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Economic Empowerment: Unveiling Asian Bank Performance Trends

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Abstract

This research undertakes a comprehensive and pioneering investigation into the determinants of commercial bank performance across diverse Asian economies, analyzing data from 71 banks over the period 2010 to 2022. Utilizing an array of financial metrics -such as Return on Assets, Return on Equity, Profit Margin, and Net Interest Margin—this study augments traditional indicators with additional covariates like technical, resource, and profit efficiency as captured by the Malmquist Productivity Index. Further variables, including intellectual capital, effective tax rates, loan growth, and income diversity, enrich the analytical depth. The study employs the sophisticated System Generalized Method of Moments (sGMM) as its methodological cornerstone, allowing for robust hypothesis testing that scrutinizes the interplay between profitability and an array of efficiency and financial metrics. The novelty of the research lies in its encompassing scope: it extends beyond the limitations of existing scholarship by focusing on a heterogeneous collection of Asian economies and leveraging a larger and more robust sample size. These design attributes not only address critical gaps in the extant literature but also significantly enhance the study's generalizability, offering a nuanced, comparative lens through which to understand bank performance across varied economic landscapes.

Keywords: Bank efficiency, Intellectual capital, Performance Evaluation, Systems Generalized Method of Moments (SGMM), Malmquist Production Index

JEL Classification: M41, F30, D89

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1. Introduction

Banks serve as pivotal financial intermediaries in modern economies, channelling capital from surplus sectors to entities requiring financing, thereby underpinning business investments and influencing a nation's political and economic stability. This central role places the performance and efficiency of banks under heightened scrutiny, especially in the wake of major macroeconomic shocks such as the COVID-19 pandemic, trade wars, and currency crises in emerging markets - all of which have underscored the transnational interconnectedness of banking risks (Reinhart and Rogoff 2009). The fallout from banking sector vulnerabilities has been starkly demonstrated, from the ripple effects of the 2007-2008 global financial crisis to recent government interventions like the 2020 emergency stimulus packages and central bank liquidity provisions. These failures have wide-ranging consequences, jeopardizing not only individual capital but also eroding public trust, thereby heightening the risk of panic withdrawals and subsequent liquidity crises (Conrad 2023; Borio et al. 2020; Jameaba 2020; Khan 2019).

Our study is informed by previous research that has identified several determinants of bank performance. These include bank-specific factors such as size, capital adequacy, operating efficiency, liquidity risk management, credit risk management, productivity, income diversification (Goddard et al. 2004), market power (Schaeck et al. 2009), and technical efficiency (Fethi and Pasiouras 2010). Additionally, country-level factors such as financial development status (Schaeck et al. 2009) and regulatory quality (Fethi and Pasiouras 2010) have also been found to impact bank performance.

Our research methodology utilizes data sourced from BankFocus, a specialized database for banking information. We analyze publicly available data on banks operating in the economies mentioned earlier. Employing the System Generalized Method of Moments (sGMM) as our econometric framework, we aim to identify the relative importance of each determinant in influencing bank performance. This rigorous approach allows our study to provide a comprehensive and nuanced analysis of the factors that contribute to bank success across diverse economies.

This study aims to address several key gaps in the existing literature. Firstly, in contrast to prior research predominantly focused on Western economies, our study offers a nuanced, comparative analysis centred on a diverse range of Asian markets, including global financial hubs like Hong Kong and the UAE, high-growth ASEAN markets such as Malaysia and Vietnam, and South Korea's advanced yet still emerging economy. Secondly, the multi-country framework enables a more comprehensive examination of how profitability determinants vary across different banking systems, thus filling a lacuna in the existing literature that often concentrates on more homogeneous settings. Thirdly, we leverage a more expansive and robust dataset obtained from BankFocus, covering five economies, thereby enhancing the external validity and generalizability of our findings. This addresses the limitations of prior studies that are often restricted to single-country samples. Lastly, our research employs sGMM as the econometric framework, providing a more rigorous analytical approach compared to the commonly used OLS models for analyzing dynamic panel data.

This research endeavour seeks to enrich the existing body of scholarship through an extensive, multi-country analysis focused on identifying the principal factors influencing bank performance. By adopting a robust analytical framework, the study ensures the reliability and validity of its findings. To offer a comprehensive understanding of the research objectives and methodologies, the proposal is systematically structured into several key sections. This approach is designed to provide a thorough exploration of the dynamics shaping bank performance across various economic landscapes. The remainder of this paper is outlined as follows: Section 2 reviews relevant literature and establishes the theoretical framework. Section 3 presents the hypotheses. Section 4 outlines data sources and methodology. Section 5 reports initial findings and robustness checks. Section 6 concludes, highlighting practical and theoretical implications.

2. Theoretical Framework and Prior Empirical Studies

2.1. Theoretical Framework

The Resource-Based View (RBV) and Efficiency Theory form the cornerstone of this study's theoretical framework, aimed at dissecting the nexus between intellectual capital (IC) and organizational performance in the banking sector. RBV centres on the strategic utilization of a firm's internal resources and capabilities, such as skilled personnel and proprietary technology, to foster strategic advantages and cultivate intellectual capital—including human, structural, and relational components (Boxall and Purcell 2000; Hsu and Wang 2012; Mohammad Shafiee 2022). These elements are integral to building and sustaining a bank's competitive edge.

Complementing RBV, Efficiency Theory underscores the importance of maximizing output from minimal input, advocating for strategic decisions that bolster operational efficiency and the optimal deployment of a bank's resources (Leibenstein 1978; Boxall and Purcell 2000; Kiruja and Kimencu 2020). Such strategies are vital for enhancing the bank's intellectual capital and improving service offerings, customer relations, and innovation.

Strategic decision-making (SDM) emerges as a critical intermediary in this framework, operationalizing the tenets of RBV and Efficiency Theory into tangible practices and policies that nurture intellectual capital. It is this intellectual

capital that then propels organizational performance, influencing essential financial metrics and market growth (David 2014; Bedford and Sappington 2016; Wang and Cen 2022).

The interplay between RBV and Efficiency Theory through the lens of SDM provides a multifaceted view of the research, offering insights into how management and investment in a bank's intellectual assets are fundamental for attaining superior performance outcomes (Alhassan and Asare 2016). This integrated approach affords a unique vantage point from which to evaluate and understand the complex dynamics that drive performance in the banking industry. Figure 1 provides an illustration of the theoretical framework.

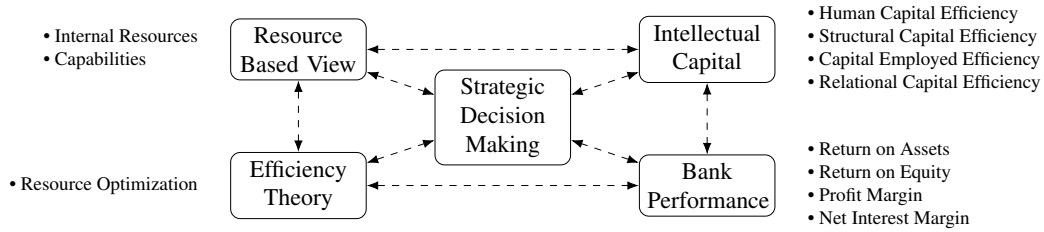

Figure 1: Conceptual Theoretical Framework

2.2. Prior empirical studies

2.2.1. Banking Efficiency: A Focus on Malmquist Index and DEA

In the expansive field of banking efficiency research, two methodologies stand out: the Malmquist index and Data Envelopment Analysis (DEA). Originating from Scandinavian countries, the Malmquist index serves as a critical tool for assessing productivity growth across a variety of banking sectors globally. This index has proven its adaptability by highlighting increased productivity growth in banking sectors following deregulatory activities in the 1980s, notably in Norway, Finland, and Sweden (Berg et al. 1992, 1993). Moreover, its significance is corroborated by studies from Asian economies like Thailand and Turkey, which also show significant gains in total factor productivity and improvements in efficiency following deregulation (Leightner and Lovell 1998; Isik and Hassan 2003). The versatility of the Malmquist index extends even further, providing valuable insights into efficiency-driven growth in credit unions in Australia, the assessment of bankruptcy risk in the United States, and the role of technological advancements, particularly among foreign banks, in Algeria (Worthington 1999; Liu et al. 2018; Boukhetala and Boudriga 2019). Additionally, recent studies in China and Taiwan have emphasized the transformative effects of digital maturity, market competition, and business diversification on banking efficiency (Huang et al. 2017; Zuo et al. 2021; Yu et al. 2021). There's also a sustainability dimension, as indicated by a study focusing on Lithuania's banking sector which suggests room for improvement in cost efficiency and profitability (Novickytė and Droždz 2018).

