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Faculty Economics and Business Building, 3rd Floor, UIN Syarif Hidayatullah Jakarta
Jl. Ibn. Sina IV, Ciputat 15412
Telp. (021) 22744610
Email: etikonomi@apps.uinjkt.ac.id
Website: http://journal.uinjkt.ac.id/index.php/etikonomi

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Editorial Office

Faculty Economics and Business Building, 3rd Floor, UIN Syarif Hidayatullah Jakarta

Jl. Ibn. Sina IV, Ciputat 15412

(021) 22744610

etikonomi@apps.uinjkt.ac.id

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Unleashing the Central Bank Digital Currency Revolution and its Impact on Exchange Rate: A Monetary Approach Synthesis

Akhmad Syakir Kurnia[1*], Muhammad Adnan Assidiq[2]
[1]Department of Economics and Development Studies, Diponegoro University, Indonesia
[2]Graduate School of Economics, Gadjah Mada University, Indonesia
E-mail: [1]akhmadkurnia@lecturer.undip.ac.id; [2]m.adnanasshidiq@gmail.com
[*)]Corresponding Author

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Abstract

Research Originality: The introduction of CBDC by the Central Bank of Indonesia has increased the intensity of news about CBDC. Besides aiming to introduce the future direction of the payment system, the news potentially causes uncertainty and speculation in the market, which may impact the rupiah exchange rate.

Research Objectives: This research analyzes the impact of CBDC news on the rupiah exchange rate, synthesizing a sticky price version of the monetary approach to the exchange rate.

Research Methods: A CBDC News Index is constructed based on a compilation of news data from major online media between 2018 and 2023. The structural VAR (SVAR) method is then employed to investigate the impact of CBDC news on the exchange rate dynamic.

Empirical Results: The results suggest a trend consistent with the hypothesis, indicating that news about CBDC may lead to pressure on the domestic currency, resulting in depreciation. However, the impact is not statistically convincing as the coefficient is not statistically different from zero. The monetary approach synthesis findings suggest that raising the policy rate is likely efficacious in counteracting the pressure of domestic currency depreciation. Meanwhile, other monetary approach variables exhibit anomalies related to exchange rate dynamics.

Implications: As the central bank plans to implement a Central Bank Digital Currency (CBDC), it must carefully control the dissemination of information about what the CBDC will entail and how it will be rolled out. CBDC blueprint and official disclosure help reduce uncertainty and speculation about implementing CBDC.

Keywords:
central bank digital currency; exchange rates; monetary approach; news shock; structural vector autoregression

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INTRODUCTION

Technological developments in the financial sector are proliferating. The advent of digitally encrypted Cryptocurrencies as a payment system beyond the control of monetary authorities has marked a radical revolution in the financial sector. On the one hand, digital payment systems encourage potential broader financial inclusion. On the other hand, it has raised concerns about risks to financial stability and payment systems itself. The high volatility and mining costs of cryptocurrencies make them an unstable and risky means of payment (Nabilou, 2020). Moreover, if cryptocurrencies are accepted as a means of payment, they threaten central banks' sovereignty in regulating payment systems (Schiller & Gross, 2021). As cryptocurrencies gain popularity as a decentralized payment system, not tied to any government, and operate on blockchain technology, central banks are challenged to explore digital currencies. Central Bank Digital Currency (CBDC) is developed to maintain control over the monetary system and ensure stability. CBDCs provide a regulated and government-backed alternative to decentralized cryptocurrencies (Alfar et al., 2023; Zhou, 2024).

The concept of a Central Bank Digital Currency (CBDC) and how it is supposed to be implemented have been under consideration by several countries worldwide (Bhaskar et al., 2022; Alonso et al., 2021). It is a digital form of a nation's official currency issued and regulated by that country's central bank. In contrast to decentralized cryptocurrencies such as Bitcoin or Ethereum, Central Bank Digital Currencies (CBDCs) are established and overseen by a government's central bank, giving it under the control of the central bank. Therefore, CBDCs are meant to replace cryptocurrencies, as the implementation of CBDCs provides substantial economic benefits (Bank of England, 2020).

The introduction of CBDC has raised attention and prompted scholarly discourse concerning its implementation and related issues. Several studies have highlighted the potential advantages of CBDC. Adopting CBDCs can save money handling costs, prevent counterfeiting, strengthen legal tender authorities, and improve payment systems' efficiency and safety by providing a secure and low-cost means of transferring funds. This could increase financial inclusion and enhance the payment system's inclusive character (Sun et al., 2017). CBDC can also promote faster and more complete monetary policy transmission by giving the central bank more control over the money supply and interest rates. This will be more helpful in achieving targets for inflation, output, and employment levels (Hanl & Michaelis, 2019; Davoodalhosseini, 2022; Zhou, 2024). In addition, CBDCs can boost economic growth as lower real interest rates encourage economic agents to increase consumption and investment (Barrdear & Kumhof, 2022), eliminate zero lower bound constraints, and thereby improve the effectiveness of negative interest rate policy-NIRP (Xin & Jiang, 2023). Moreover, CBDC-based NIRP could more effectively smooth macroeconomic fluctuations and alleviate the negative impact of an uncertainty shock, which is more conducive to restoring market confidence and promoting economic recovery (Xin & Jiang, 2023)

Concerning the banking system, a well and carefully designed CBDC has the potential to increase its stability because Banks engage in less maturity transformation

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when depositors have access to Central Bank Digital Currency (CBDC), reducing their risk of bank runs. Additionally, tracking the movement of funds into CBDC enables policymakers to detect and address struggling banks earlier, reducing the incentive for depositors to withdraw their funds in a panic (Keister & Monnet, 2022).

While it offers various benefits, CBDC also brings several challenges and threats. CBDC can exacerbate financial uncertainty during economic stress, in which users may procure CBDC without limit, leading to bank runs and financial instability (Williamson, 2022; Ferrari Minesso et al., 2022). Interest-bearing CBDC can also have a substitution effect from deposits to CBDC, leading to banking disintermediation and financial instability by affecting the demand for traditional bank deposits and other forms of money, reducing the reliance on commercial banks for payment services. (Chiu et al., 2019; Fegatelli, 2022). Disintermediation leads to reduced availability of bank funding and increased credit costs from the banking sector, which causes changes in the aggregate supply and demand in the economy (Bank of England, 2020). In addition, central banks face the challenge of attracting public attention and support for using CBDC (Sarmiento, 2022). An unavoidable concern is the risk of operational failure. Given the electronic nature of the financial system, central bank digital currency (CBDC) is susceptible to various malicious actions during offline scenarios, like blackouts or system shutdowns (Chu et al., 2022).

Few studies explore the implications of implementing central bank digital currencies (CBDCs) within the international monetary system, particularly concerning how a country's CBDC exchange rate aligns with another country's currency. The sparse body of literature focuses on the connection between central bank digital currencies (CBDCs) and exchange rates within the broader monetary policy framework. This research considers exchange rate stability as one of the critical issues in the realm of monetary policy under a CBDC regime. The introduction of CBDC could impact exchange rates by influencing capital flows and the demand for domestic and foreign currencies. Literature on CBDC suggests that CBDC may have several implications for macroeconomic fundamentals that can affect exchange rates. CBDC can increase economic growth through low-real interest rates (Barrdear & Kumhof, 2022) and increase the demand for money in an economy, which has implications for the exchange rate. Interest-bearing CDBCs can also cause interest rates faced by the public to change rapidly, which causes changes in the difference between foreign and domestic interest rates, which leads to the exchange rate (Meaning et al., 2018). On the other hand, CBDC can also lead to an increase in money supply, leading to disruption and inflation (Brunnermeier & Landau, 2022), which has implications for the exchange rate.

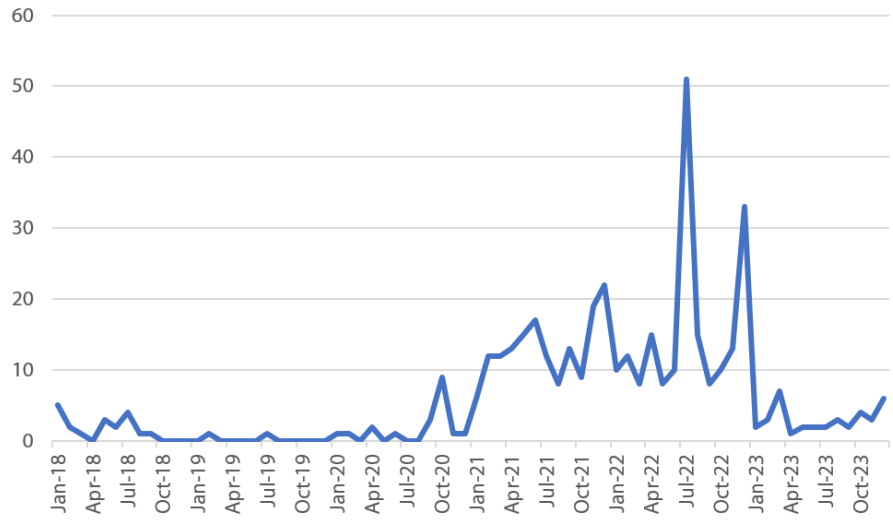
Most countries, including Indonesia, are still in the initial stages of preparing to adopt central bank digital currency (CBDC). The plan to implement CBDC as a new digital-based currency platform to replace the old is intrinsically intertwined with the emerging payment system ecosystem and evolving monetary policy landscape, both of which remain unclear. It leads to increased attention and uncertainty regarding the future trajectory of the economy. It causes economic actors to be more sensitive to news

information related to CBDC obtained, causing the volatility of currency exchange rates to increase (Wang et al., 2022).

Similar to the redenomination of the Rupiah, the redenomination of the Rupiah has been in the news a lot and has subsequently sparked speculation about when it will be carried out, what the implementation mechanism will be, and the consequences for the payment system and the economy as a whole. These speculations put pressure on exchange rate stability. With Bank Indonesia's recent announcement of plans to introduce CBDC in Indonesia, the central bank may encounter additional hurdles in maintaining exchange rate stability. This is particularly evident as the dissemination of information regarding CBDC has surged across various news media platforms in Indonesia. As depicted in Figure 1, there has been a notable upsurge in the recent coverage of CBDC-related news in Indonesia. This heightened coverage is poised to foster an atmosphere of increased uncertainty and speculation among economic actors in the foreign exchange market.

The circumstances show that it is crucial to empirically know how CBDC news impacts the stability of the rupiah exchange rate. No studies in Indonesia have examined the impact of central bank digital currency (CBDC) news on the Rupiah's exchange rate. Because it is still in the planning stage, existing studies that have come to the literature are in the form of theoretical literature. For example, Syarifuddin and Bakhtiar (2021) analyzed the monetary implications of CBDC implementation using a seven-sector DSGE model calibrated for Indonesian conditions. The results show that based on a closed economy model, CBDC can improve the effectiveness of monetary policy transmission.

