks listed on the HOSE between 2013 and 2022. Financial institutions that did not comply with the criteria above were omitted from the sample. The dataset consists of 150 observations from the combination of 16 banks observed for ten years.

The study employed the pooled ordinary least squares (OLS), fixed effects model (FEM), and random effects model (REM) techniques to examine the adherence of the model. Additionally, the study considered the methodology of table data recovery and relevant certifications. In their subsequent work following Beck & Katz (1995), Hoechle (2007) employed the Feasible Generalized Least Squares (FGLS) technique to rectify model inaccuracies arising from issues such as autocorrelation and numerical mistakes in variables.

4. Research results

4.1. Statistical results

The statistical data (*see Appendix 2 online*) presents the performance of 15 banks that are listed in the HOSE during the period spanning from 2013 to 2022. The Return on assets (ROA) exhibited considerable variability, as indicated by the standard deviation, encompassing both the minimum and maximum values. The mean ROA for a sample of 15 banks throughout 2013-2022 was recorded at 1.0697%. The level of diversification among banks exhibits considerable variation, as indicated by the average Herfindahl-Hirschman Index (HHI) of 16 banks included in the study, which stands at 0.2282. However, several banks demonstrate a substantially lower HHI index of merely 0.0198. The allocation of financial resources towards human resources in the banking sector exhibits considerable variation, as evidenced by a wide range of expenditure levels observed across different banks. Many banks demonstrate high spending, with the highest recorded value reaching -0.1773. Conversely, a minority of banks allocate much fewer resources towards human capital, with the least observed value being -0.9222, which falls well below the average expenditure level. The value provided is -0.4766. The variables, namely equity-to-asset ratio (EAR), borrowing balance (LAR), cost-effectiveness (CIR), bad debt (NPL), and bank scale (SIZE), exhibit substantial variations. Commercial banks in Vietnam exhibit variations in operating patterns, total assets, managerial qualities, and other pertinent factors. This observation indicates that the elements contributing to the bank's functioning exhibit notable distinctions.

4.2. Results of regression and discussions

Based on the correlation matrix presented (*see Appendix 3 online*), it can be observed that the majority of pairwise correlation coefficients between variables exhibit values below 0.6. However, it is worth noting that the variables LAR and SIZE demonstrate a correlation coefficient of 0.6632, which surpasses this threshold. To mitigate the presence of multicollinearity and maintain impartial outcomes, the variance inflation factor (VIF) was taken into account, as suggested by Gujarati et al. (2012). The findings (*see Appendix 3 online*) indicate that the VIF coefficients are consistently low (VIF < 5), suggesting the absence of multicollinearity within the model.

Table 1. Regression results

Dependent variable: Return on assets (ROA)	Regression			
Biến độc lập	POOL	FEM	REM	FGLS
Herfindahl-Hirschman Index (HHI)	-0.525	0.455	0.230	-0.318
	[-1,22]	[1.02]	[0.55]	[-1.00]
Human capital (HC)	-0.366	-0.715**	-0.779***	-0.746***
	[-1,07]	[-2.30]	[-2.70]	[-3.25]
Equity ratio (EAR)	0.120***	0.0965***	0.0997***	0.111***
	[6.93]	[6.54]	[6.87]	[6.35]

Dependent variable: Return on assets (ROA)	Regression			
Biến độc lập	POOL	FEM	REM	FGLS
Loan balance ratio (LAR)	0.00534	0.0178***	0.0161***	0.0046
	[1.08]	[3.62]	[3.38]	[1.16]
Cost-effectiveness (CIR)	-0.0170***	-0.0159***	-0.0169***	-0.0105***
	[-4.33]	[-4.25]	[-4,78]	[-3,95]
Non-performing loans (NPL)	-0.0387***	-0.0024	-0.0046	-0.0116
	[-2.80]	[-0.23]	[-0.45]	[-1.46]
Bank size (SIZE)	0.175***	0.255**	0.188**	0.162**
	[2.68]	[2.46]	[2.31]	[2.37]
Constant	-5.258**	-9.040***	-6.650**	-5.306**
Model fit	F(7,151)	F (15, 156)	Wald chi2 (7)	Wald chi2 (7)
F - value/ Wald chi2	25.59***	16.16***	338.22***	131.47***
Model selection				
Model selection (Wald test) F (7, 136)	50.02***			
Hausman Test (Hausman test) (chi2(7))		12.24***		

*Note: The symbols ***, ** and * represent the 1% significance level, respectively; 5% and 10% t-statistics in brackets [ ]*

The results (Table 1) show that all three models, POOL, FEM, and REM, have F and Wald statistical indices with Prob values <α=5%, so all are considered appropriate.