On the other hand, DEA has emerged as another principal methodology, particularly popular in Taiwanese studies for evaluating operational efficiency. This non-parametric approach is often used in tandem with other methods to yield more comprehensive analyses (Chen and Yeh 2000; Chen 2002; Chiu and Chen 2009; Shyu et al. 2015; Ting et al. 2021; Kweh et al. 2021; Yu et al. 2021; Yu and Huang 2023). Importantly, DEA-based analyses indicate that efficiency scores can differ significantly depending on whether different analytical techniques such as Chance-Constrained DEA or Stochastic Frontier Analysis are employed. Furthermore, this methodology is not limited to Taiwan; its application extends to emerging markets and ASEAN countries, where research has emphasized the impact of risk measures, technological advancements, and digital transformations on banking efficiency (Saha 2018; Zuo et al. 2021; Wang et al. 2013). Specifically, in the context of China, fintech innovations have been demonstrated to significantly enhance the cost efficiency and technological capabilities of state-owned commercial banks (Lee et al. 2021; Li et al. 2022). DEA's reach even includes less commonly studied banking systems, such as Poland's, where research has pointed to the intriguing possibility that high levels of technical efficiency could actually inhibit overall bank efficiency Yu and Huang (2023).

2.3. Bank Performance and Intellectual Capital

The role of Intellectual Capital (IC) in influencing bank performance has been a recurring theme in literature, especially in Asian economies. Studies from Indonesia and Malaysia underscore a positive relationship between IC and performance metrics like profitability and Return on Assets (Anik et al. 2021; Suardi and Chandra 2014; Muhammad and Ismail 2009; Amalia and Safira 2021). This line of research has also broadened to include the interaction between IC and operational strategies, highlighting various factors that contribute to efficiency outcomes. For example, in Taiwan, efficiency is influenced by both operational improvements and strategic benefits of bank mergers, especially when the merging institutions are culturally diverse (Chen and Yeh 2000; Chen 2002; Peng and Wang 2004; Chiou 2009; Yang and Liu 2012). Further extending the discussion to the Indonesian context, financial performance acts as a mediator

between IC and Good Corporate Governance (GCG), supporting the notion that IC positively affects financial health indicators such as return on assets and return on equity (Anik et al. 2021; Suardi and Chandra 2014; Anwar et al. 2019; Amalia and Safira 2021). On a global scale, IC's positive impact on bank performance has been corroborated through studies in India, Malaysia, China, and Pakistan, emphasizing key areas like profitability, resource utilization, and capital employed efficiency (Kamath 2004; Muhammad and Ismail 2009; Xu et al. 2019). Risk factors and the adoption of fintech innovations are other variables that have been found to influence bank efficiency, as evidenced in multi-country Asian studies and research focused on China's fintech landscape (Saha 2018; Lee et al. 2021).

2.4. Income Diversification and Bank Performance

The question of how income diversification affects bank performance is gaining scholarly attention and is deeply rooted in the Structure-Conduct-Performance (SCP) and Efficient-Structure Hypothesis (ESH) theoretical frameworks (Lelissa and Kuhil 2018; Samad 2008). Research findings are diverse and often contingent on geographical and economic contexts. For instance, evidence from Kenya (Kiweu et al. 2012), Pakistan (Shahzad et al. 2016), and India (Vidyarthi 2019) suggests a positive correlation between diversification and bank profitability, whereas conflicting results emerge from other African nations, Vietnam, and Indonesia (Marshall and Elzinga-Marshall 2017; Ho 2020; Nguyen et al. 2021; Wulandari et al. 2021). Moderating factors such as bank size, business models, and economic development levels further complicate the landscape; larger banks generally diversify more effectively, while smaller ones face increased revenue volatility (Marshall and Elzinga-Marshall 2017). Banks in emerging economies are often slower to transition toward non-interest income (Ho 2020). Concurrently, there's a consensus on the importance of understanding the conditions that lead to successful diversification, including risk management and tailored strategies for different banking models (Nguyen et al. 2019; Wulandari et al. 2021). The academic discourse is also expanding to consider the effects of unconventional banking activities, particularly in under-studied markets like Africa, where views on the impact of non-interest income on profitability are divergent (Malik et al. 2013; Tariq et al. 2021; Najam et al. 2022). Given these multifaceted insights and the ongoing trend towards diversification, further research is imperative for a nuanced, context-specific understanding.

3. Hypotheses Development

Given the focus of this study on the drivers of bank performance, the following hypotheses are proposed:

- $\mathbf{H}_1$: There is no significant relationship between bank profitability, measured by ROA, ROE, PM, and NIM, and Profit Efficiency (PE) as calculated through the Malmquist index.
- $\mathbf{H}_2$: There is no significant relationship between bank profitability, measured by ROA, ROE, PM, and NIM, and Resource Efficiency (RE) as calculated through the Malmquist index.
- $\mathbf{H}_3$: There is no significant relationship between bank profitability, measured by ROA, ROE, PM, and NIM, and Technical Efficiency (TE) as calculated through the Malmquist index.
- $\mathbf{H}_4$: There is no significant relationship between bank profitability, measured by ROA, ROE, PM, and NIM, and Modified Value Added Intellectual Capital (MVAIC).
- $\mathbf{H}_5$: There is no significant relationship between bank profitability, measured by ROA, ROE, PM, and NIM, and Income Diversity (ID).
- $\mathbf{H}_6$: There is no significant relationship between bank profitability, measured by ROA, ROE, PM, and NIM, and Loan Growth (LG).

As noted, this study aims to explore the key drivers of bank performance, focusing on four measures of profitability (ROA, ROE, PM and NIM). and three efficiency measures (PE, RE, and TE) Modified Value Added Intellectual Capital (MVAIC), Income Diversity (ID), and Loan Growth (LG) are also hypotheses tested. The inclusion of MVAIC, ID, and LG adds an innovative layer to the study, allowing for a more comprehensive understanding of the factors that contribute to a bank's financial health.

4. Data and Methodology

4.1. Data and Study Period

This study will leverage data from the BankFocus database, focusing on commercial banks from five distinct countries: Hong Kong SAR, Korea, Malaysia, the United Arab Emirates, and Vietnam. The data spans from 2010 to 2022 and includes domestic and foreign banking institutions. As Table 1 indicates, Panel A presented a dataset with 1,470

observations from 105 banks. However, the dataset had to be refined due to the unavailability of annual reports and essential data for some of these institutions.

Panel B in Table 1 shows the pruned sample, which consists of 477 observations from 71 banks, representing a 32.4% reduction in observations and a 32.4% reduction in the number of banks. The composition of this refined dataset is as follows: 7 banks from Hong Kong SAR, 20 from Korea, 5 from Malaysia, 13 from the United Arab Emirates, and 26 from Vietnam. These banks collectively represent a broad spectrum of the banking sectors in these countries, both in terms of market share and geographical coverage.

While data cleaning and the exclusion of banks with incomplete data were necessary steps to ensure the robustness of the study, it's important to note that the pruned sample still provides a comprehensive overview of the banking landscape across these five countries. The study aims to maintain the integrity of a balanced panel data set, which is crucial for accurate efficiency score computation.

Table 1: Data

	Hong Kong SAR	Korea, Rep.	Malaysia	United Arab Emir	Vietnam	Total
Panel A						
Obs	196	280	168	308	518	1470
Banks	14	20	12	22	37	105
Pct	13%	19%	11%	21%	35%	100%
Panel B						
Obs	58	109	29	94	98	477
Banks	7	20	5	13	26	71
Pct	7%	19%	5%	12%	25%	100%

Source: BankFocus.

Table 9 in Appendix A summarizes the 71 commercial banks across five Asian economies that comprise the sample for this study's panel data analysis. The diverse mix of countries and institutions enables a rich investigation of drivers of bank profitability.

4.2. Econometric Model

4.2.1. Dependent Variables

In this study, the dependent variables capturing bank performance encompass multiple profitability metrics - Return on Assets (ROA), Return on Equity (ROE), Profit Margin (PM), and Net Interest Margin (NIM). Prior academic research has predominantly relied on ROA, ROE and NIM to gauge bank profitability (Liu and Wilson 2010; Seenaiah et al. 2015; Ghosh et al. 2019). However, each metric provides unique insights. ROA measures how efficiently a bank utilizes its assets to generate profits, while ROE indicates profit generation relative to shareholder equity. PM demonstrates net income per dollar of revenue, and NIM specifically examines returns from core lending operations. This study analyzes all four profitability indicators as dependent variables to enable a multidimensional assessment, offering a more comprehensive evaluation of bank performance than existing literature. Multiple metrics are expected to provide richer, more nuanced insights into the determinants influencing bank returns across diverse dimensions. Table **??** summarizes the study's variables, including performance metrics, key determinants, control variables, data sources, and hypothesized effect on bank profitability.

4.3. Independent Variables

4.3.1. Measurements of Efficiency

To scrutinize the performance of banks, this study employs Data Envelopment Analysis (DEA), a non-parametric approach acclaimed for its minimal assumptions and methodological simplicity. Within the DEA framework, the Malmquist Productivity Index (MPI) serves as a vital instrument for gauging temporal shifts in efficiency. MPI disentangles efficiency change into two constituents: alterations in the best-practice frontier termed technical change, and changes in the distance of a Decision Making Unit (DMU) from this frontier, termed efficiency change.

In essence, the MPI represents a compound metric synthesized from the Technical Change Index (TCI) and the Efficiency Change Index (ECI). While the TCI captures shifts in the optimum output-to-input ratio, the ECI assesses the movement in a DMU's individual output-to-input ratio. This bifurcation allows for a nuanced understanding of efficiency dynamics, attributing them to technological innovation or operational adjustments.