Figure 1. CBDC News Intensity in Indonesia 2018-2023



Our research provides contributions in threefold. First, we propose an index that measures the intensity of CBDC-related news coverage named CBDC News Index (ICBDC). Second, while CBDC has not yet been implemented, media coverage reporting

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on CBDC is becoming more intense. The news about CBDC serves an educational role while also shaping market expectations and motivating economic agents to act rationally. Third, we synthesize a sticky price version of the monetary approach to exchange rates with CBDC news as a shock. Our model modified the naïve version of the flexible price of the monetary approach of the exchange rate by assuming that PPP holds only in the long run. The sticky price version assumes that the economy faces rigidity in the short run and that people adjust their expectations rationally. Unlike the flexible price version, which suggests that increased interest rates lead to domestic currency appreciation, the sticky price version suggests that the effect is ambiguous. If the money supply is more sensitive than the money demand in response to an increased interest rate, an increased policy rate (BI rate in Indonesia) will spurse even higher domestic currency depreciation.

METHODS

The Construction of the CBDC News Index

The CBDC index is calculated using the method developed by Wang et al. (2022), which is in line with the method of Baker et al. (2016), Huang & Luk (2020), and Lucey et al. (2022). However, the CBDC index calculation in our paper is different from Wang et al. (2022) in that we do weighting each news report based on the content of each news. Each piece of news is extracted based on three keywords of the financial sector related to Indonesia's CDBC initiative: payment systems, monetary policy, and financial stability. The Digital Rupiah CBDC White Paper released by Bank Indonesia states that Bank Indonesia will implement wholesale CBDC as the initial project to support financial system stability and monetary operations. It seems that Bank Indonesia directs CBDC as a support instrument to achieve financial system stability and monetary policy effectiveness goals. Therefore, financial system and monetary policy content are each assigned a higher weight of 0.4, while payment system content is given a weight of 0.2 as follows:

$$I_t = 0{,}4(Financial\ System) + 0{,}4(Monetary\ Policy) + 0{,}2(Payment\ System) \quad (1)$$

where l_t is the CBDC score at month t between January 2018 and December 2023. Keywords associated with the Financial System encompass terms such as financial system, infrastructure, finance, market, banking, wholesale, blockchain, and macroprudential. Those linked to Monetary Policy include remuneration, interest rate, transmission, monetary, market operation, exchange rate, inflation, money supply, and macroeconomy. Meanwhile, Payment Systems are characterized by keywords like wallet, retail, financial inclusion, transaction, digital Rupiah, and payment.

We observed online CBDC news from online media of CNN, Bisnis, CNBC, Detik, Media Indonesia, Kumparan, and Republika. The monthly CBDC news score, which is generated using equation *(1)*, is then normalized by the average and standard deviation value and then standardized by adding 100 to get the CBDC index as follows (Wang et al., 2022):

$$CBDCI_t = \left(\frac{(I_t - \mu)}{\sigma}\right) + 100$$

Where I_t is monthly score generated from equation *(1)*, μ and σ are average and standard deviation values, respectively.

CBDC and the Monetary Approach Synthesis

The monetary approach posits that the exchange rate between two countries' currencies is influenced by the balance of their respective money market equilibrium. This theory holds that variations in money market conditions can lead to shifts in the exchange rate. However, the link between the money markets and exchange rates is indirect. It operates through adjustments in relative prices, which ultimately affect exchange rates as they align with purchasing power parity. Accordingly, the validity of this approach hinges on whether purchasing power parity (PPP) holds. Given that many empirical studies have found inconsistencies with PPP, the flexible-price version of the monetary approach is often criticized as overly simplistic (Frankel, 1976; Boughton & Section, 1989). Accordingly, we adopt a synthesis of the sticky price version of the monetary approach as a correction to the flexible price and incorporate expectations at once.

$$m_t + \delta r_t = p_t + \Phi y_t - \lambda r_t \quad (3)$$

$$m_t^* + \delta r_t^* = p_t^* + \Phi y_t^* - \lambda r_t^* \quad (4)$$

$$s_t' = p_t - p_t^* \quad (5)$$

All variables in equations *(3), (4),* and *(5)* are in logarithmic form. Equations *(3)* and *(4)* demonstrate money market equilibrium conditions. The left-hand side of the equation exhibits the endogenous money supply consisting of exogenous components (m_t) and endogenous component, which is a function of interest rate (r_t) with a parameter of δ. The right-hand side of the equation is the nominal cash holding, which is assumed to be positively related to price changes (p_t), and output growth (y_t), and negatively related to interest rates (r_t). Equation *(5)* illustrates that PPP applies solely in the long term. The notation s_t' represents the long-run exchange rate to differentiate it from the short-run exchange rate (s_t). The * sign denotes the counterpart country.

The expectation of the exchange rate change is assumed to obey the following scheme:

$$s_{t+1}^e - s_t = \theta(s_t' - s_t) + (\pi_t^e - \pi_t^{e*}) \quad (6)$$

Equation *(6)* states that if the spot rates are below (or above) the long-run equilibrium level, the exchange rate is expected to depreciate (appreciate). In addition, the expected inflation differential ($\pi_t^e - \pi_t^{e*}$) leads to expected currency depreciation. This implies that the model accounts for market expectations by incorporating information from market equilibrium and the expected inflation rate. Combining equation *(6)* and the international fisher condition $s_{t+1}^e - s_t = r_t - r_t^*$, we obtain the following equation:

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$$s_t' - s_t = -{}^{1}/_{\theta}\,[(r_t - \pi_t^e) - (r_t^* - \pi_t^e)] \quad (7)$$

Putting equations *(3), (4), (5),* and *(7)* together while adding the CBDC news index as a shock results in the following equation:

$$s_t = (m_t - m_t^*) - \Phi(y_t - y_t^*) + (\delta + \lambda - 1)(r_t - r_t^*) + {}^{1}/_{\theta}\,(\pi_t^e - \pi_t^{e*}) + \mu ICBDC \quad (8)$$

Equation *(8)* can be elucidated as follows: First, an increase in domestic nominal money supply growth leads to a proportional increase in domestic prices and hence causes the domestic currency to depreciate. Second, increased domestic output leads to excessive nominal demand for money, leading to domestic currency appreciation. Third, a higher interest rate differential leads to an ambiguous effect on the exchange rate that depends on δ and λ. Both represent the sensitivity of money supply and demand changes in response to the increased interest rate. Fourth, market expectations represented by expected inflation differential affect the exchange rate, whereas a higher expected inflation differential leads to domestic currency depreciation. Finally, we hypothesize that the CBDC News Index has a positive relationship with the exchange rate, where an increase in the CBDC News Index leads to a depreciation of the domestic currency.

Empirical Strategy: Structural Vector Autoregression

We employ the structural vector autoregression (SVAR) model to test the structural shock analysis of the CBDC News Index to the Rupiah Exchange Rate. Initially, the validity of how the CBDC News Index is expected to affect other variables is examined using vector autoregressions, written as follows:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + x'_t + e_t \quad (9)$$

which p denotes the order of the VAR model, y_t is a *(K x 1)* vector of endogeneous variables, A are *(K x K)* coefficient matrices, x' is a set of exogenous variables and e_t is the error term, wherein the term of the VAR model is called unobserved structural innovations. Afterward, the impact of CBDC News Index shocks on the Rupiah Exchange Rate is examined using the Structural Vector Autoregression (SVAR) model by imposing restrictions on matrix A and adding error terms into the linear combination of structural shocks. The general structural representation is written as follows:

$$Ay_t = A^*{}_1 y_{t-1} + \cdots + A^*{}_p y_{t-p} + x'_t + Bu_t \quad (10)$$

where $u_t \sim (0, I_K)$, The A* are (K x K) coefficient matrices, and B is a structural form parameter matrix. This model follows the AB model by Lütkepohl (2005), where the structural shocks, u_t, are orthogonal and contemporaneously correlated. Thus, the correlation between the error of reduced and structural forms is:

$$Ae_t = Bu_t \quad (11)$$

Our structural model comprises four macroeconomic variables derived from the monetary approach to the exchange rate with a CBDC news index, which is exogenous. The macroeconomic variables are the rupiah exchange rate (s_t), interest rate differential $(r_t - r_t^*)$, money supply growth differential $(m_t - m_t^*)$, and economic growth differential (y-y^*). This

yields the reduced form disturbances: $e_t^{icbdc}, e_t^{r-r*}, e_t^{m-m*}, e_t^{y-y*} e_t^{\pi-\pi^*}, e_t^s$. The restriction of the structural response model, $Ae_t = Bu_t$, is specified as follows:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & \alpha_{32} & 1 & 0 & 0 & 0 \\ 0 & \alpha_{42} & \alpha_{43} & 1 & 0 & 0 \\ 0 & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 & 0 \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & 1 \end{bmatrix} \begin{bmatrix} e_t^{icbdc} \\ e_t^{r-r*} \\ e_t^{m-m*} \\ e_t^{y-y*} \\ e_t^{\pi-\pi^*} \\ e_t^s \end{bmatrix} = \begin{bmatrix} \beta_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & \beta_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & \beta_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & \beta_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & \beta_{66} \end{bmatrix} \begin{bmatrix} u_t^{icbdc} \\ u_t^{r-r*} \\ u_t^{m-m*} \\ u_t^{y-y*} \\ u_t^{\pi-\pi^*} \\ u_t^s \end{bmatrix} \quad (12)$$

Equation *(12)* elucidates the correlation between reduced form and structural shock for each endogenous variable. The focus is drawn to the sixth row, which describes the estimated structural factorization of exchange rate shock in a reduced form consisting *of* the CBDC news index $\left(e_t^{icbdc}\right)$, interest rate differential (e_t^{r-r*}), money supply differential (e_t^{m-m*}), economic growth differential shocks $\left(e_t^{y-y*}\right)$ and expected inflation differential $(e_t^{\pi-\pi^*})$.

Data and the Definition

The data used in this study are as follows:

Rupiah exchange rate is defined as *IDR/USD*

Interest rate differential is the difference between the Bank Indonesia (BI) Rate and the Fed Funds Rate $(r - r^*)$.

The money supply growth differential is the difference between Indonesia's and the United States money supply growth $(m - m^*)$.

Economic growth differential is the difference between Indonesia's GDP growth (yoy) and the United States $(y - y^*)$.

The inflation differential is the difference between Indonesia's inflation (yoy) and the United States $(\pi^e - \pi^{e*})$.

The CBDC News Index (ICBDC) is generated from a weighted composite index. The data is collected from major online news media in Indonesia, such as CNN Indonesia, CNBC Indonesia, Bisnis, Detik, Republika, and Media Indonesia. All data is monthly data for a period from 2018 to 2023.

RESULTS AND DISCUSSION

Non-stationary data used in VAR estimation will result in spurious regression results. Therefore, we check the data to ensure that it follows a stationary process and that our estimation results are valid and reliable. For that purpose, we used the Augmented Dickey-Fuller (ADF) test. The test results show that some data are stationary at a level and some at first difference *I(1)*. Thus, we estimate the VAR model using the first difference data. Appendix 1 shows the ADF test results.

Lag length selection in Vector Autoregression (VAR) is crucial because it risks a misspecification bias that dramatically impacts the model's performance, interpretability, and

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reliability of the results (Hafer & Sheehan, 1989; Schorfheide, 2005). A lag length that is too high will cause over-parametrization conditions, bearing the emergence of noise along with the underlying patterns. On the other hand, under-parameterization conditions occur if the lag length is too low, so the model fails to capture the essential dynamics in the time series data. Thus, selecting the optimal lag length in VAR involves balancing statistical validity, computational feasibility, and theoretical justification (Hafer & Sheehan, 1989).