Choosing OLS or FEM: The results of the Wald test (Table 1) show that the Prob value > F = 0.0000 (<α=5%) with F (7, 136) = 50.02 is proven at the 5% significance level, proving that specific differences exist between companies in the model. The FEM model is selected.

Choose FEM or REM: Hausman test results show that the value Prob>chi2 = 0.0000 (<α=5%) with chi2(9) = 12.24, confirming that the FEM model is more suitable than the REM model when researching the data used. Thus, the FEM model will be used for subsequent analysis.

Based on the findings (*see Appendix 4 online*), it is evident that the chibar2 value exhibits a Prob>chi2 of less than 1%, while Pesaran demonstrates a Pr. value of less than 1%. These results indicate the presence of heteroskedasticity and autocorrelation within the FEM model. This limitation will constrain the efficacy of the FEM model. Beck & Katz (1995) argue that the FGLS estimation approach is suitable for addressing the issues of heteroskedasticity and autocorrelation. By employing this method, Hoechle (2007) suggests that the estimated outcomes can be unbiased. The findings from the estimation of the FEM model, which was adjusted using the FGLS approach and presented in Table 1, indicate that the variables HC, EAR, CIR, and SIZE exhibit a significant influence on the operating efficiency (ROA) of commercial banks listed on the HOSE.

Discuss regression results

Based on the regression analysis conducted using the FEM and adjusted using the FGLS approach, it can be concluded that hypotheses H1, H4, and H6 fail to achieve the necessary level of statistical significance, as indicated in Table 1. This result implies that the variables HHI, LAR, and NPL exhibit no significant impact on the operating efficiency, as measured by the Return on assets (ROA). The hypotheses

H2, H3, H5, and H7 are accepted as indicated in Table 1. The operating efficiency (ROA) of commercial banks listed on HOSE is influenced by HC, EAR, CIR, and SIZE variables.

The findings from the FGLS analysis, as presented in Table 1, indicate that there is a statistically significant relationship between the growth in human capital (HC) and the corresponding rise in Return on assets (ROA). Specifically, when controlling for other factors and holding them constant, a 1% increase in HC leads to a 0.764% increase in ROA. It is important to note that the negative sign denotes expenses, indicating that this relationship is associated with the expenditure on resources. This result is significant at the 1% level of significance. There is a positive correlation between the level of human resources and operating efficiency, which aligns with the initial predictions. The findings presented herein align with the research outcomes reported by Yusuf (2013), Yen et al. (2019), Rosita et al. (2020), Johan & Hapsari (2020), Rosita et al. (2020), and Widarni & Bawono (2022). Empirical evidence demonstrates that allocating resources towards personnel expenditures, encompassing salaries, bonuses, perks, and training, plays a pivotal role in formulating strategies to attract and retain a proficient and exceptionally productive workforce. This component exerts a significant and favorable impact on the operational efficiency of banks.

The estimation findings of the FGLS method, as presented in Table 1, indicate a positive relationship between the Efficiency of Asset Utilization Ratio (EAR) and the Return on Assets (ROA) of commercial banks that are listed on the HOSE. At a significance level of 1%, and assuming all other variables remain constant, evidence suggests that an increase of 1% in banks' equity ratio is associated with a corresponding increase in ROA to 11.1%. This represents a significant increase. The obtained outcome aligns with the initial hypotheses and is congruent with the findings reported by Batten & Vo (2016), Pham Quoc Viet & Pham

Tran Quang Phuc (2020), Phan et al. (2022), as well as Githaiga (2022). This finding elucidates the rationale for state banks' perpetual interest in and insistence on commercial banks augmenting their equity capital.