This research employs an input-oriented model within DEA, a fitting selection given that banks usually have greater control over their inputs rather than their outputs. The study aligns with the intermediation perspective, conceiving banks as entities that mobilize deposits into loans through labour and other resources. Noteworthy input variables encompass interest, operating, and fee and commission expenses. On the flip side, the output variables incorporate

interest and fee-commission income. All computational analyses, including DEA and MPI, were executed using Stata, version 18. Table 2 reviews the efficiency indices' inputs and outputs.

Table 2: Overview of Efficiency Inputs and Outputs

MPI Index	Inputs	Outputs
Technical Efficiency	Total Operating Expenses Total Interest Expenses Staff Expenses	Total Interest Income Fee & Commission Income
Resource Efficiency	Total Operating Expenses Number of Branches Number of Employees	Consumer Loans Customer Deposits Other Operating Income
Profit Efficiency	Total Interest Expenses Fee & Commission Expenses Total Operating Expenses Provisions	Total Interest Income Fee & Commission Income

Within the MPI framework, the DMUs, in this case, banks, are selected to establish an optimal benchmark for performance. This is achieved through the evaluation of input-output combinations across the sampled DMUs. The ultimate aim is to quantify the performance gap between individual banks and this optimal benchmark. The output distance function, denoted as D_0^t, is formulated in alignment with the models proposed by Shephard (1970) and Caves et al. (1982).

$$D_0^t(X_t, Y_t) = \min\{\theta : (X_t, Y_t/\theta) \in \mathscr{T}^t\} \tag{Eq. 1}$$

where

$\mathscr{T}^t$ symbolizes the production technology depicted as $\mathscr{T}^t = \{X_t, Y_t\}$,
X_t represents the input vector at time t,
Y_t stands for the output vector at time t.

Note that $D_0^t \leq 1$ signifies that the pair (X_t, Y_t) is a part of the production technology $\mathscr{T}^t$ and resides on the frontier of optimal practice when $D_0^t = 1$.

$$M_0(X_{t+1}, Y_{t+1}, X_t, Y_t) = \sqrt{\frac{D_0^t(X_{t+1}, Y_{t+1})}{D_0^t(X_t, Y_t)} \times \frac{D_0^{t+1}(X_{t+1}, Y_{t+1})}{D_0^{t+1}(X_t, Y_t)}} \tag{Eq. 2}$$

An M_0 value above 1 indicates an improvement in efficiency between time t and $t+1$, while a value below 1 indicates a decline.

$$M_0(X_{t+1}, Y_{t+1}, X_t, Y_t) = \frac{D_0^{t+1}(X_{t+1}, Y_{t+1})}{D_0^t(X_t, Y_t)} \times \sqrt{\frac{D_0^t(X_{t+1}, Y_{t+1})}{D_0^{t+1}(X_{t+1}, Y_{t+1})} \times \frac{D_0^t(X_t, Y_t)}{D_0^{t+1}(X_t, Y_t)}} \tag{Eq. 3}$$

Equation 3 clarifies that the Malmquist index is decomposed into two main components: "technical variation" and "efficiency variation." The term within the square root on the right-hand side of Equation 3 captures shifts in the optimal frontier at the input level across periods t and $t+1$. This geometric mean reflects the "technical variation" between the two periods. Conversely, the initial ratio outside the square root in Equation 3 signifies "efficiency variation," depicting changes in technical efficiency from time t to $t+1$. This latter metric reveals whether a DMU is moving closer to or farther from the existing frontier, thereby encapsulating the efficiency catch-up effect. A value greater than 1 implies a narrowing efficiency gap relative to the prevailing best practice.

4.3.2. Measurement of intellectual capital

This study follows Tran et al. (2020); Soetanto and Liem (2019) in using the Modified Value Added Intellectual Capital model as an Intellectual Capital proxy. MVAIC is calculated as the sum of HCE, SCE, CEE, and RCE as per Eq.4.

$$MVAIC_i = HCE_i + SCE_i + CEE_i + RCE_i \tag{Eq. 4}$$

The four components of MVAIC are estimated as follows:

$$HCE_{it} = \mathrm{VA}_{it}/\mathrm{HC}_{it} \tag{Eq. 5}$$

$$SCE_{it} = \mathrm{SC}_{it} - \mathrm{VA}_{it} \tag{Eq. 6}$$

$$CEE_{it} = \mathrm{VA}_{it}/\mathrm{CE}_{it} \quad (Eq.\ 7)$$

$$RCE_{it} = \mathrm{RC}_{it}/\mathrm{VA}_{it} \quad (Eq.\ 8)$$

where

HCE	is human capital proxied by funds spent compensating employees
SCE	is structural capital efficiency and is the result of VA less HCE
CEE	is capital employed proxied by the net of total assets less total liabilities
RCE	is relational capital, proxied by spending to sustain relations with customers, suppliers, shareholders, and government
VA	is Value Added (VA) is the difference between output and inputs
i and t	denote bank and year, respectively

Higher HCE, SCE, CEE, and RCE values indicate greater IC value creation.

$$VA_{it} = \mathrm{Output}_{it} - \mathrm{Input}_{it} \quad (Eq.\ 9)$$

where

Output	denote total bank revenue made up of interest and non-interest income, including fees and commissions
Input	is calculated as operation costs, including interest, administration, and other expenses, excluding personnel costs

4.4. System Generalized Method of Moments Regression

To assess which variables drive bank performance, we employ a two-step system GMM approach for its superior statistical consistency and ability to address endogeneity (Arellano and Bover 1995; Blundell and Bond 1998; Windmeijer 2005). The method uses a firm's historical data as internal instruments and incorporates lagged dependent variables to capture dynamic relationships. This approach is consistent with established research in the field (Wintoki et al. 2012).

$$\begin{aligned}\pi_{i,t} = {} & \beta_1 \mathrm{Eff}_{i,t}(\mathrm{PE}_{i,t}, \mathrm{RE}_{i,t}, \mathrm{TE}_{i,t}) + \beta_2 \mathrm{MVAIC}_{i,t} \\ & + \beta_3 \mathrm{IncDiv}_{i,t} + \beta_4 \mathrm{LGrwth}_{i,t} + \beta_5 \mathrm{Size}_{i,t} + \beta_6 \mathrm{Tax}_{i,t} \\ & + \sum \mathrm{Asset\ Quality}_{i,t} + \sum \mathrm{Country\ Specific}_{i,t} + \sum \mathrm{D}_{i,t} + \varepsilon_{i,t}\end{aligned} \quad (Eq.\ 10)$$

where

π	denote four performance indicators (ROE / ROE / PM / NIM)
MVAIC	denotes intellectual capital
Eff	denotes three efficiency measures (Profit / Resource / Technical)
IncDiv	denotes income diversity
LGrwth	denote loan growth
Size	denotes bank size
Tax	denotes the the effective tax rate
Asset Quality	denotes the asset quality control variables (to be outlined below)
Country Specific	denotes the country-specific control variables (to be outlined below)
D	denotes the dummy and categorical variables

To construct a comprehensive framework for assessing bank performance drivers, we amalgamate various metrics spanning intellectual capital, income diversity, and efficiency measures. Specifically, loan growth *(LGrowth)* is included due to its dual nature: it positively correlates with short-term valuations but can undermine solvency and loan quality over time (Clair et al. 1992; Dang 2019; Niu 2016). Bank size *(Size)* is incorporated to account for the observed variances in profit efficiency and loan quality between smaller and larger institutions (Chukwuogor-Ndu and Wetmore 2006; Yahaya et al. 2022; Sarnolyk 1994). Effective tax rates *(Tax)* are also included to capture the non-linear effects on pre-tax profit efficiency (Gallemore et al. 2017; Gaganis and Varotsis 2013). For an evaluation of Asset Quality, Loan Loss Reserves *(LLR)* and Tier 1 capital ratio *(T1CAPR)* are integrated into the model, given their influence on profitability and regulatory compliance. To control for the unique characteristics of each operating environment, we add several country-specific and time-sensitive variables. Further information on the study variable can be found in Table 3.