We estimate the VAR model with a lag length of 1. The quick response of financial markets to new information, regulatory requirements, or inherent characteristics of the financial data justifies the selection of a lag length of 1 in a VAR. We also use statistical criteria to determine the optimal lag length. The result aligns with the theoretical justification. Appendices 2 and 3 show the statistical criteria for selecting the optimal lag length and VAR model estimate. The estimate of VAR was conducted by imposing several restrictions on equation *(9)*.

Structural VAR Analysis Results

The structural VAR models are estimated using maximum likelihood based on the variance-covariance matrix of the reduced form and the restrictions imposed on the structural model. Maximization was conducted using numerical optimization methods and a scoring algorithm. The formal over-identification test does not reject the over-identified model estimated at the 5 percent level, which indicates that the estimated model is fit and that the structural restrictions used are valid. The SVAR estimate of equation *(12)* is shown in Table 1.

Table 1. Estimates of the Reduced form (Matrix A)

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0.021620^{***} & 1 & 0 & 0 & 0 \\ 0 & 0.424203^{***} & 23.55114^{***} & 1 & 0 & 0 \\ 0 & -0.275834^{*} & -0.845231 & -0.101031^{**} & 1 & 0 \\ 0.139295 & -0.014263^{*} & -0.531579^{***} & 0.001488 & -0.005301 & 1 \end{bmatrix}$$

Note:
*)p<0.1; **) p<0.05; ***) p<0.01

The sixth row shows the estimated coefficient of structural factorization of exchange rates in the reduced form involving the CBDC news index $\left(e_t^{icbdc}\right)$, interest rate differential (e_t^{r-r*}), money supply differential (e_t^{m-m*}), economic growth differential shocks $\left(e_t^{y-y*}\right)$ and expected inflation differential $(e_t^{\pi-\pi^*})$. The estimate of the coefficient α_{61} = 0.139295 is not statistically significant, indicating that the CBDC News Index as a shock has no impact on exchange rate changes. However, it suggests that the coefficient exhibits a positive sign, confirming the direction of how the shock is expected to influence the exchange rate.

The estimated coefficient α_{62} -0.014263 has a negative sign and is statistically significant, suggesting that an increase in the interest rate differential leads to an appreciation of the domestic currency. This finding confirms a critical aspect of the

sticky price model where the influence of changes in interest rates on the exchange rate occurs through both money supply and money demand channels. Whether a higher differential interest rate causes an appreciation of the domestic currency or vice versa depends on the sensitivity of changes in money supply and money demand to changes in the interest rate differential. The domestic currency is likely to appreciate only when the money supply and demand are relatively insensitive to rising interest rates, allowing the higher interest rate differential to impact domestic currency appreciation.

The coefficients of the remaining variables synthesized in the monetary approach, α_{63}, α_{64} and α_{65} exhibit a divergent trend from the Monetary Approach Synthesis, notably with α_{63} being statistically significant with a negative sign. This suggests that the effect of output growth on the exchange rate does not align with the monetary approach framework.

Figure 2. Response of Rupiah Exchange Rate to Structural VAR Shock

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We then examine the impulse response dynamics within the estimated structural VAR systems. The analysis focuses on how the Rupiah Exchange Rate responds to the CBDC News Index shock. In addition, we also examine how the Rupiah exchange rate responds to the shock of macroeconomic variables synthesized in the monetary approach to the exchange rate model. Figure 2 displays the impulse response based on the SVAR estimates. Figure 2 shows that the Rupiah Exchange Rate generally responds to shocks from all variables in the short term, no more than six months. The Rupiah exchange rate reacts initially to interest rate shocks, typically depreciating in the early period following the shock and then bouncing back to appreciate and stabilizing after the fifth period. A positive shock of the money supply causes an initial depreciation of the Rupiah currency, stabilizing the depreciation within the fourth period. Conversely, a positive economic growth shock prompts an initial Rupiah appreciation at the beginning, stabilizing in the fifth period after the shock. Lastly, the Rupiah currency is volatile in response to news about CBDC in the early period. However, the volatility subsided within five months. In other words, traces of the influence of news about CBDC on the Rupiah currency disappear after five months of news.

Claiming that the CBDC news index is putting pressure on the Rupiah currency is unlikely convincing. Although the estimation shows a positive coefficient, suggesting that CBDC news shocks may contribute to Rupiah depreciation due to increased uncertainty, the coefficient is not statistically significant. This result contrasts with the findings of Wang et al. (2022), which demonstrate a significant positive correlation between the CBDC News Index and currency exchange rate volatility in financial markets. We posit that the limited impact of news regarding CBDC on exchange rate stability in Indonesia stems from its official sourcing from Bank Indonesia, thereby mitigating market uncertainty and speculation. Bank Indonesia's publication of the 2025 CBDC Blueprint helps mitigate uncertainty and speculation regarding the economic trajectory of CBDC. This contrasts with the discourse surrounding the Rupiah redenomination, which causes uncertainty and speculation in financial markets (Lianto & Suryaputra, 2012; Mahardika et al., 2015; Astrini et al., 2016; Karnadi & Adijaya, 2017).

Moreover, people are already familiar and comfortable with digital transaction platforms provided by private providers. On the one hand, people have perceived the benefits and become comfortable with digital transactions whose platforms are provided by the private sector; on the other hand, there are still concerns about the risks of using digital currency, especially related to security issues, regulatory uncertainty, lack of consumer protection, and market manipulation. In this regard, the central bank's issuance of official digital currency is perceived as a positive thing in overcoming privately provided digital currency platforms that concern people (Al-Okaily et al., 2020; Alaa Mahdi Sahi et al., 2021; Susanto et al., 2022; Norbu et al., 2024; Najib & Fahma, 2020; A M Sahi et al., 2021; Kumar et al., 2017).

The monetary approach to exchange rates has long served as a foundational framework in open macroeconomic analysis. However, the validity of the approach remains debated due to mixed empirical findings (DeJong & Husted, 1993), which is

the case with the findings in our research. We identified a critical issue in the sticky price version of the monetary approach, demonstrating that a rise in the interest rate differential leads to an appreciation of the domestic currency. This finding is critical because it validates the central bank's actions in response to the pressure of domestic currency depreciation. When the Rupiah comes under depreciation pressure, Bank Indonesia typically responds by raising the policy interest rate. Given the ambiguity of how an increased policy rate impacts exchange rates, these empirical results validate the central bank's current strategy.

CONCLUSION

Given that the CBDC as an official and regulated digital currency has been in the pipeline to be introduced, this paper contributes to adding empirical literature on CBDC. Numerous issues are under discussion regarding the optimal form of CBDC, its implementation strategies, and how CBDC impacts other macroeconomic variables. This paper investigated the exchange rate against the CBDC News index based on the sticky price version of the monetary approach to exchange rate synthesis. The CBDC news index was generated from weighted components comprising the financial system, monetary policy, and payment system identified based on the keywords contained in the CBDC news reports by major online mass media from 2018 to 2023.

Our approach results in two main findings. First, the presence of a CBDC blueprint by the central bank, coupled with information sourced directly from the central bank, serves to mitigate uncertainty and speculation surrounding CBDC implementation. The public's widespread familiarity with digital platforms in daily transactions further diminishes the impact of CBDC-related news on exchange rate shocks. Secondly, our approach reveals a critical aspect of the sticky price version of the monetary approach to the exchange rate in which the policy rate serves as an effective instrument to help reduce pressure on domestic currency depreciation. It validates the central bank's use of policy rate instruments to counteract pressure on the domestic currency to depreciate. On the other hand, the impact of macroeconomic variables other than interest rates, which diverge from the assumptions of the monetary approach, further adds to the mixed results of its empirical studies.

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Appendix 1. McKinnon *t* Statistics of ADF Unit Root Test

Variables	Level, *I(0)*	First Difference, *I(1)*
s	-4.149826***	-7.331635***
ICBDC	-3.063314	-3.884408***
$r_t - r_t^*$	-1.440610	-5.584722***
$m_t - m_t^*$	-0.997318	-9.232152***
$y_t - y_t^*$	-1.877763*	-2.484285**
$\pi_t^e - \pi_t^{e*}$	-2.081572**	-2.674932***

Note:
***) Reject the non-stationary null hypothesis at a *99 %* confidence level.
**) Reject the non-stationary null hypothesis at a *95 %* confidence level.

Appendix 2. Optimal Lag Length Criteria

Lag	Optimal Lag Length Criteria			
	FPE	AIC	HQ	SC
0	2.24e-12	-9.798326	-9.600891*	-9.720201
1	9.08e-13*	-10.70477*	-9.322728	-10.15789*
2	1.30e-12	-10.37071	-7.804048	-9.355072
3	1.04e-12	-10.65962	-6.908348	-9.175230
4	1.49e-12	-10.43270	-5.496823	-8.479563

Appendix 3. Estimate of Restricted VAR Model

	ICBDC	$r - r^*$	$m - m^*$	$(y - y)$	$\pi^e - \pi^{e*}$	*s*
$ICBDC_{t-1}$	-0.344958	-	-	-	-	-0.501710
	(0.10733)					(0.23548)
	[-3.21391]					[-2.13060]
$(r - r^*)_{t-1}$	-	0.364987	-0.019045	0.177322	-0.295252	-0.023297
		(0.11125)	(0.00652)	(0.44080)	(0.17003)	(0.00885)
		[3.28086]	[-2.91984]	[0.40228]	[-1.73642]	[-2.63243]
$(m - m^*)_{t-1}$	-	-	-0.197186	-0.176066	0.841989	-0.181597
			(0.12590)	(9.14791)	(3.47359)	(0.18334)
			[-1.56624]	[-0.01925]	[0.24240]	[-0.99049]
$(y - y)_{t-1}$	-	-	-0.001211	0.414558	-0.070769	-0.003115
			(0.00152)	(0.11066)	(0.04203)	(0.00222)
			[-0.79504]	[3.74613]	[-1.68392]	[-1.40062]
$(\pi^e - \pi^{e*})_{t-1}$	-	-	0.003780	0.625109	0.406799	-0.000608
			(0.00394)	(0.28616)	(0.10879)	(0.00586)
			[0.95970]	[2.18445]	[3.73941]	[-0.10363]
DLS(-1)	-	-	0.008131	5.374924	0.180482	-0.169388
			(0.08252)	(5.99612)	(2.27679)	(0.12015)
			[0.09853]	[0.89640]	[0.07927]	[-1.40978]
C	0.000210	-0.008834	0.000853	0.003109	-0.021478	0.001849
	(0.00128)	(0.04228)	(0.00219)	(0.14431)	(0.05721)	(0.00289)
	[0.16390]	[-0.20895]	[0.38992]	[0.02154]	[-0.37541]	[0.63903]
R-squared	0.153450	0.133504	0.117511	0.275091	0.205910	0.153433
Sum sq. resids	0.008009	8.745845	0.023289	101.0891	15.90111	0.040637
Mean dependent	0.000206	-0.013969	0.000901	-0.003381	-0.024429	0.001700
S.D. dependent	0.011709	0.382466	0.019557	1.421628	0.538709	0.026376

Note: Standard errors in ( ) & t-statistics in [ ]

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Trust and Risk: Evidence from Rural Banks in Emerging Markets

Irwan Trinugroho[1*], Aldy Fariz Achsanta[2], Taufiq Arifin[3], Nugroho Saputro[4]
[1,2,3,4]**Faculty of Economics and Business, Universitas Sebelas Maret, Indonesia**
E-mail: [1]irwan_t@staff.uns.ac.id, [2]aldyfariz.achsanta@staff.uns.ac.id,
[3]taufiqar@staff.uns.ac.id, [4]nugrosaputro@gmail.com
[*)]**Corresponding Author**

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Abstract

Research Originality: This research is the first to discuss how rural bank risk-taking behaviour is affected by trust in particular when the poverty rate is high.