The estimation findings of the FGLS method, as presented in Table 1, indicate that the Capital Adequacy Ratio (CIR) has a significant influence on the operating efficiency, as measured by the ROA, of commercial banks that are listed on the HOSE. Assuming all other factors remain constant at a significance level of 1%, a inpositive relationship exists between the bank's operational expenditures as a proportion of total income and ROA. In particular, it has been observed that a 1% increase in the Cost-to-Income Ratio (CIR) leads to a corresponding 1.05% reduce in the ROA. ROA did not experience a significant increase; nevertheless, it still exhibited a positive correlation, indicating the attainment of cost efficiency as first anticipated. This finding serves to reinforce the research findings of Hafidiyah & Trinugroho (2016), Pham Quoc Viet & Pham Tran Quang Phuc (2020), and Phan et al. (2022). This observation indicates that commercial banks on the HOSE have efficient and suitable expenditure practices.

The estimation findings of the FGLS method, as provided in Table 1, provide empirical support for a positive association between bank size, measured by total assets (SIZE), and operating efficiency, as indicated by the ROA. The FGLS estimations indicate that the beta coefficient attains a value of -0.162 at a significance level of 5%. Assuming all other factors remain constant, a 1% rise in the asset growth rate results in a corresponding 16.20% increase in the profitability ratio to total assets, as determined at a significance level of 1%. This outcome aligns with the initial hypotheses and is consistent with the findings reported by Nguyen Thi Thu Trang & Hoang Anh Thu (2019), Octavio & Soesetio (2019), and Phan et al. (2022). This assertion holds accurate in practical application and aligns with the theoretical concept of

"economy of scale." Indeed, commercial banks possessing substantial assets are characterized as large banks with extensive operational reach. Notably, the banks examined in this study include VCB, BID, ACB, and others.

No evidence suggests that HHI, LAR, and NPL significantly influence commercial banks' operating efficiency (ROA) listed on the HOSE. The lack of high-service diversification among commercial banks listed on HOSE may account for this phenomenon. The diversification of banks has only commenced in recent years, thereby making this strategy's success inconspicuous. In recent years, commercial banks have effectively managed lousy debt as a result of adherence to state bank laws. Simultaneously, it can be observed that the credit policies implemented by banks exhibit similarities, hence resulting in a lack of impact on the ROA with outstanding loans.

5. Conclusion and implications

5.1. Conclusion

This study investigates the correlation between income diversification, human capital, and operating efficiency within a sample of 15 commercial banks listed on the HOSE from 2013 to 2022. The findings indicate that no empirical evidence supports that income diversification (HRD) significantly affects performance (ROA). The influence of Human Resources (HC) on operational efficiency (ROA) is notably beneficial and robust. The FGLS findings also indicate that there exist variations among banks, providing evidence that both cost-effectiveness (CIR) and bank scale (SIZE) have an impact on the Return on assets (ROA). The findings indicate that implementing diversification strategies has yielded unsatisfactory outcomes for commercial banks in Vietnam.

5.2. Implications

According to the findings of the study, it is recommended that commercial banks listed on

the HOSE undertake the following measures: (i) Enhance their asset and equity ratio to ensure a gradual improvement in operational efficiency; (ii) Place emphasis on investing in human capital, such as increasing remuneration, offering rewards, and providing training opportunities, to foster employee loyalty and enhance their productivity, thereby exerting a substantial impact on the overall efficiency of the bank. Due to the nature of the banking industry as a service-oriented sector, it strongly relies on the human element. Hence, the bank retains its workforce by implementing human resources strategies that exert a favorable and robust influence on its operational efficiency. Additionally, no empirical support indicates that income diversification (IRD) impacts the bank's operating efficiency as measured by Return on assets (ROA). One possible explanation for the relatively low early results is that banks commenced diversifying their services only after the onset of the Covid-19 pandemic in 2019.

Following the notion of portfolio diversification, banks should contemplate the diversification of their services as a means to broaden their income streams. This result is particularly pertinent in the current era of robust growth in technology 4.0. Nevertheless, it is imperative for banks to carefully contemplate the notion of diversification under their distinct qualities and available resources. This study exclusively utilizes data from commercial operators listed on the HOSE over the timeframe spanning from 2013 to 2022. Hence, to establish a scientific foundation for aiding banks in their decision-making about diversification, it is imperative to validate subsequent research by categorizing each revenue based on the bank's operations or incorporating longer-term data.

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