Table 3: Study variable descriptive, expected effect, and data source

Category	Notation	Description	Source	Expected Effect	Reference
Dependent Variable					
Performance Metrics	ROA	Return on Average Assets	BankFocus		Liu and Wilson (2010)
	ROE	Return on Average Equity	BankFocus		Liu and Wilson (2010)
	PM	Profit Margin	Author's Calculation		Liu and Wilson (2010)
	NIM	Net Interest Margin	BankFocus		Liu and Wilson (2010)
Determinants					
Efficiency Measures	PE	Profit Efficiency: Malmquist index	Author's Calculation	+	Author
	RE	Resource Efficiency: Malmquist index	Author's Calculation	+	Author
	TE	Technical Efficiency: Malmquist index	Author's Calculation	+	Author
Operations	MVAIC	Modified Value Added Intellectual Capital	Author's Calculation	+	Soetanto and Liem (2019)
	IncDiv	Income Diversity	Author's Calculation	+	Nguyen (2018)
	LGrwth	Loan Growth	ADB	+	Dang (2019)
	Size	Natural log of total assets	Author's Calculation	+/-	Shrieves and Dahl (1992)
	Tax	Effective Tax Rate	BankFocus	-	Fagbemi et al. (2019)
Control Variables					
Asset Quality	LLR	Loan Loss Reserves	BankFocus	-	Kanagaretnam et al. (2003)
	T1CAPR	Tier 1 capital to Risk weighted assets	BankFocus	+	Acharya et al. (2014)
Country - Specific	UEC	Unemployment (%)	ADB	-	Author
	CPI	Consumer Price Index (%)	ADB	-	Author
	GDS	Gross Domestic Savings (%)	GDS	+	Thornton (2009)
	PC	Population Change	ADB	+/-	Author
	GDPG	GDP Growth	ADB	+	Thornton (2009)
Dummy /Categorical	MSCI_class	Categorical - Developed, Emerging, Frontier	MSCI		
	Specialization	Categorical - Commercial, Savings, Islamic	BankFocus		Author
	Year	Dummy variable	Author's creation		Author

Note: Macroeconomic data including population changes and gross domestic savings, were obtained from the Asian Development Bank (ADB). GDP growth rates and inflation statistics were sourced from the International Monetary Fund (IMF). The variable of bank size was operationalized as the natural logarithm of total assets. Capitalization was quantified as the natural logarithm of total equity. Income Diversification follows Nguyen (2018); Abbas et al. (2021) as is calculated as 1-(net income-operating income)/operating income. .

4.5. Descriptive Statistics

Table 4 provides descriptive statistics for a range of variables related to bank performance, including measures of profitability, efficiency, and other operational indicators. Each variable is summarized using four key statistics: Mean, Median, Standard Deviation (Std. Dev), and Coefficient of Variation (C.V.). The table serves as a quick reference for understanding the central tendencies and variability of each variable in the dataset.

Analysis of the descriptive statistics table reveals striking variability in certain performance metrics, alongside unusual central tendencies for select variables. Most prominently, NIM displays pronounced volatility as shown by its high standard deviation of 3524.7 and an exceptionally large Coefficient of Variation of 47.1, indicating NIM likely requires closer inspection due to its sharp fluctuations. Meanwhile, the profitability metric ROA also exhibits notable variability with a standard deviation of 55.6, suggesting potential volatility in returns. In contrast, the asset Size variable has very low variability with a standard deviation of just 1.4, denoting relative consistency in this measure across the dataset. Uniquely, ID shows a negative mean value of -2.5, an unconventional central tendency that merits further investigation into this metric.

Table 4: Descriptive Statistics

Variable	Mean	Median	Std. Dev	C.V.
ROA	5.6	0.8	55.6	9.9
ROE	4.6	0.9	15.9	3.5
PM	4.1	0.6	15.4	3.7
NIM	74.9	35.6	3524.7	47.1
PE	1.9	1.1	2.6	1.3
RE	3.5	1.0	7.8	2.2
TE	2.0	0.9	3.8	2.0
MVAIC	12.0	4.8	69.9	5.8
ID	-2.5	1.2	15.1	-6.1
LG	1.5	0.0	8.9	5.8
Size	33.2	33.3	1.4	0.0
ET	-4.5	0.2	40.8	-9.0
LLR	6E+14	3E+14	2E+15	2E+00
T1CAPR	2E+14	1E+03	1E+15	6E+00

Note:

Table 8 offers look into the dynamics of profit, resource, and technical efficiency scores over a period spanning from 2010 to 2022. The table reveals a wide range of efficiency scores across years, indicating considerable fluctuations. For instance, profit efficiency varies dramatically, ranging from a low of 0.490 in 2021–2022 to a high of 8.469 in 2013–2014. Similarly, resource efficiency shows a peak of 9.145 in 2012–2013, contrasting with a low of 1.089 in

2010–2011. Technical efficiency also demonstrates variability, with scores ranging from 0.524 in 2015–2016 to 4.985 in 2018–2019. The aggregate scores suggest an average profit efficiency of 1.927, resource efficiency of 3.527, and technical efficiency of 1.955 across the entire period. These scores, at first glance, suggest efficiency is not strictly improving but subject to periodic volatility. The temporal patterns beg for further investigation into the influence of efficiency on bank performance.

4.6. Correction Matrix

Table 5 provides an analytical overview of the relationships between various financial and operational variables and serves as a tool for understanding the relationships between various financial and operational variables. Each cell in the table shows the correlation coefficient between two variables, along with the p-value in parentheses.

Analysis of the correlation matrix reveals several notable relationships between the variables. Most prominently, Profit Margin (PM) demonstrates a robust positive correlation with Return on Average Equity (ROE) at 0.48, implying a tendency for these two profitability metrics to move in tandem, highlighting their interdependence in driving financial performance. In contrast, a strong negative correlation emerges between bank Size and ROA at -0.25, suggesting that as asset size increases, ROA decreases, a potential red flag for larger institutions. Finally, Technical Efficiency (TE) correlates positively with Profit Efficiency (PE) at 0.31, indicating that gains in technical efficiency are associated with improved profit efficiency. This underscores the value of operational effectiveness in boosting financial returns. Together, these correlations provide valuable insights into the connections between efficiency, size, and profitability drivers in shaping overall bank performance.

Table 5: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) ROA	1.00													
(2) ROE	0.11*	1.00												
	(0.02)													
(3) PM	0.10*	0.48***	1.00											
	(0.02)	(0.00)												
(4) NIM	0.01	0.01	-0.02	1.00										
	(0.90)	(0.77)	(0.71)											
(5) PE	-0.04	-0.01	-0.03	-0.07	1.00									
	(0.45)	(0.83)	(0.61)	(0.23)										
(6) RE	-0.04	-0.08	-0.02	0.03	0.12*	1.00								
	(0.49)	(0.15)	(0.69)	(0.63)	(0.03)									
(7) TE	0.02	0.02	0.01	-0.11	0.31***	0.24***	1.00							
	(0.74)	(0.70)	(0.82)	(0.06)	(0.00)	(0.00)								
(8) MVAIC	0.02	0.04	-0.06	0.06	-0.04	-0.18**	-0.03	1.00						
	(0.69)	(0.37)	(0.19)	(0.18)	(0.47)	(0.00)	(0.63)							
(9) IncDiv	-0.08	-0.38***	-0.36***	-0.04	0.04	0.03	-0.04	0.04	1.00					
	(0.07)	(0.00)	(0.00)	(0.39)	(0.47)	(0.63)	(0.49)	(0.40)						
(10) LGrwth	-0.01	-0.03	-0.03	-0.02	-0.04	-0.05	-0.04	0.05	0.03	1.00				
	(0.78)	(0.55)	(0.61)	(0.66)	(0.52)	(0.37)	(0.52)	(0.37)	(0.62)					
(11) Size	-0.25***	-0.05	0.00	-0.02	0.06	-0.01	0.08	-0.04	-0.01	0.04	1.00			
	(0.00)	(0.26)	(0.92)	(0.66)	(0.28)	(0.91)	(0.19)	(0.42)	(0.77)	(0.38)				
(12) Tax	-0.02	-0.11*	-0.10*	-0.07	0.04	0.03	0.03	0.01	0.14**	0.01	-0.01	1.00		
	(0.69)	(0.01)	(0.03)	(0.13)	(0.51)	(0.61)	(0.65)	(0.90)	(0.00)	(0.83)	(0.80)			
(13) LLR	0.00	0.01	0.07	0.01	-0.00	-0.02	-0.04	0.08	0.03	-0.02	0.02	-0.04	1.00	
	(0.92)	(0.83)	(0.11)	(0.88)	(0.95)	(0.68)	(0.52)	(0.09)	(0.54)	(0.66)	(0.64)	(0.40)		
(14) T1CAPR	0.21***	0.20***	0.26***	-0.01	-0.02	-0.04	-0.05	-0.07	-0.20***	0.15*	-0.02	-0.05	-0.04	1.00
	(0.00)	(0.00)	(0.00)	(0.88)	(0.72)	(0.54)	(0.46)	(0.23)	(0.00)	(0.01)	(0.74)	(0.35)	(0.49)	

Note: Coefficients are displayed in the top line with significance denoted as follows:
$*\rho < 0.10, **\rho < 0.05, ***\rho < 0.01$.t-statistics are presented below the coefficients. Data from 2010 - 2022

5. Results and Analysis

5.1. Malmquist Efficiency and Performance

Table 6 presents the results of an SGMM regression analysis focused on understanding the drivers of bank performance. The dependent variables include ROA, ROE, PM, and NIM. Various independent variables such as efficiency measures, operational metrics, and macroeconomic indicators are included.

The negative impact of Profit Efficiency on PM could be attributed to initial cost-cutting measures aimed at enhancing profit efficiency, which may inadvertently reduce margins. Similarly, the negative relationship between RE and both ROA and ROE could arise from a focus on resource conservation, potentially leading to underinvestment in profitable ventures. Conversely, Technical Efficiency shows a positive relationship with ROA and ROE, suggesting that improvements in Technical Efficiency likely contribute to better asset utilization and equity management, thereby boosting returns. These observations underscore the complex and nuanced interplay between different types of efficiency and key profitability metrics.