Research Objectives: This research aims to investigate how risk in rural banks is shaped by the two dimensions of trust by taking into account different poverty levels across the region.

Research Methods: To thoroughly conduct our research, we use quarterly dataset of rural banks obtained from the financial service authority (OJK) for the period of 2010Q2 to 2016Q3 when the bail-out regime was still in effect. We employ a random effect model to account for individual heterogeneity.

Empirical Results: Our evidence suggests that in-group trust is detrimental to rural banks' risk. Conversely, out-group trust positively affects rural banks' stability only if the region has a lower poverty level.

Implications: To reduce risk, the rural bank has to use social capital and penetrate informally to the market where in-group trust is high to be able to compete with informal lending and to contribute better to society.

Keywords:

rural banks; trust; bank stability; poverty; risk banking management

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INTRODUCTION

Trust has been widely discussed as a crucial part of fostering economic growth (Bjørnskov, 2012; Bohnet & Zeckhauser, 2004; El-Attar & Poschke, 2011; Gennaioli et al., 2015) notably, many empirical research has linked trust with banks' risk (Duarte et al., 2012; Koomson et al., 2023; Quang Trinh et al., 2023). The link between trust and bank risk lies in how the trust will affect the lending decision, as the element of trust is present in every commercial transaction in the banking industry (Nicolas et al., 2023). Bankers often face information asymmetry, which involves adverse selection and moral hazards. Hence, trust contributes to the decision-making process by influencing the outcome of lending decisions (Thakor & Merton, 2018). The decisions will be more likely to depend on the trustworthiness of the borrowers during the screening process. As such, the trustworthiness then may differ whether the client is someone who has been known before or a completely new person (Bohnet & Zeckhauser, 2004; Courbage & Nicolas, 2021; Thakor & Merton, 2018).

The dimensions of trust are normally divided into two main characteristics. The first type of trust is widely known as in-group trust. In-group trust reflects how a person's trustworthiness is affected by the established relationship between parties, which implies that both parties know each other (Lei & Vesely, 2010). The second dimension of trust is out-group trust, which indicates a person's trust in strangers, persons they do not know, or another person they meet for the first time. These two subcomponents of trust can affect how lending decisions are made, which, in turn, will impact banks' stability due to the potential losses of bad debt.

Previous empirical works of literature have focused on analyzing trust as a channel in determining bank risk (Jin et al., 2020; Kanagaretnam et al., 2019; Nicolas et al., 2023), personal and business risk-taking behavior (Courbage & Nicolas, 2021; Dowling et al., 2019) firms' cost of debt (Wang & Gu, 2024), there is little attention being paid into the link of trust and risk for smaller rural banks. Thus, it leaves an open question on how trust may determine rural bank risk-taking behavior, as the studies on trust still focus on countries or big financial institutions that operate in nationwide areas. Unlike big financial institutions, rural banks typically serve in the areas where bigger financial institutions are deemed risky and have fewer incentives to enter (Amanda, 2023). Rural banks also normally deal with limited region or area coverage, and a specific level of trust is embedded into their established culture.

However, a high level of trust may result in a bad situation in rural banking management. As stated, rural banks often operate where those clients are less likely to access commercial banks for many reasons (e.g., less worthiness, lack of financial reporting capability, and being considered high-risk clients). These clients are characterized by higher asymmetry information and potentially increase rural banks' credit risk. This situation can further be exacerbated if the rural banks operate in regions where the poverty level is high, reducing repayment capability. We, therefore, bridge the gap by providing evidence of the link between trust and rural bank risk and further dig deeper

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by taking into account poverty as a channel that could play an essential role in rural bank risk management.

To conduct our empirical investigation, we employ unique hand-collected data on quarterly financial reports of 1854 rural banks from 2010Q2 to 2016Q3. We did not consider 2017 and above due to the bail-in regulation enacted by the Indonesian Financial Services Authority in 2017. This condition is to avoid a change in risk profile trend after the bail-in regime becomes active.

Our findings suggest that rural banks are more likely to have lower risk in the regions where out-group trust is high and tend to be risky in the regions where in-group trust is high. This finding supports the argument that with the increase of in-group trust, people are less likely to trust people they do not know, thus reducing trust in financial institutions and fostering the development of informal lending. Moreover, our results show that poverty can be a game changer in keeping trust and can positively impact rural bank risk stability.

The high poverty rate combined with high in-group trust forms more growth for informal lending, reducing potential bad debt to rural banks, as those who are underbanked or unbanked tend to borrow from their acquaintances rather than formal institutions. Conversely, rural banks tend to have higher risk and less stability in the regions where the level of out-group trust and poverty is high. In these regions, even though the high out-group trust is bolstering the growth of lending through formal financial institutions, the high rate of poverty, in fact, also increases the probability of bad debt, which can be translated into more risk of loan failure in repayment and, in turn, the risk of default for rural banks

Our paper, therefore, has several contributions. First, we contribute to the literature on rural banks by showing that trust can be a key determining factor of rural banks' risk profile (Amanda, 2023; Wasiaturrahma et al., 2020). Secondly, we contribute to the literature on trust by showing that poverty can be a key factor in changing both subcomponents (in-group trust and out-group trust) of trust effect towards risk (Bohnet & Zeckhauser, 2004; Lei & Vesely, 2010; Sangnier, 2013; Thakor & Merton, 2018; Zak & Knack, 2001).

METHODS

Our research is based on a thorough examination of a quarterly dataset on Indonesian Rural Banks for the period of 2010-2016, collected from the Indonesian Financial Services Authorities (OJK). We stopped our sample until 2016 to isolate the effect of the enactment of the bail-in regime which takes effect in 2017 where banks no longer expect any sort of external financial aid as this will impact their risk-taking behaviour. This dataset, combined with the World Value Survey dataset on general trust (Haerpfer et al., 2020), forms the foundation of our study. Our final sample comprised 37191 observations from 1866 rural banks, ensuring the reliability and robustness of our findings.

We use Z-Score as a proxy for rural bank risk stability or risk-taking. This measurement is commonly used in the literature on bank risk as it provides straightforward interpretation and uses only accounting data (Achsanta et al., 2021; Beck et al., 2013; Fu et al., 2014). The z-score is calculated as follow.

$$Z = \frac{(ROA + EQTA)}{SDROA} \qquad (1)$$

Where ROA is return on assets, EQTA is equity to total asset, and SDROA is the standard deviation of bank's ROA. The z-score therefore is a calculation of the standard deviation by which the bank return has to diminish to deplete bank's equity(Schaeck & Cihák, 2014). We also follow Fu et al. (2014) by calculating the logarithm value of the z-score.

Our primary variable of interest is general trust extracted from Waves 7, which Indonesia presents in the sample. We break down the survey based on region to develop a regional trust index. Although trust value does not vary across time, there is a considerable heterogeneity of trust value between regions in Indonesia. We follow Nicolas et al. (2023) by distinguishing trust into two groups: in-group and out-group. In-group trust is defined as a specific trust in which the individuals trust only people they know (*InTrust*). Hence, in-group trust is measured as percentages of respondents who answer entirely trust in the family, the neighborhood, and the people they know. On the other hand, Out-group trust (*OutTrust*) is defined as an individual's trust in people they do not know, commonly known as general trust. Thus, *OutTrust* is calculated based on the percentages of respondents who answer thoroughly trust on whether they trust the people they meet for the first time.

We consider several control variables at the bank and the regional level that may affect bank risk. We employ the natural logarithm of rural banks' total assets to control for the size (*lnTA*) and expect a positive effect on banks' stability. We also use the ratio of equity to total assets to reflect bank financial risk (*EQTA*) and the capital adequacy ratio (*CAR*) and expect a positive effect on bank risk. We also employ the ratio of non-performing loans to total loans (*NPL*) and expect a negative effect on the bank's risk. We also control the intermediation function by employing the ratio of loan to deposit (*LDR*) and expect a positive impact on bank risk. We employ the natural logarithm of regional GDP (*GDRP*) and poverty rate (*Poverty*) for the macro-regional level to account for regional economic characteristics. We use bank density (*Bank_Density*) by calculating the number of all types of bank branches to control competition. Rural banks have limited area coverage compared to their commercial counterpart; thus, commercial banks' presence increases regional competition.

In order to empirically examine the effect of trust on rural bank risk in Indonesia, we developed the following equation:

$$ZScore_{it} = \beta_0 + \beta_1 Trust_{it} + + \sum_m \theta_m Control_i + \varepsilon_i \qquad (2)$$

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where *i* and *t* refer to a bank and time index. To estimate eq. (2) using static panel regression technique, we first run both random and fixed estimators and run the Hausman test to choose which estimation technique is more appropriate. As the Hausman test suggests random effect model is the more appropriate we then employ it as our main estimation technique. The standard errors in the estimation were adjusted at the bank level to eliminate heteroscedasticity and autocorrelation issues.

We tested the correlation coefficient between independent variables to ensure that our model did not have any multicollinearity issues. As shown by Table 1, there are no multicollinearity issues due to correlation coefficients between independent variables being less than 0.5. Although InTrust and OutTrust exhibit low correlation we still separately run the two trust categories following Nicolas et al. (2023) to distinguish between the two trust dimensions.

RESULTS AND DISCUSSION

In this sub-section, we provide the result of our empirical estimation regarding trust and bank risk. Our primary research question is to analyze whether or not trust will affect rural bank risk-taking behavior. Table 2 implies that trust indeed determines rural bank risk. Furthermore, we discover a different effect of the trust dimension on bank rural stability. We observe a robust negative impact of in-group trust on rural bank stability. The increase of in-group trust will most likely reduce trust toward formal financing and develop more into informal financing, reducing rural bank stability as a formal lender. Conversely, our evidence suggests that out-group trust is positively associated with bank stability. The increase in general trust will also increase bank lending and require less formal enforcement mechanisms, translating into more profit and stability for rural banks as formal lenders.

Table 1. Correlation Matrix

	InTrust	OutTrust	lnTA	EQTA	NPL	CAR	LDR	GDRP	Poverty	Bank_Density
InTrust	1.000									
OutTrust	0.097	1.000								
lnTA	-0.025	-0.010	1.000							
eqta	0.001	0.001	-0.025	1.000						
npl	-0.005	0.004	-0.060	0.002	1.000					
car	-0.002	0.001	-0.003	-0.001	0.002	1.000				
ldr	-0.007	0.002	-0.012	-0.001	0.093	0.001	1.000			
GDRP	-0.132	-0.009	0.014	-0.001	0.002	0.002	0.004	1.000		
Poverty	-0.321	0.130	0.017	-0.001	0.003	0.004	0.004	-0.067	1.000	
Bank_Density	0.127	-0.022	-0.091	0.005	0.009	0.001	-0.002	-0.081	0.070	10.000

This evidence on two dimensions of trust is in line with the previous empirical literature (Nicolas et al., 2023; Saiedi et al., 2020). The high level of *InTrust* implies

that society is less likely to open to formal financial institutions, forming the growth of informal lenders and keeping them away from formal institutions (Saiedi et al., 2020). This condition could be exacerbated further if there is a presence of high distrust towards formal banking institutions (Ziegler et al., 2019). Conversely, the high level of *OutTrust*implies society's openness toward outside institutions, including formal financial institutions. Thus, *OutTrust* will increase the likelihood of formal financial institution growth, lowering rural banks' risk (Nicolas et al., 2023).

Table 2. The Effect of Trust on Rural Bank Risk

	(1)	(2)	(3)	(4)
	ZROA	**LnZROA**	**ZROA**	**LnZROA**
lnTrust	-3.885**	-5.830***		
	(-2.31)	(-3.37)		
OutTrust			18.45***	21.97***
			(5.80)	(5.50)
lnTA	0.0529***	-0.0321**	0.0531***	-0.0318**
	(2.90)	(-1.99)	(2.91)	(-1.98)
EQTA	0.323***	0.000287**	0.323***	0.000291**
	(5329.67)	(2.21)	(5321.36)	(2.23)
NPL	-0.000471	-0.000306***	-0.000472	-0.000308***
	(-1.55)	(-4.30)	(-1.55)	(-4.26)
CAR	2.15e-09***	1.26e-09***	2.14e-09***	1.25e-09***
	(16.66)	(12.85)	(16.66)	(12.81)
LDR	0.0000261***	0.0000205*	0.0000262***	0.0000206*
	(3.00)	(1.72)	(3.00)	(1.71)
GDRP	-0.0161***	-0.0131***	-0.0159***	-0.0126***
	(-4.31)	(-3.29)	(-4.26)	(-3.17)
Poverty	0.107***	0.0992***	0.109***	0.105***
	(7.60)	(7.69)	(8.23)	(8.43)
Bank_Density	0.0127***	0.00720***	0.0125***	0.00686***
	(7.93)	(5.45)	(7.95)	(5.30)
_cons	0.364	1.433**	-1.222***	-0.859***
	(0.56)	(2.28)	(-3.76)	(-2.90)
N	37191	32838	37191	32838
N_g	1866	1834	1866	1834
r2_w	0.986	0.00458	0.986	0.00454
r2_o	0.984	0.0230	0.985	0.0303

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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Table 3. The Effect of Trust on Rural Bank Risk Based on Regional Poverty

	(1)	(2)	(3)	(4)
	ZROA	**LnZROA**	**ZROA**	**LnZROA**
lnTrust	-2.655	-4.484**		
	(-1.55)	(-2.56)		
OutTrust			16.15***	19.68***
			(5.24)	(5.22)
HPoverty*lnTrust	17.36***	21.76***		
	(8.32)	(10.77)		
HPoverty*OutTrust			-45.53***	-54.14***
			(-12.35)	(-13.01)
lnTA	0.0521***	-0.0332**	0.0523***	-0.0329**
	(2.85)	(-2.05)	(2.86)	(-2.04)
EQTA	0.323***	0.000297**	0.323***	0.000299**
	(5245.01)	(2.27)	(5230.43)	(2.28)
NPL	-0.000470	-0.000306***	-0.000471	-0.000308***
	(-1.55)	(-4.34)	(-1.55)	(-4.31)
CAR	2.14e-09***	1.25e-09***	2.14e-09***	1.25e-09***
	(16.66)	(12.75)	(16.66)	(12.72)
LDR	0.0000261***	0.0000205*	0.0000261***	0.0000205*
	(3.00)	(1.71)	(3.00)	(1.71)
GDRP	-0.0165***	-0.0135***	-0.0164***	-0.0131***
	(-4.42)	(-3.40)	(-4.39)	(-3.31)
Bank_Density	0.0138***	0.00821***	0.0137***	0.00800***
	(8.72)	(6.27)	(8.74)	(6.19)
HPoverty	-5.089***	-6.470***	1.210***	1.379***
	(-7.68)	(-10.11)	(15.79)	(16.29)
_cons	0.576	1.563**	-0.563*	-0.225
	(0.91)	(2.54)	(-1.77)	(-0.78)
N	37191	32838	37191	32838
N_g	1866	1834	1866	1834
r2_w	0.986	0.00459	0.986	0.00457
r2_o	0.984	0.0247	0.985	0.0311

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

We find that size does not consistently predict bank stability as the result is inconsistent with different stability measurements. Furthermore, the leverage represented by the ratio of equity to the total asset (*EQTA*), capital adequacy ratio (*CAR*), and the ratio of total loan to total deposit significantly (*LDR*) and positively impacts stability.

In line with theory, lower financial risk, liability risk, and intermediation efficiency will translate into higher profitability and stability. A higher regional economy (*GDRP*) leads to lower stability. A plausible explanation for this is that in the wealthier region, people are more likely to obtain financing from bigger banks as their access to financing is substantially improved alongside the development of the economy, which decreases rural banks' stability.

Poverty (*Poverty*) consistently impacts stability, as shown by a positive significant coefficient across different rural bank risk-stability measurements. Poorer regions typically have lower access to conventional banks or national-wide syariah banks, which gives rural banks more opportunity to serve to fill the financing gaps. Thus, rural banks have more opportunities than others. Rural banks also create profitability in the area, translating into a lower risk of default and more stability. Bank density (*Bank_Density*) positively correlates with rural banks' stability, implying that high-density banks in the area are more likely to increase stability due to regions' growth opportunities that attract more banks to serve financing in the area. Our results on control variables are in line with previous empirical works of literature (Achsanta et al., 2021; Moudud-Ul-Huq, 2019).

To investigate further how trust shapes risk-taking behaviour in rural banks, we interact our trust variables with regional poverty by creating dummy *HPoverty* which takes value one if the regional poverty is above median and zero otherwise. Our result as shown by Table 3 indicates that trust in two different regions classified by poverty in fact has contradictive impact. We find that in-group trust in lower poverty region has negative impacts toward rural banks stability, while in high poverty region in-group trust has positive impact on rural banks stability. This further clarify that indeed higher in-group trust will encourage the development of informal lending in the society thus reduces rural banks stability due to the lack of demand.

Furthermore, we find also that out-group trust has a positive impact on stability only in low poverty regions compared to high poverty regions, in which out-group trust has a negative impact on stability. In lower-poverty areas, high out-group trust generally translates into more lending creations, including higher trust in formal financing institutions. However, in the higher poverty regions, this higher lending creations may lead to financing potentially bad debtors, which more likely to increase rural banks' risk. This underscores the urgent need to address the potential negative impact of out-group trust in high-poverty regions.

These empirical findings, therefore, are in line with previous empirical literature. First, rural banks are dealing with a market where commercial banks are reluctant to enter due to clientele factors (e.g., lack of financial report, mostly underbanked clients, high information asymmetry, creditworthiness), which increases the credit risk (Wasiaturrahma et al., 2020). Secondly, such risk will reduce rural banks' profitability and, in turn, translate into higher overall risk for the rural banks (Banna et al., 2022; Blanco-Oliver et al., 2021; Zamore et al., 2019). Therefore, higher *OutTrust* will not be beneficial

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in an area with high poverty. Conversely, a higher level of *InTrust* in the high poverty region will shift the credit risk from rural banks to their informal lending institution counterpart.

CONCLUSION

Trust has been one of the important components in finance that helps develop the economy by fostering better resource allocation through intermediaries. However, understanding key dimensions of trust is essential as there is indeed a different view on how people regard acquaintances and strangers in developing their trust. This condition will affect the behavior of borrowing and lending, which can be translated into the bank's risk profile. Rather than big banks that operate nationally, rural banks tend to deal with a specific level of trust given to the culture adopted in the region where the banks operate. Therefore, our evidence is important to understand why rural banks in specific regions are prone to failure compared to other regions. Using unique hand-collected data on rural banks' quarterly financial reports from 2010Q2 to 2016Q3 with around 1846 rural banks in Indonesia, we conduct empirical estimation to study how regional characteristics shape rural banks' risk.

Our evidence suggests that rural banks tend to be stable in the regions where out-group trust is high and tend to be risky in the regions where in-group trust is high. Furthermore, our analysis shows that poverty is important in determining rural banks' risk profile, given the in-group and out-group trust levels. Rural banks tend to have lower risk and more stability in the region with high in-group trust and poverty levels. The high poverty rate combined with high in-group trust forms more growth for informal lending, reducing potential bad debt to rural banks, as those who are underbanked or unbanked tend to borrow from their acquaintances rather than formal institutions. In contrast, rural banks tend to have higher risk and less stability in the regions where the level of out-group trust and poverty is high. In these regions, even though the high out-group trust is bolstering the growth of lending through formal financial institutions, the high rate of poverty, in fact, increases also the probability of bad debt, which can be translated into more risk of loan failure in repayment and, in turn, the risk of default for rural banks.

Our research offers crucial policy recommendations for both regulators and industries. Firstly, rural banks in regions with high out-group trust and poverty levels must exercise prudence in their loan enforcement and screening processes. This is a key strategy to mitigate the higher risk associated with these regions. Secondly, poverty alleviation emerges as the primary solution to transform rural banks' risk profiles to a lower level, underscoring the urgency of addressing poverty in these regions.

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Competition Dynamics of Market Share for Assets in the Banking Industry Using the Lotka-Volterra Model Approach

Sri Wahyuni Jamal[1], Suparno[2], Umi Kartini Rashid[3*], Fenty Fauziah[4]

[1]Department of Management, Universitas Muhammadiyah Kalimantan Timur, Indonesia
[2]Department of Mathematics, Gadjah Mada University, Yogyakarta, Indonesia
[3]Johor Business School, Universiti Tun Hussein Onn Malaysia, Malaysia
[4]Master of Management Study Program, Universitas Muhammadiyah Kalimantan Timur, Indonesia
E-mail: [1]swj579@umkt.ac.id, [2]soeparno.daga@gmail.com, [3]kartini@uthm.edu.my, [4]ff230@umkt.ac.id
[*)]**Corresponding Author**

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Abstract

Research Originality: Competition in the banking sector is unavoidable. Such competition is present among state-owned banks in Indonesia. In contrast to the previous studies that did not include the competition type and its stability, this study includes the competition type and its stability in the estimation.

Research Objectives: This study aims to discover the competition type and its stability, and to forecast the market share among the four state-owned banks.

Research Methods: Using market share data of assets published annually by each of the banks from 2010 to 2023, the study employs the Lotka-Volterra model approach to analyze the competition type and its stability that occur among the four state-owned banks.

Empirical Results: The study discovers that the competition types of the four state-owned banks vary. There have been three competition types among the four state-owned banks: mutualism, predator-prey and pure competition. Besides, the stability property of the four state-owned banks tended to be unstable. As a result, the total market share gains for the four state-owned banks declined sequentially.