It is noteworthy that an increase in Intellectual Capital is positively correlated with key performance indicators such as ROA, ROE and PM. Additionally, the Effective Tax Rate exhibits an inverse relationship with all performance measures, with the exception of PM. Furthermore, both Loan Growth and Income Diversity consistently demonstrate an inverse relationship with all performance metrics under consideration.

In light of the empirical results, several hypotheses warrant discussion. The first hypothesis, $\mathbf{H}_1$, posited that there would be no significant relationship between Profit Efficiency (PE) and the profitability measures ROA, ROE, PM, and NIM. The data partially refute this claim, revealing that PE has a negative relationship with PM but a positive relationship with NIM. The second hypothesis, $\mathbf{H}_2$, suggested that Resource Efficiency (RE) would not significantly impact ROA, ROE, PM, and NIM. Contrary to this hypothesis, the empirical findings indicate that RE is negatively correlated with ROA and ROE, but positively correlated with NIM. Lastly, the third hypothesis, $\mathbf{H}_3$, asserted that there would be no significant relationship between Technical Efficiency (TE) and ROA, ROE, PM, and NIM. The results largely contradict this, showing that TE is positively correlated with ROA and PM but negatively correlated with NIM. Collectively, these findings suggest that the impact of efficiency measures on profitability is not uniform and varies depending on the specific metric considered. The relationships become even more complex when considering lagged variables, underscoring the importance of temporal dynamics in understanding the impact of efficiency measures on financial performance.

5.2. Intellectual Capital and Performance

The empirical results reveal a positive link between intellectual capital and performance metrics like ROA, ROE, and NIM, supporting $\mathbf{H}_4$. This finding is consistent with existing literature, which posits that companies with abundant intellectual capital tend to have increased efficiency and productivity, subsequently boosting ROA and ROE (Xu and Liu 2021). Interestingly, a contrasting trend emerges with PM, which shows a negative relationship with intellectual capital. A potential reason might be a company's inclination to channel significant resources into research and development. While such investments are vital for long-term sustainability and expansion, they might temporarily depress Profit Margins (Sthle et al. 2015).

5.3. Income Diversity and Performance

Contrary to the expectations set forth by $\mathbf{H}_5$, the empirical results indicate a contractionary effect of income diversity on all performance metrics, consistent with prior research (Hsieh et al. 2023; Moldasheva 2015). This contributes to the growing body of evidence challenging the traditional beliefs about the advantages of income diversification. A plausible explanation for this unexpected outcome might be the dispersion of organizational attention and the stretched allocation of resources. Allocating resources across various income streams might lead to reduced efficiency and profitability, especially in situations where managing diverse income streams adds operational complexities and increases costs.

5.4. Loan Growth and Performance

Our empirical findings on loan growth reveal an unexpected negative relationship with key performance indicators, thereby failing to support $\mathbf{H}_5$. This outcome is consistent with Fahlenbrach et al. (2018), who connect this to the biased expectations hypothesis. Under this hypothesis, both investors and analysts tend to overestimate the future performance of banks with high loan growth, leading to overly optimistic projections about their profitability and expansion. Building on this, we argue that rapid loan growth might suggest a bank's inclination to accept higher-risk loans to enlarge its portfolio. Such an approach could increase default rates, negatively affecting the bank's overall performance. Additionally, swift loan growth, especially in long-term loans with fixed rates, can make a bank vulnerable to interest rate risks, particularly if rates were to ascend in the future.

Table 6: SGMM Regression

	(1) ROA	(2) ROE	(3) ProfitMargin	(4) NIM
Efficiency Index				
Profit_efficiency	-0.0492	-0.0979	-0.882***	60.89**
	(-0.50)	(-0.70)	(-16.36)	(2.80)
Resource_efficiency	-0.161***	-0.463***	-0.105*	16.04***
	(-5.42)	(-8.04)	(-2.17)	(3.88)
Technical_efficiency	0.467***	0.173	0.254*	-32.83**
	(3.94)	(1.56)	(2.24)	(-2.63)
Operations				
MVAIC	0.121***	0.0881***	-0.0330***	20.40***
	(13.83)	(9.25)	(-4.25)	(10.77)
Income_Diversity	-1.695***	-1.960***	-0.399**	-152.1***
	(-10.06)	(-18.64)	(-2.81)	(-5.26)
Loan_Growth	-0.577***	-1.034***	-1.688***	-132.1***
	(-4.88)	(-19.54)	(-10.94)	(-4.37)
Size	-9.753***	-2.539**	5.180***	-632.9***
	(-13.66)	(-3.07)	(11.37)	(-5.66)
Effective_tax_Rate	-2.158***	-1.578***	-2.673***	89.24***
	(-6.64)	(-7.25)	(-13.84)	(6.66)
Asset Quality Variables	incl.	incl.	incl.	incl.
Country-Specific Variables	incl.	incl.	incl.	incl.
Dummy_Categorical_Variables	incl.	incl.	incl.	incl.
_cons	323.7***	80.05**	-170.6***	21179.4***
	(14.18)	(2.74)	(-12.06)	(5.40)
AR1	-2.121***	-2.276***	-1.435	-1.493
AR2	-0.000621	0.215	0.888	-1.540
Sargan	45.05	42.72	15.15	8.157
Hansen	21.36	26.56	24.21	22.56
Wald Chi2	1245991.9***	199424131.4***	424722582.7***	1.86385e+09***

Note: Coefficients are displayed in the top line with significance denoted as follows:

$*\rho < 0.10, **\rho < 0.05, ***\rho < 0.01$.t-statistics are presented below the coefficients. Data from 2010 - 2022

5.5. Robustness Results

Our initial analysis illuminated the complex interplay of factors influencing financial performance. To further substantiate these insights, we incorporated lagged measures, recognizing their three-fold benefits: addressing endogeneity concerns, capturing the delayed impact of current strategies on future outcomes, and enhancing the model's robustness by accounting for firms' adaptive behaviours in the face of economic shifts. This lagged approach is particularly pertinent in finance, given the often deferred consequences of strategic choices.

Upon reassessing with the one-period lagged variables for the DEA efficiency metrics, as presented in Table 7, distinct variations emerged compared to our preliminary results. For instance, lagged profit efficiency displayed a positive association with ROA, ROE, and profit margin but negatively impacted the net interest margin. Conversely, lagged resource efficiency had a diminishing effect on ROA but bolstered other metrics. Technical efficiency, when lagged, showed a consistent enhancement for ROA and ROE but pivoted to a negative correlation for profit margin. These divergences, particularly in coefficient magnitudes, emphasize the intricate relationship between efficiency and performance, suggesting our initial model might have faced simultaneity bias. By contrast, the lagged approach, accounting for reverse causality, offers a more refined perspective on how efficiency influences bank profitability over extended periods.

Further, the lagged model revealed nuanced effects of various drivers on bank performance. MVAIC, for example, exhibited a negative correlation with both ROA and ROE but positively influenced Profit Margin. Income diversity, while retaining its adverse relationship with ROA, displayed positive correlations with ROE and Profit Margin. Loan growth's correlation flipped to positive across all performance metrics in the lagged analysis, and while the bank's size and effective tax rate largely aligned with our initial findings, some variations in magnitudes were noticeable.

In conclusion, the findings from our lagged approach underscore the dynamic nature of determinants influencing bank performance. It accentuates the importance of time lags and potential endogeneity in understanding the multifaceted impacts of strategic decisions. While our direct associations offer insights into immediate effects, the lagged outcomes delve deeper into the extended ramifications.

Table 7: Data

	(1) L.ROA	(2) L.ROE	(3) L.ProfitMargin	(4) L.NIM
Efficiency Index				
Profit_efficiency	0.760	-0.313***	2.119***	-82.33***
	(1.88)	(-4.74)	(35.51)	(-7.51)
Resource_efficiency	-2.507***	0.186***	0.0659***	-22.71***
	(-12.28)	(20.53)	(4.37)	(-7.40)
Technical_efficiency	2.899***	1.934***	-1.295***	-34.29***
	(13.23)	(16.51)	(-18.02)	(-3.55)
Operations				
MVAIC	-0.176***	-0.0576***	0.0542***	4.780**
	(-3.42)	(-12.40)	(14.52)	(3.04)
Income_Diversity	-3.641***	0.916***	-1.609***	-61.40***
	(-6.95)	(11.04)	(-32.69)	(-5.07)
Loan_Growth	1.855***	1.789***	0.843***	129.6***
	(3.66)	(11.22)	(14.90)	(8.61)
Size	-9.585***	-2.236***	-2.937***	487.8***
	(-9.60)	(-23.22)	(-5.37)	(4.99)
Effective_tax_Rate	8.826***	-0.626***	1.312***	-10.98
	(16.19)	(-9.13)	(17.22)	(-1.10)
Asset Quality Variables	incl.	incl.	incl.	incl.
Country-Specific Variables	incl.	incl.	incl.	incl.
*Dummy_Categorical_Variable*s	incl.	incl.	incl.	incl.
_cons	326.9***	0	98.57***	-14986.7***
	(10.64)	(.)	(4.33)	(-5.53)
AR1	-2.917***	-1.734	-1.510	-2.040***
AR2	0.142	-1.895	1.058	-0.880
Sargan	77.00***	58.24	38.55	6.880
Hansen	22.21	179.4 ***	25.50	18.07
Wald Chi2	11941502.0***	132324355.1***	56696581.3***	289255907.4***

Note: Coefficients are displayed in the top line with significance denoted as follows:

$*\rho < 0.10, **\rho < 0.05, ***\rho < 0.01$.t-statistics are presented below the coefficients. Data from 2010 - 2022

The findings from the analysis of lagged performance variables present some notable divergences from those obtained using non-lagged variables. Specifically, Profit Efficiency shifts from a positive association with both PM and NIM in the non-lagged model to a more complex relationship when lagged variables are considered. Resource Efficiency, which was negatively correlated with ROA, ROE, and PM but positively associated with NIM in the non-lagged analysis, exhibits a more nuanced set of relationships in the lagged model. Similarly, Technical Efficiency moves from a positive correlation with ROA and PM and a negative relationship with NIM in the non-lagged model to a different pattern in the lagged analysis. These variations underscore the importance of considering temporal dynamics when evaluating the impact of efficiency measures on financial performance.