Implications: This research holds significance for four state-owned banks in Indonesia as it provides valuable insights into considering the three competition types (mutualism, pure competition and predator-prey) as the primary key to achieving a significant market share value.

Keywords:

asset; competition type; Lotka-Volterra model; market share; stability

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INTRODUCTION

A bank is a financial institution and intermediary that accepts deposits, provides loans, and actively participates in stock market derivatives as a liaison between customers (individuals or companies) who lack capital and customers (individuals or companies) who have excessive capital. Financial institutions are considered the key component in economic development and growth. Therefore, measuring the strength and potential of the macroeconomy as a whole requires a sustainable banking industry (Talpur, 2023).

The earliest manifestation of the "banking phenomenon" is Monte dei Paschi di Siena, headquartered in Siena, Italy, operating since 1472, followed by Berenberg Bank of Hamburg in 1590, Germany, and Sveriges Riskbank of Sweden in 1668, Sweden. Banks play an essential role in developing the economy by injecting funds into the financial sector, mobilizing funds from surplus units to deficit units, and providing various innovative services (Uddin et al., 2022).

The banking system offers a complex array of products and services, directly or indirectly connecting with almost every economic sector (Citterio, 2024; Hurd, 2018). However, it is also crucial to examine the efficiency of banks, as they directly affect the stability of the banking sector and the effectiveness of the country's economic policies. The banking sector's stability plays a crucial role in fostering economic growth and enhancing the overall health of the financial system in all countries (Athari, 2022; Balcilar et al., 2018; Stewart et al., 2021).

Efficient financial systems are essential for the economic growth and development desired by countries worldwide (Bekele & Degu, 2023; Diallo, 2018). Furthermore, an efficient financial system is less susceptible to financial crises and contributes to financial and economic stability (Yuan et al., 2022). Over the past few decades, there has been steady growth in research related to coopetition strategies (Czakon & Czernek, 2016; Felzensztein et al., 2018; Meena et al., 2023). Coopetition refers to the interaction between cooperation and competition, wherein organizations collaborate with their industry competitors to achieve mutually beneficial outcomes, such as acquiring new assets and enhancing customer satisfaction (Bengtsson & Raza-Ullah, 2016; Pattinson et al., 2018). Industrial market conditions can strongly influence bank efficiency, especially market competition (Cheng et al., 2022).

Fundamentally, the primary motivation for banking competition is attributed to the booster of economic growth via the channel of lower prices (Huynh, 2023). The traditional view is that increased banking competition is associated with a drop in lending rates, an essential driver of increased business investment and improved economic growth (Abuselidze, 2021). Banking competition can offer welfare gains by wiping out monopoly rents and reducing cost inefficiencies, leading to better access to financial services and improved financial stability (Claessens & Leaven, 2005). However, despite its numerous benefits, one has been concerned about the negative aspects of high competition in the banking sector (Huynh, 2023). The most considerable concern is based on the competition fragility view (Ekananda, 2023), implying that greater competition may damage bank

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prudence through reduced profits, thereby raising risk-taking incentives of incumbent banks and posing a threat to the safety and soundness of the banking system. Also, increased competition may discourage banks from investing in lending relationships and negatively influence enterprises' access to finance (Sääskilahti, 2016).

In the banking industry, differentiation from competitors hinges on providing top-notch service. Technological advancements enable businesses to offer superior services that meet clients' needs and expectations (Ejigu, 2016). Competition dynamics, particularly among companies, are currently very tight, but most companies offer products or services almost the same as their competitors. To differentiate themselves from competitors, companies need to offer excellent services. It is known that higher service quality leads to more satisfied customers, and higher customer satisfaction leads to customer loyalty. Providing quality and taking the market, as well as offering more services, will make customers satisfied and loyal, and in return, the company will earn more profits (Ozatac et al., 2016).

The increasingly intense competition in the Indonesian banking sector began with the transparency of Indonesian banking, issuing a policy package on June 1, 1983 (Pakjun83), aiming for banking modernization. This regulation was followed by the October policy package (Pakto88) on October 27, 1988, which eased the licensing for establishing new banks, including opening branch offices. At that time, with only IDR 10 billion, an investor could already establish a new bank (Daruri & Edward, 2004), which led to a significant increase in banks. Thus, the increase in the number of banks will certainly result in competition dynamics in the banking sector.

The mathematical modeling approach, particularly the competition model among species, has been extensively used in economics. Based on its role, competition is divided into six types: mutualism, predator-prey, commensalism, amensalism, pure competition, and neutralism (Mougi, 2016). One is applying the competition model to see the company's market share dynamics. Undeniably, external and exogenous factors (technological innovation and regulation) greatly affect the market's functioning and push companies to change their competitive strategies. This condition is because competitive interactions among companies change over time in response to technological innovations and regulations (Cerqueti et al., 2015; Marasco et al., 2016b).

Several studies have explored competition among banks in Indonesia, such as those conducted by Widyastuti and Armanto (2013) and Qori'ah (2016). In their studies, Widyastuti and Armanto (2013) examined the level of competition in the banking industry before and after the introduction of the Indonesian Banking Architecture (API). Using panel data, they found a decrease in banking competition after the introduction of API and a tendency toward large monopolies or collusive oligopolies. Similarly, (Qori'ah, 2016) examined the concentration and competitive behavior of conventional commercial banks in the national banking industry. Her analysis revealed less competitive bank behavior due to high industry concentration. While Widyastuti and Armanto (2013) utilized the Panzar Rosse (PR) model, Qori'ah (2016) employed a panel data regression model. However, neither study determined the specific competition

types and their stabilities among competing banks. Therefore, this study aims to fill this gap by analyzing the competition types and their stabilities among the competing banks.

Competition in the banking sector is also often supposed to benefit bank clients because it increases the available choices and contributes to the lowering of the borrowing rates and the raising of the deposit rates (Ferreira, 2023). Two main competing hypotheses are identified. The competition-fragility hypothesis views competition as reducing stability because it encourages banks to increase risk and operate with low capital buffers, highlighting the potential trade-off between competition and stability (Anhert & Martinez-Miera, 2021; Horvath et al., 2016) The competition-stability hypothesis views financial consolidation as improving stability, namely through higher capital buffers and a greater degree of diversification (Goetz, 2018; Schaeck & Cihák, 2014). Based on some studies above, it is important to recognize the competition type and stability among banks. Hence, the novelty of this research includes the competition type and stability among the four state-owned banks in Indonesia.

In this study, we apply the Lotka-Volterra model approach (Lotka, 1925; Volterra, 1926) to determine the competition type and its stability that occur among state-owned banks (BRI, BNI, Mandiri, and BTN) based on market share data for assets owned by each bank. In addition, we also forecast the market share for assets in the next few years. This forecast is intended to see the dynamics of future competition among the four banks. We use market share data for annual assets published by each bank from 2010-2023 (BNI, 2024; BRI, 2024; BTN, 2024; Mandiri, 2024). Our model assumes that each bank can change its competitive behavior based on time. This model allows us to know the level of asset growth and the interaction coefficient at the four banks, which depends on time. It is hoped that the results of this research can provide important information about the competition type and stability in the banking sectors as a basis for consideration, support, and contribution of thought to decision-makers in business to increase income and carry out business development.

METHODS

The types of banks in Indonesia are Commercial Banks, Rural Banks, and Sharia Banks. One business entity that plays an important role in Indonesia is State-Owned Enterprises. The State-Owned Enterprises Industry Cluster consists of Tourism and Support Services, Telecommunications and Media Cluster, Energy, Oil, and Gas Cluster, Health Cluster, Manufacturing Cluster, Food and Fertilizer Cluster, Plantation and Forestry Cluster, Mineral and Coal Cluster, Insurance and Pension Fund Services, Financial Services, Infrastructure Services and Logistics Services (BUMN, 2023). Financial Services consists of Bank Rakyat Indonesia (BRI), Bank Negara Indonesia (BNI), Bank Mandiri (Mandiri), and Bank Tabungan Negara (BTN). The data we use in this study is market share data for assets published annually by each bank. There are fourteen pieces of data, and those are from 2010 to 2023.

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In Figure 1, it can be seen that the market share gain from the four banks has fluctuated from 2010-2023. BTN's market share has always been under BRI, BNI and Mandiri. The lowest market share for assets was obtained by BTN of 0.023 in 2010, while the highest market share gain for BRI was 0.178 in 2022. In Figure 2, it appears that the total market share for the assets of the state-owned banks with 0.504 gain occurred in 2022. On the other hand, the highest market share gain was for assets not owned by BRI, BNI, Mandiri, and BTN (for example, other banks, insurance companies, pawn shops, and others) was 0.621 in 2013. In addition, the total market share gain for BRI, BNI, Mandiri, and BTN assets has increased from 2013 to 2020. On the contrary, the market share gain for assets outside of BRI, BNI, Mandiri, and BTN tended to decrease over the same period.

Figure 1. The Assets Market Share of the Four State-Owned Banks

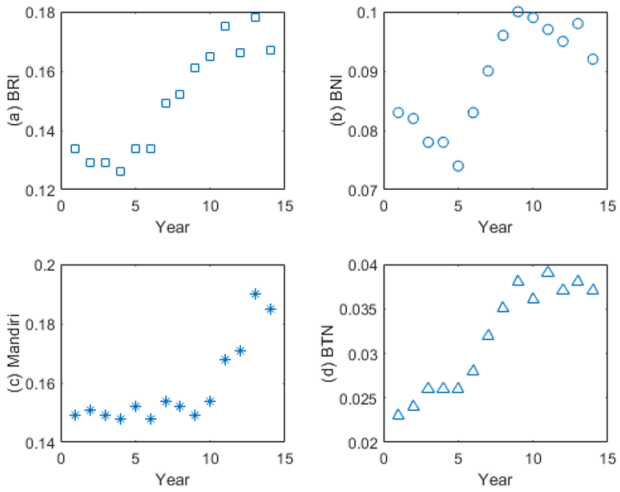
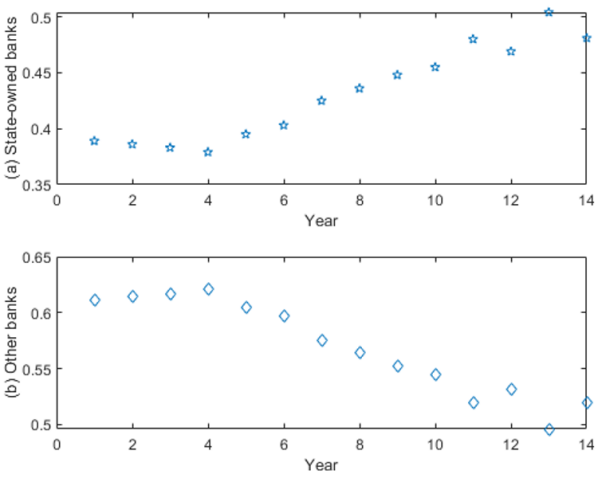


Figure 2. The Total Market Share for Assets of the State-Owned Banks and the Market Share Outside the State-Owned Banks



This study used a mathematical approach by adopting the Lotka-Volterra (LV) model (Marasco et al., 2016a). This model generally describes the dynamics of interaction between species in a population. The LV model in question is as follows.

$$\dot{x}_i(t) = x_i(t)\left[g_i(t) - \sum_{j=1}^{N} g_j(t)x_j(t)\right], \quad i = 1,2,3,\dots,N, \tag{1}$$

where $g_i(t)$ that is a function that can be integrated over the interval $0 \le t \le \infty$, and N is the number of competing species.

If Model (1) is applied to the market share for a bank's asset ($x_i(t)$ denotes market share), two cases arise. In this research, we only use the first case.

If $\sum_{i=0}^{N} x_i(t) = 1$, Model (1) supplies market share for all assets and $x_0(t) = 1 - \sum_{j=1}^{N} x_j(t)$. According to the research results, the solution of Model (1) is as follows (Nevo & Rossi, 2008).

$$x_i(t) = \frac{\exp(f_i(t))}{1 + \sum_{j=1}^{N} \exp(f_j(t))}, \quad i = 1,2,3,\dots,N, \tag{2}$$

where $f_i(t)$ is the utility function that consumers choose the i bank, $g_i(t) = \dot{f}_i(t) = \frac{df_i}{dt}$, and $x_i(t_0) = \frac{\exp(f_i(t_0))}{1+\sum_{j=1}^{N} \exp(f_j(t_0))}$.

By using Equation (2), we can evaluate the utility function $f_i(t)$ based on available market share data. In fact, like the classical logarithmic model, we can easily find the discrete value solution of the utility function as follows:

$$f_i(t) = \ln x_i(t) - \ln x_0(t), \quad i = 1,2,3,\dots,N. \tag{3}$$

Furthermore, by using the curve fitting, which is available in Matlab software, we can find a function that is close to the utility function $f_i(t)$,i=1,2,3,...,N. The approximation result function obtained depends on time t. After the utility function is approximated, the approximation result is substituted into Equation (2). Thus, up to this point, we have found the function $g_i(t)$, which is the value of the parameter in Model (1) and we have also found the estimation result of market share. Through the calculation result of function $g_i(t)$, we can determine the competition type that occurred among banks. The function $g_i(t)$ is no other than a function that can be zero, positive or negative (Marasco et al., 2016a).

To evaluate the accuracy of the market share value estimated by the LV model, we use Mean Square Error (MSE) and Mean Absolute Percentage Error (MAPE to compare historical data with estimated data. The MSE and MAPE error sizes can be calculated as follows:

$$\text{MSE} = \frac{1}{n}\sum_{i=1}^{N}(h_i - p_i)^2, \qquad \text{MAPE} = \frac{1}{n}\sum_{i=1}^{N}\left|\frac{h_i - p_i}{h_i}\right| 100\%,$$

where h_i and p_i sequentially are historical data and estimation result data. The final stage of this study is to forecast market share by extending the time t.

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RESULTS AND DISCUSSION

Result

Based on the annual market share data for assets from BRI, BNI, Mandiri and BTN that we have collected, the total market share for the assets of the four banks from 2010-2023 is less than one (see Figure 2). This means that there is a market share for the assets of banks or other companies, symbolised by $x_0(t)$, which is involved in the dynamics of competition. In other words, the discussion in this study accommodates the existence of other market shares for assets.

Since the market share data for the observed assets were taken from four state-owned banks, the discussion in this study involves a system of four-dimensional differential equations. The system is as follows:

$$\begin{aligned}
\dot{x}_1(t) &= g_1(t)x_1(t) - g_1(t)x_1^2(t) - g_2(t)x_1(t)x_2(t) - g_3(t)x_1(t)x_3(t) - g_4(t)x_1(t)x_4(t)\\
\dot{x}_2(t) &= g_2(t)x_2(t) - g_2(t)x_2^2(t) - g_1(t)x_1(t)x_2(t) - g_3(t)x_2(t)x_3(t) - g_4(t)x_2(t)x_4(t)\\
\dot{x}_3(t) &= g_3(t)x_3(t) - g_3(t)x_3^2(t) - g_1(t)x_1(t)x_3(t) - g_2(t)x_2(t)x_3(t) - g_4(t)x_3(t)x_4(t)\\
\dot{x}_4(t) &= g_4(t)x_4(t) - g_4(t)x_4^2(t) - g_1(t)x_1(t)x_4(t) - g_2(t)x_2(t)x_4(t) - g_3(t)x_3(t)x_4(t),
\end{aligned} \tag{4}$$

where $x_1(t)$, $x_2(t)$, $x_3(t)$ and $x_4(t)$ consecutively are market share for BRI assets, market share for BNI assets, market share for Mandiri assets and market share for BTN assets. The term $x_1(t)x_2(t)$, $x_1(t)x_3(t)$, $x_1(t)x_4(t)$, $x_2(t)x_3(t)$, $x_2(t)x_4(t)$ and $x_3(t)x_4(t)$ consecutively is the competition term between BRI and BNI, the competition term between BRI and Mandiri, the competition term between BRI and BTN, the competition term between BNI and Mandiri, the competition term between BNI and BTN and the competition term between Mandiri and BTN.

Model (4) represents the growth rate of four banks over time t. The operator $\dot{x}_1(t)$ is the growth of market share for BRI, $\dot{x}_1(t)$ is the growth of market share for BNI, $x_3(t)$ is the growth of market share for Mandiri, and $\dot{x}_1(t)$ is the growth of market share for $g_i(t)$ BTN. On the other hand, Model (4) also includes function $g_i(t)$, i =1,2,3,4. Function g_i (t) is called the parameter. So, there are four parameter functions in Model (4). Every parameter function determines the behaviour and stability of the Model (4). Every change of parameter values (from positive to negative or vice versa, or zero) will change the competition type and stability of the Model (4). Function $g_i(t)$ as the parameter depends on time t.

To get the best estimation of market share for assets, we need to find the solution of Model (4). Mathematically, the analytical solution of Model (4) is

$$x_i(t) = \frac{\exp(f_i(t))}{1 + \sum_{j=1}^{4} \exp\left(f_j(t)\right)}, \quad i = 1,2,3,4, \tag{5}$$

where $f_i(t)$ is the utility function that consumers determine the choice of the i bank, $x_i(t_0) = \frac{\exp(f_i(t_0))}{1+\sum_{j=1}^{4} \exp(f_j(t_0))}$, and $x_0(t) = 1 - \sum_{j=1}^{4} x_j(t)$.

In this section, we will show the utility functions of BRI, BNI, and Mandiri using curve fitting with Matlab software. In economics, the utility function measures consumer welfare or satisfaction. As it is known in Equation (5), the market share value for bank $x_i(t)$ assets depend on the fit utility function $f_i(t)$, i = 1,2,3,4. Therefore, in estimating the market share value for an asset, we must first find its utility function. According to the data, we can find the function $f_i(t) = \ln x_i(t) - \ln x_0(t)$ for each bank. The utility function is polynomial functions of degree three, with an accurate fit test. The utility functions of each bank are as follows.

$$f_1(t) = -0.00091t^3 + 0.0208t^2 - 0.088t - 1.457, \quad f_3(t) = -0.00011t^3 + 0.00588t^2 - 0.0325t - 1.37$$
$$f_2(t) = -0.00128t^3 + 0.0289t^2 - 0.142t - 1.873, \quad f_4(t) = -0.001001t^3 + 0.0205t^2 - 0.0486t - 3.23,$$

where $f_1(t)$, $f_2(t)$, $f_3(t)$ and $f_4(t)$ consecutively is the utility function for BRI, the utility function for BNI, the utility function for Mandiri and the utility function for BTN.

Theoretically, the competition type of BRI, BNI, Mandiri and BTN can be observed through the (negative, zero, or positive) signs in each parameter value ($g_i(t)$, i=1,2,3,4) in Model (4) (Marasco et al., 2016a). It is found that the utility function is a polynomial function of degrees three. Therefore, we can calculate $g_i(t)$ easily. The function $g_i(t)$ is the first derivative from the utility function $f_i(t)$ toward time t. Hence, we obtain the function $g_i(t)$ as follows:

$$g_1(t) = -0.002739t^2 + 0.041728t - 0.08862, \quad g_3(t) = -0.0003357t^2 + 0.011772t - 0.0325{,}8$$
$$g_2(t) = -0.003867t^2 + 0.05788t - 0.1424, \quad g_4(t) = -0.003003t^2 + 0.04104t - 0.04868,$$

where $g_1(t)$, $g_2(t)$, $g_3(t)$ and $g_4(t)$ consecutively are parameter value for BRI, parameter value for BNI, parameter value for Mandiri and parameter value for BTN.

Since the derivative of the polynomial function is also a polynomial function, the function $g_i(t)$ can be integrated at the interval $0 \le t \le \infty$. Table 1 shows the parameter value of $g_i(t)$ toward time t from each bank from 2010-2023.

Table 1. The parameter value of $g_i(t)$ from each bank

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14
g_1	-0.05	-0.016	0.012	0.035	0.052	0.063	0.070	0.070	0.066	0.055	0.040	0.019	-0.008	-0.040
g_2	-0.09	-0.045	-0.007	0.024	0.048	0.064	0.073	0.075	0.070	0.058	0.038	0.011	-0.023	-0.064
g_3	-0.02	-0.011	-0.001	0.008	0.017	0.025	0.032	0.039	0.045	0.050	0.055	0.059	0.062	0.065
g_4	-0.01	0.021	0.047	0.067	0.081	0.089	0.091	0.087	0.077	0.061	0.039	0.011	-0.023	-0.063

Based on the sign of the parameter value in Table 1, we can determine the competition type of each bank by looking at the sign of each parameter value. The competition types of the four banks are explain in Table 2. Generally speaking, from 2010-2023, the competition types of the four banks vary from year to year. There have been three competition types among the four state-owned banks: mutualism, predator-prey and pure competition.

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Market share is the percentage of sales of a product in units, dollars or measures generated by the company on all product sales. Based on this definition, market share is directly affected by the utility function of a product, or mathematically we can say that market share can be measured through the utility function.

Table 2. Competition types

Year	BRI & BNI	BRI & Mandiri	BRI & BTN	BNI & Mandiri	BNI & BTN	Mandiri & BTN
2010	Mutualism	Mutualism	Mutualism	Mutualism	Mutualism	Mutualism
2011	Mutualism	Mutualism	Prey-predator	Mutualism	Prey-predator	Prey-predator
2012	Predator-prey	Predator-prey	Pure competition	Mutualism	Prey-predator	Pure competition
2013-2021	Pure competition	Pure competition	Pure competition	Pure competition	Pure competition	Pure competition
2022-2023	Mutualism	Prey-predator	Mutualism	Prey-predator	Mutualism	Predator-prey

To obtain the estimated value of the market share for those four banks, we can directly substitute the utility function $f_1(t)$, $f_2(t)$, $f_3(t)$ and $f_4(t)$ into Equation (5). Therefore, we obtain the results of the estimated market share for assets from BRI, BNI, Mandiri and BTN, which are presented in Table 3, Figure 3, and Figure 4.