6. Conclusion and Implications

The MPI is a composite measure of efficiency change that decomposes the change in efficiency into two components: technical change and efficiency change. The technical change pertains to alterations in the best-practice frontier, while efficiency change refers to variations in the DMU's distance from the frontier. Specifically, MPI is computed as the product of the technical change index (TCI) and the efficiency change index (ECI). While TCI gauges the change in the output-to-input ratio of the best-practice frontier, ECI measures the shift in the DMU's output-to-input ratio.
The existing body of research offers limited insights into evaluating the performance of banks across various Asian countries using DEA-Malmquist efficiency tests, intellectual capital, income diversity, and loan growth. By analyzing 71 banks from Hong Kong, South Korea, Malaysia, the UAE, and Vietnam, this study makes several noteworthy contributions to both academic discourse and policy considerations.

Firstly, our research reveals a statistically significant inverse relationship between resource efficiency and key performance indicators for banks. Specifically, when considering inputs such as the number of branches, employee usage, and total operating expenses, we observed a corresponding decline in outputs like consumer loans, customer deposits, and other income streams. Although counterintuitive, this finding is corroborated by a similar inverse relationship between performance measures and income diversity.

This unexpected correlation offers new perspectives on the efficiency and operational strategies of banks in the Asian context. It suggests that traditional metrics of resource allocation may not be as effective in these markets, warranting a reevaluation of conventional wisdom in banking management and policy formulation. The study also raises questions about the long-term sustainability of relying on income diversity as a performance enhancer.

Additionally, our study uncovers a positive correlation between technical efficiency and performance metrics of ROA and ROE. Conversely, we observed a negative relationship with NIM. When these findings are examined in the context of the input metrics—operational expenses, interest expenses, and staff expenses—and output metrics—interest income, fee income, and commission income—the study illuminates several key points. Notably, the positive correlation between ROA and ROE suggests that banks that are technically efficient are also effective in leveraging their assets and equity to generate returns. On the other hand, the negative correlation with NIM indicates that technical efficiency may not necessarily translate into better interest rate spreads for these institutions.

In terms of profit efficiency, our study found no statistically significant correlation between ROA and ROE when examined in real-time. However, a negative impact on ROE was observed when evaluated with lagged variables. The relationship between PM and NIM presented a more complex picture. Specifically, while PM showed a positive correlation when examined in the present context, it exhibited a negative relationship when considered as a lagged variable. Intriguingly, NIM displayed the exact opposite behaviour.

Given that this measure incorporates four inputs and two outputs, these findings offer several illuminating insights. Firstly, the lack of a significant relationship between ROA and ROE suggests that profit efficiency may not be a reliable predictor of these commonly used performance metrics in real-time. Secondly, the contrasting behaviours of PM and NIM, especially when examined as lagged variables, indicate that the temporal dynamics of these metrics have a significant impact on profit efficiency.

Intellectual capital tended to show a positive association with performance measures despite showing a negative association with ROA and ROE when examined against a lagged variable. From this, we can largely deduce that greater intellectual capital can lead to better decision-making, which in turn can improve asset utilization (ROA) and shareholder returns (ROE). Further, Intellectual capital can provide a bank with a competitive edge, such as proprietary technology or specialized knowledge, which can lead to higher profitability and, consequently, higher ROA and ROE.

The empirical analysis reveals a pervasive negative association between income diversification and loan growth with key performance indicators, specifically ROA and ROE, both in contemporaneous and lagged contexts. This counterintuitive finding may be attributed to several underlying factors. Firstly, income diversification could introduce multifaceted market risks that the institution may not be adequately equipped to manage, thereby exerting downward pressure on performance metrics. Secondly, an aggressive expansion in loan portfolios may elevate the risk profile of the bank, increasing the likelihood of loan defaults and consequently adversely affecting ROA and ROE. Lastly, the negative correlation could also be indicative of a strategic misalignment within the institution, suggesting that the bank may lack the requisite focus or expertise to effectively manage a diversified income stream or rapid loan growth.

6.1. Practical Implications

The comprehensive analysis of banks across various Asian countries offers invaluable insights that have immediate practical implications for both banking executives and policymakers. The study's findings, which challenge conventional wisdom on resource efficiency and performance metrics, suggest that banks should reevaluate their operational strategies, particularly in the context of branch optimization and cost structures. The contrasting behaviours of key performance indicators like ROA, ROE, and NIM over time underscore the need for more dynamic, real-time monitoring systems and a rethinking of interest rate strategies. Furthermore, the study highlights the importance of intellectual capital as a competitive advantage, urging investment in human capital and technology. However, the negative correlations observed with income diversification and loan growth call for a more cautious approach, necessitating thorough risk assessments and a focus on strategic alignment to ensure that any diversification or growth initiatives are in line with the bank's core competencies and overall strategy.

6.2. Theoretical Implications

This study, analyzing bank performance through the RBV and Efficiency Theory, reveals a complex, non-linear relationship between a firm's internal resources and financial performance, challenging the consistent applicability of RBV in the banking sector. It simultaneously supports Efficiency Theory, evidenced by the positive correlation between technical efficiency and key performance indicators like ROA and ROE, emphasizing the importance of operational effectiveness in enhancing asset utilization and shareholder value. Yet, the narrative is nuanced by the negative impact of profit efficiency on certain financial metrics, hinting at a misalignment between market structures and equity leverage. Moreover, the unexpected negative correlation of income diversity and loan growth with profitability contradicts both RBV and Efficiency Theory, indicating that diversification and expansion do not always yield positive financial outcomes. These findings underscore gaps between theoretical frameworks and practical banking applications, advocating for a deeper understanding of how banks can leverage internal capabilities and optimize operational efficiency in diverse Asian contexts.

6.3. Limitations and Direction for Future Research

Notwithstanding its contributions, this study on Asian bank performance, covering 71 banks from 2010-2022, has limitations that offer avenues for future research. Its focus on commercial banks and quantitative data limits the scope and depth of findings. Key areas unexplored include broader financial sectors, qualitative insights, and political, social, and technological influences. Future research should expand the sample size and timeframe, incorporate qualitative data, and explore a wider range of variables. Comparative studies across various financial institutions, assessing the impact of fintech and sustainability initiatives, particularly in emerging markets, would enrich our understanding of global banking dynamics.

Appendix A

Table 8: Efficiency Scores by Year and Efficiency Measure

Efficiency Measure	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022
Profit	1.025	2.283	0.610	8.469	1.072	0.570	3.039	0.749	5.222	0.842	2.281	0.490
Resource	1.089	1.428	9.145	3.026	4.185	1.680	6.735	3.984	3.132	5.597	3.134	1.496
Technical	2.223	1.252	1.045	2.914	2.982	0.524	4.086	0.706	4.985	0.756	0.768	0.920

Table 9: Data

Hong Kong SAR, China	Korea, Rep.	Malaysia	United Arab Emirates	Vietnam
FUBON BANK (HK)	NONGHYUP BANK	MALAYA BANK BERHAD	UTD ARAB BANK PJSC	MILITARY COMM JS BANK
SHANGHAI COMM BANK	DAEGU BANK	AFFIN BANK BERHAD	SHARJAH ISLAMIC BANK	BAO VIET COMM JS BANK
CHINA CONST BANK (ASIA)	WOORI BANK	BANK SIMPANAN NASIONAL	ABU DHABI COMM BANK	NAM-A COMM JS BANK
CHIYU BANKING CORP	PUREUN MUT SAV BANK	UTD OVERSEAS BANK (MY)	STD CHARTERED BANK (UAE)	VIETINBANK
CMB WING LUNG BANK	DEBEC MUT SAV BANK	HSBC BANK (MY)	ABU DHABI ISLAMIC BANK	WOORI BANK VIETNAM
OCBC WING HANG BANK	JEJU BANK		NAT BANK OF RAS AL-KHAIMAH	SACOMBANK
BOC HONG KONG	CHOEUN SAVING BANK		AL MASRAF BANK	ORIENT COMM JS BANK
	KOOKMIN BANK		BANK OF BARODA (UAE)	ASIA COMM JS BANK
	KYONGNAM BANK		PSC BANK	AN BINH COMM JS BANK
	CITIBANK KOREA		AL KHALIJI FRANCE SA	VN BANK FOR AGRICULTURE
	INDUSTRIAL BANK OF KOREA		COMMERCIAL BANK INTL PSC	INDOVINA BANK
	KEB HANA BANK		NAT BANK OF FUJAIRAH PJSC	SAIGON - HANOI COMM JS BANK
	STD CHARTERED BANK (KR)		ARAB BANK PLC (UAE)	LIEN VIET POST JS COMM BANK
	HYUNDAI SAV BANK CO.			SAIGON JS COMM BANK
	DEUTSCHE BANK (SEOUL)			VN PROSPERITY JS COMM BANK
	KBANK BANK			DONGA COMM JS BANK
	JEONBUK BANK			BIDV BANK
	SHINHAN BANK			STD CHARTERED BANK (VN)
	H K SAVINGS BANK			ANZ BANK (VN)
	BUSAN BANK			PETROLIMEX GROUP (PG) BANK
				VIETCOMBANK
				EXIMBANK
				TIEN PHONG COMM JS BANK
				PUBLIC BANK VIETNAM
				VIETNAM TECHCOMBANK
				VIET CAPITAL COMM JS BANK

Note: Comm = Commercial, CONST = Construction, INTL = International, CORP = Corporation, JS = Joint Stock, KR = Korea, MUT = Mutual, MY = Malaysia, NAT = National, PSC = Public Shareholder Company, SAV = Savings, STD = Standard, UTD = United, VN = Vietnam

References

Abbas, F., Masood, O., Ali, S., Rizwan, S., 2021. How do capital ratios affect bank risk-taking: New evidence from the united states. Sage Open 11, 2158244020979678.

Acharya, V., Engle, R., Pierret, D., 2014. Testing macroprudential stress tests: The risk of regulatory risk weights. Journal of Monetary Economics 65, 36–53.

Alhassan, A.L., Asare, N., 2016. Intellectual capital and bank productivity in emerging markets: evidence from ghana. Management Decision 54, 589–609.

Amalia, P.S., Safira, D.N., 2021. The influence of intellectual capital and sharia compliance on islamic banks financial performance in southeast asia. AKURAT —Jurnal Ilmiah Akuntansi 12, 129–142. URL: http://ejournal.unibba.ac.id/index.php/AKURAT/article/view/1060, doi:10.29313/akurat.v12i3.1060.

Anik, S., Chariri, A., Isgiyarta, J., 2021. The effect of intellectual capital and good corporate governance on financial performance and corporate value: A case study in indonesia. Journal of Asian Finance, Economics and Business 8, 391–402. URL: http://dx.doi.org/10.13106/jafeb.2021.vol8.no4.0391, doi:10.13106/jafeb.2021.vol8.no4.0391.

Anwar, M., Nidar, S.R., Komara, R., Layyinaturrobaniyah, L., 2019. Rural bank efficiency and loans for micro and small businesses: evidence from west java indonesia. International Journal of Emerging Markets .

Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. Journal of econometrics 68, 29–51.

Bedford, D., Sappington, J., 2016. A qualitative and quantitative assessment of the intellectual capital of library and information science professionals, in: ICICKM 2016-Proceeding of the 13th International Conference on Intellectual Capital Knowledge Management & Organisational Learning, Academic Conferences and publishing limited. p. 31.

Berg, S.A., Førsund, F.R., Hjalmarsson, L., Suominen, M., 1993. Banking efficiency in the nordic countries. Journal of Banking & Finance 17, 371–388.

Berg, S.A., Førsund, F.R., Jansen, E.S., 1992. Malmquist indices of productivity growth during the deregulation of norwegian banking, 1980-89. The Scandinavian Journal of Economics , S211–S228.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of econometrics 87, 115–143.

Borio, C.E., Farag, M., Tarashev, N.A., 2020. Post-crisis international financial regulatory reforms: a primer .

Boukhetala, K., Boudriga, A., 2019. Productivity change of algerian banks: A dea-based malmquist productivity index approach. Journal of Economic Cooperation and Development 40, 1–28.

Boxall, P., Purcell, J., 2000. Strategic human resource management: where have we come from and where should we be going? International journal of management reviews 2, 183–203.

Caves, D.W., Christensen, L.R., Diewert, W.E., 1982. The economic theory of index numbers and the measurement of input, output, and productivity. Econometrica: Journal of the Econometric Society , 1393–1414.

Chen, T.y., 2002. A comparison of chance-constrained dea and stochastic frontier analysis: bank efficiency in taiwan. Journal of the Operational Research Society 53, 492–500.

Chen, T.Y., Yeh, T.L., 2000. A measurement of bank efficiency, ownership and productivity changes in taiwan. Service Industries Journal 20, 95–109.

Chiou, C.C., 2009. Effects of financial holding company act on bank efficiency and productivity in taiwan. Neurocomputing 72, 3490–3506.

Chiu, Y.H., Chen, Y.C., 2009. The analysis of taiwanese bank efficiency: Incorporating both external environment risk and internal risk. Economic Modelling 26, 456–463.

Chukwuogor-Ndu, C., Wetmore, J., 2006. Comparative performance evaluation of small, medium and large us commercial banks .

Clair, R.T., et al., 1992. Loan growth and loan quality: some preliminary evidence from texas banks. Economic Review, Federal Reserve Bank of Dallas, Third Quarter 1992, 9–22.

Conrad, C.A., 2023. Final conclusion: Economic systems, markets and politics, in: Economic Systems, Markets and Politics: An Ethical, Behavioral and Institutional Approach. Springer, pp. 419–431.

Dang, V., 2019. The effects of loan growth on bank performance: Evidence from vietnam. Management Science Letters 9, 899–910.

David, S., 2014. An investigation of influences on strategic decision-making in popular recorded music industry micro-enterprises. Ph.D. thesis. University of Westminster.

Fagbemi, T.O., Olaniyi, T.A., Ogundipe, A.A., 2019. The corporate tax planning and financial performance of systemically important banks in nigeria .

Fahlenbrach, R., Prilmeier, R., Stulz, R.M., 2018. Fast loan growth and poor performance of banks. The Review of Financial Studies 31, 1014–1062.

Fethi, M., Pasiouras, F., 2010. Assessing bank efficiency and performance with operational research and artificial intelligence techniques: A survey. European Journal of Operational Research 204, 189–198.

Gaganis, V., Varotsis, N., 2013. An improved bip matrix decomposition method for reduced flash calculations. Fluid Phase Equilibria 340, 63–76.

Gallemore, J., Mayberry, M., Wilde, J., 2017. Corporate taxation and bank outcomes: Evidence from us state taxes. University of Chicago, Florida and Lowa Graduate School of Business , 1–92.

Ghosh, A., Bose, S., Maji, G., Debnath, N., Sen, S., 2019. Stock price prediction using lstm on indian share market, in: Proceedings of 32nd international conference on, pp. 101–110.

Goddard, J., Molyneux, P., Wilson, J., 2004. Dynamics of growth and profitability in banking. Journal of Money, Credit and Banking 36, 1069–1090.

Ho, T.H., 2020. Financial performance and income diversity in vietnamese commercial banks: Does state ownership matter? International Journal of Economics and Finance 12, 83.

Hsieh, M.F., Lee, C.C., Shen, M.F., 2023. Ownership structure, diversification, and bank performance: International evidence. Emerging Markets Finance and Trade 59, 90–112.

Hsu, L.C., Wang, C.H., 2012. Clarifying the effect of intellectual capital on performance: the mediating role of dynamic capability. British journal of management 23, 179–205.

Huang, T.H., Lin, C.T., Chen, K.C., 2017. Evaluating efficiencies of chinese commercial banks in the context of stochastic multistage technologies. Pacific-Basin Finance Journal 41, 93–110. doi:10.1016/j.pacfin.2016.12.001.

Isik, I., Hassan, M.K., 2003. Financial deregulation and total factor productivity change: An empirical study of turkish commercial banks. Journal of Banking & Finance 27, 1455–1485.

Jameaba, M.S., 2020. Digitization revolution, fintech disruption, and financial stability: Using the case of indonesian banking ecosystem to highlight wide-ranging digitization opportunities and major challenges. FinTech Disruption, and Financial stability: Using the Case of Indonesian Banking Ecosystem to highlight wide-ranging digitization opportunities and major challenges (July 16 2, 2020) .

Kamath, G.B., 2004. The intellectual capital performance of indian banking sector .

Kanagaretnam, K., Lobo, G.J., Mathieu, R., 2003. Managerial incentives for income smoothing through bank loan loss provisions. Review of Quantitative Finance and Accounting 20, 63–80.

Khan, M., 2019. Corporate sustainability practices impact on firm financial performance: Evidence from the banking sector of pakistan. City University Research Journal 9.
Kiruja, K., Kimencu, L., 2020. Effects of business process management practices on financial performance of commercial banks in nairobi county, kenya. International Academic Journal of Human Resource and Business Administration 3, 1–26.
Kiweu, J., Teimet, O.I., Anywa, S., 2012. Income diversification and financial performance of commercial banks in kenya. International Journal of Humanities and Social Science 2, 1–11.
Kweh, Q.L., Lu, W.M., Tone, K., Nourani, M., 2021. Risk-adjusted banks' resource-utilization and investment efficiencies: does intellectual capital matter? Journal of Intellectual Capital .
Lee, C.C., Li, X., Yu, C.H., Zhao, J., 2021. Does fintech innovation improve bank efficiency? evidence from china's banking industry. International Review of Economics & Finance 74, 468–483.
Leibenstein, H., 1978. X-inefficiency xists: Reply to an xorcist. The American Economic Review 68, 203–211.
Leightner, J.E., Lovell, C.K., 1998. The impact of financial liberalization on the performance of thai banks. Journal of economics and business 50, 115–131.
Lelissa, T.B., Kuhil, A.M., 2018. The structure conduct performance model and competing hypothesis–a review of literature. Structure 9, 76–89.
Li, Y., Li, X., Li, Y., Li, X., 2022. Evaluation of innovation efficiency of chinese commercial banks under the impact of internet finance. Security and Communication Networks 2022.
Liu, H., Wilson, J.O., 2010. The profitability of banks in japan. Applied Financial Economics 20, 1851–1866.
Liu, X., Zhang, G., Li, J., Li, X., 2018. Bank efficiency and failure prediction using nonparametric dynamic and static models in a developing economy. Expert Systems with Applications 94, 1–14.
Malik, F., Gul, S., Khan, M.T., Rehman, S.U., Khan, M., 2013. Factors influencing corporate dividend payout decisions of financial and non-financial firms. Research Journal of Finance and Accounting 4, 35–46.
Marshall, M.G., Elzinga-Marshall, G., 2017. Polity iv project datasets. Center for Systemic Peace .
Mohammad Shafiee, M., 2022. Competitive advantage via intellectual capital: a moderated mediation analysis. Journal of Intellectual Capital 23, 957–997.
Moldasheva, G., 2015. Corporate governance practices in emerging markets: Evidence from kazakhstan financial system. Corporate Ownership and Control 13, 889–906.
Muhammad, N.M.N., Ismail, M.K.A., 2009. Intellectual Capital Efficiency and Firm's Performance: Study on Malaysian Financial Sectors. International Journal of Economics and Finance 1, 206–214.
Najam, H., Abbas, J., Alvarez-Otero, S., Dogan, E., Sial, M.S., 2022. Towards green recovery: Can banks achieve financial sustainability through income diversification in asean countries? Economic Analysis and Policy 76, 522–533.
Nguyen, A.P., Nguyen, T.T., Nguyen, T.P., Tran, D.H., 2019. Income diversification and firm performance: Evidence from vietnamese listed firms. Journal of Asian Business and Economic Studies 26, 1–20.
Nguyen, A.P., Phan, H.T., Ngo, P.T., Vu, T.T.T., 2021. Income diversification and firm's performance of companies listed in viet nam. Macroeconomics and Finance in Emerging Market Economies , 1–16.
Nguyen, T.L.A., 2018. Diversification and bank efficiency in six asean countries. Global Finance Journal 37, 57–78.
Niu, J., 2016. Loan growth and bank valuations. The Quarterly Review of Economics and Finance 61, 185–191.
Novickytė, L., Droždz, J., 2018. Measuring the efficiency in the lithuanian banking sector: The dea application. International Journal of Financial Studies 6, 37. doi:10.3390/ijfs6020037.
Peng, Y.H., Wang, K., 2004. Cost efficiency and the effect of mergers on the taiwanese banking industry. The Service Industries Journal 24, 21–39.
Reinhart, C.M., Rogoff, K.S., 2009. This Time is Different: Eight Centuries of Financial Folly. Princeton University Press.
Saha, A.K., 2018. Relationship between corporate social responsibility performance and disclosures: commercial banks of bangladesh. Social Responsibility Journal .
Samad, A., 2008. Market structure, conduct and performance: Evidence from the bangladesh banking industry. Journal of Asian Economics 19, 181–193.
Sarnolyk, K.A., 1994. Us banking sector trends: Assessing disparities in industry performance .
Schaeck, K., Cihak, M., Wolfe, S., 2009. Are competitive banking systems more stable? Journal of Money, Credit and Banking 41, 711–734.
Seenaiah, K., Rath, B.N., Samantaraya, A., 2015. Determinants of bank profitability in the post-reform period: Evidence from india. Global Business Review 16, 82S–92S.
Shahzad, S.J.H., Nor, S.M., Ariff, M.S., 2016. Impact of income diversification on bank's profitability: Evidence from pakistan. Banks and Bank Systems 11, 1–10.
Shephard, R.W., 1970. Proof of the law of diminishing returns. Zeitschrift für Nationalökonomie 30, 7–34.
Shrieves, R.E., Dahl, D., 1992. The relationship between risk and capital in commercial banks. Journal of banking & finance 16, 439–457.
Shyu, J., Lieu, P.T., Chang, W., 2015. How the environment determines banking efficiency: a comparison of banking firms in taiwan, hong kong, and mainland china. International Transactions in Operational Research 22, 757–770.
Soetanto, T., Liem, P.F., 2019. Intellectual capital in indonesia: Dynamic panel approach. Journal of Asia Business Studies .
Sthle, P., Sthle, S., Lin, C.Y., 2015. Intangibles and national economic wealth–a new perspective on how they are linked. Journal of Intellectual capital 16, 20–57.
Suardi, R., Chandra, F., 2014. Pengaruh intellectual capital terhadap kinerja keuangan perbankan di indonesia. AKURAT— Jurnal Ilmiah Akuntansi 6, 1–12. URL: https://unibba.ac.id/ejournal/index.php/akurat/article/view/706.
Tariq, W., Usman, M., Tariq, A., Rashid, R., Yin, J., Memon, M.A., Ashfaq, M., 2021. Bank maturity, income diversification, and bank stability. Journal of Business Economics and Management 22, 1492–1511.
Thornton, D., 2009. Personal saving and economic growth. Economic Synopses .
Ting, I.W.K., Chen, F.C., Kweh, Q.L., Sui, H.J., Le, H.T.M., 2021. Intellectual capital and bank branches' efficiency: an integrated study. Journal of Intellectual Capital .
Tran, N.P., Van, L.T.H., Vo, D.H., 2020. The nexus between corporate governance and intellectual capital in vietnam. Journal of Asia Business Studies .
Vidyarthi, H., 2019. Dynamics of income diversification and bank performance in india. Journal of Financial Economic Policy 11, 399–416. doi:10.1108/JFEP-05-2019-0084.
Wang, P., Cen, C., 2022. Does digital economy development promote innovation efficiency? a spatial econometric approach for chinese regions. Technology Analysis & Strategic Management , 1–15.
Wang, W.K., Lu, W.M., Wang, Y.H., 2013. The relationship between bank performance and intellectual capital in east asia. Quality & Quantity 47, 1041–1062.
Windmeijer, F., 2005. A finite sample correction for the variance of linear efficient two-step gmm estimators. Journal of econometrics 126, 25–51.
Wintoki, M.B., Linck, J.S., Netter, J.M., 2012. Endogeneity and the dynamics of internal corporate governance. Journal of financial economics 105, 581–606.

Worthington, A.C., 1999. Measuring technical efficiency in australian credit unions. The Manchester School 67, 231–248.
Wulandari, D., Sari, Y., Sari, D.M., 2021. Market structure, income diversity, and banking stability: Evidence from indonesian commercial banks. Jurnal Keuangan dan Perbankan 25, 703–717.
Xu, J., Haris, M., Yao, H., 2019. Should Listed Banks Be Concerned with Intellectual Capital in Emerging Asian Markets? A Comparison between China and Pakistan. Sustainability 11. URL: https://www.mdpi.com/2071-1050/11/23/6582, doi:10.3390/su11236582.
Xu, J., Liu, F., 2021. Nexus between intellectual capital and financial performance: An investigation of chinese manufacturing industry. Journal of Business Economics and Management 22, 217–235.
Yahaya, A., Shagari, J.N., Mohammed, A., 2022. Bank size and financial performance in sub-saharan africa: A dynamic panel approach. Malaysian Management Journal 26, 1–30.
Yang, C., Liu, H.M., 2012. Managerial efficiency in taiwan bank branches: A network dea. Economic Modelling 29, 450–461.
Yu, M.M., Lin, C.I., Chen, K.C., Chen, L.H., 2021. Measuring taiwanese bank performance: A two-system dynamic network data envelopment analysis approach. Omega 98, 102145.
Yu, S., Huang, J., 2023. A study on the measurement of operational efficiency of commercial banks–analysis based on super-efficient dea model and malmquist index. Highlights in Business, Economics and Management 12, 210–215.
Zuo, L., Shi, J., Zuo, L., 2021. Digital transformation of commercial banks in china: A sustainable efficiency improvement perspective. Sustainability 13, 10708.