Table 3. Estimated market share for assets from each bank

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Time (t)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
X_1	0.133	0.130	0.130	0.132	0.136	0.142	0.148	0.155	0.161	0.167	0.171	0.173	0.172	0.168
X_2	0.084	0.079	0.078	0.078	0.080	0.084	0.088	0.092	0.096	0.099	0.101	0.100	0.097	0.091
X_3	0.151	0.150	0.149	0.149	0.149	0.150	0.151	0.152	0.155	0.159	0.164	0.171	0.180	0.192
X_4	0.023	0.024	0.025	0.026	0.028	0.030	0.032	0.034	0.036	0.037	0.038	0.039	0.038	0.037
Total	0.390	0.383	0.382	0.386	0.394	0.405	0.418	0.433	0.448	0.462	0.474	0.483	0.488	0.488

Figure 3. Historical Data and Estimated Market Share for the 2010-2023 period

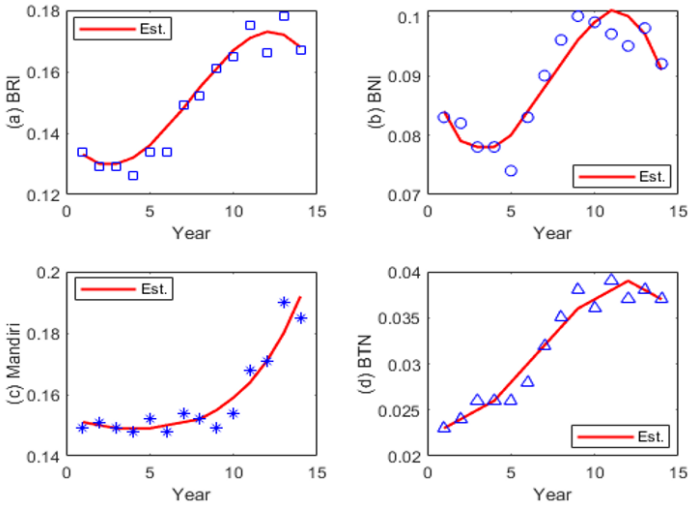
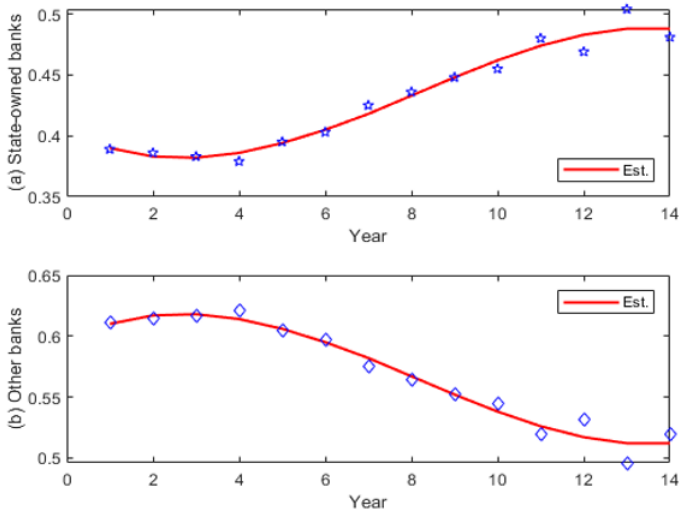


Figure 4. Historical Data of the Total Market Share for Assets

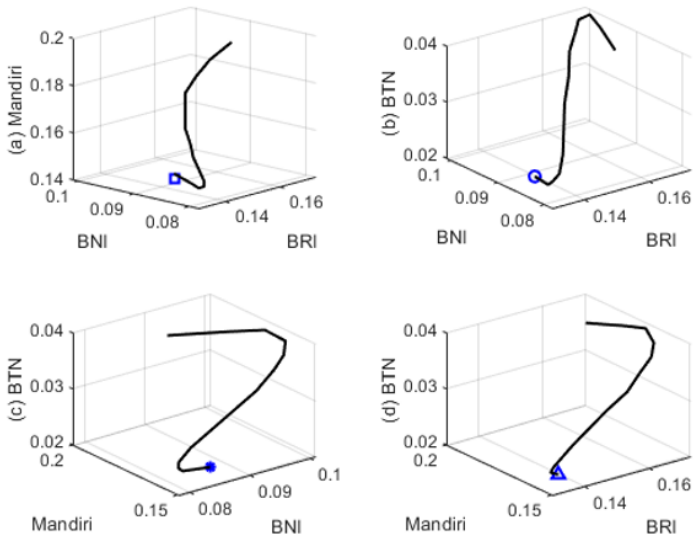


In this section, we will conduct an analysis to analyze the stability of the competition model that occurs among the four banks. Stability analysis is important, because by knowing the stability properties of the model, we can determine the behavioral tendencies of each bank resulted by the competition. Next, we present the stability properties of the model for the 2010–2023 period. The results of the competition analysis are presented in Table 4 and Figure 4.

Table 4. The Stability of the Four State-owned Banks

Period	BRI, BNI & Mandiri	BRI, BNI & BTN	BNI, Mandiri & BTN	BRI, Mandiri & BTN
2010-2023	Unstable	Unstable	Unstable	Unstable

Figure 5. The Stability of Market Share for BRI, BNI, Mandiri and BTN Assets



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To evaluate the estimation result of the four banks' market share values, we present the estimation result of the Mean Square Error (MSE) and Mean Absolute Percentage Error (MAPE). The MSE and MAPE error measures for the 2010-2023 period are showing in Table 5. Based on the MSE and MAPE results, the resulting model has very high accuracy. Therefore, this model can be used to analyze the competition dynamics that occur in the four banks. Apart from that, this model can also be used to predict the competition type that may occur between the four banks in the next few years.

Table 5. MSE and MAPE values of each bank

Bank	MSE	MAPE (%)
BRI	0.000013890463739776	1.924
BNI	0.000008885906335308	2.636
Mandiri	0.000018321384683592	1.908
BTN	0.000001658459607784	3.478
Total market share	0.000051787709303120	1.198

Table 6. The Forecasting of Competition Type for the 2024-2028 period

Year	BRI & BNI	BRI & Mandiri	BRI & BTN	BNI & Mandiri	BNI & BTN	Mandiri & BTN
2024	Mutualism	Prey-predator	Mutualism	Prey-predator	Mutualism	Predator-prey
2025	Mutualism	Prey-predator	Mutualism	Prey-predator	Mutualism	Predator-prey
2026	Mutualism	Prey-predator	Mutualism	Prey-predator	Mutualism	Predator-prey
2027	Mutualism	Prey-predator	Mutualism	Prey-predator	Mutualism	Predator-prey
2028	Mutualism	Prey-predator	Mutualism	Prey-predator	Mutualism	Predator-prey

This section will forecast the market share for BRI, BNI, Mandiri and BTN assets. This forecast assumes that the four state-owned banks will not change their strategy, either in adopting new technology or updating internal policies. They will compete for consumers over the next few years. Based on these assumptions, using Model (5), we obtain the competition type and the result of market share forecasting for the assets of the four banks for the 2024-2028 period shows in Table 6, Table 7, Figure 6 and Figure 7.

Table 7. The forecasting of Market Share for Assets from Each Bank

Year	Time (t)	X_1	X_2	X_3	X_4	Total
2024	15	0.160	0.082	0.207	0.034	0.483
2025	16	0.147	0.070	0.226	0.030	0.473
2026	17	0.130	0.056	0.249	0.026	0.461
2027	18	0.110	0.042	0.274	0.021	0.446
2028	19	0.087	0.029	0.301	0.015	0.433

Figure 6. The Forecasting of Market Share for Assets for the 2024-2028 Period

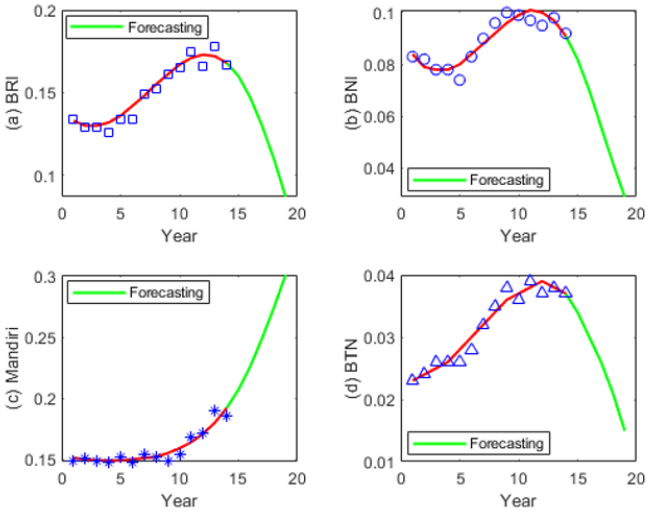
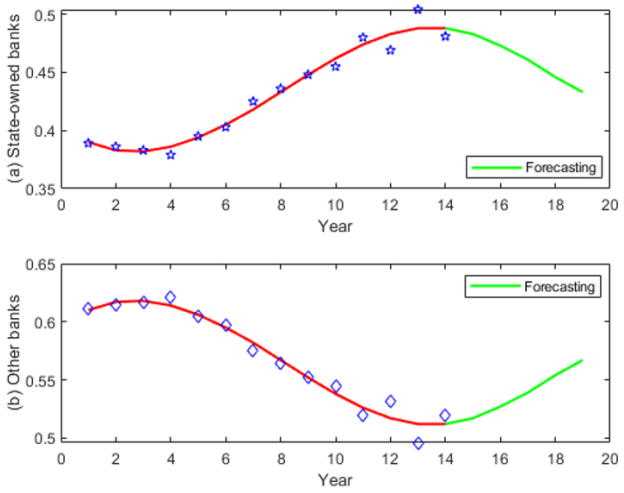


Figure 7. The Forecasting of the Total Market Share for Assets of the State-Owned Banks and the Market Share Outside the State-Owned Banks for the 2024-2028 period



DISCUSSION

Theoretically, market share is measured through a time-dependent utility function. In economics, the utility function measures consumer welfare or satisfaction. So, market share can change if the utility function changes occasionally. According to the annual market share data for assets published by BRI, BNI, Mandiri, and BTN, we can calculate their utility function. The four utility functions are four polynomial functions of degree 3. Through the utility functions of these four banks, we can quickly determine the parameters of each equation in Model (5) by differentiating every utility function toward time. Every parameter function determines the competition type and stability of the four state-owned banks.

The competition type of the four banks varies yearly from 2010-2023. Based on Table 2, the competition type of the four banks was mutualism in 2010, in which the

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market share for assets of the four banks benefited each other. In the 2022-2023 period, the competition type of BRI & BNI, BRI & BTN, and BNI & BTN also changed to mutualism, in which the market share for assets of the three banks benefited each other. These results align with previous studies (Goetz, 2018; Schaeck & Cihák, 2014). The research conducted by Goetz (2018) suggested that fewer barriers to entry significantly contribute to bank stability because more competition boosts bank profits and reduces individual bank shares of non-performing loans. Another study examined the effect of market competition on bank stability in the belief that competition incentivizes banks to enhance cost efficiency, increasing reallocation from unsuccessful (inefficient) banks to successful banks (Schaeck & Cihák, 2014). So, this competition type is identified as the competition-stability hypothesis.

In 2011, the competition type of BRI & BTN, BNI & BTN, and Mandiri & BTN changed to prey-predator, in which BTN (predator) benefit through the increased market share gains, while BRI, BNI, and Mandiri (prey) did not get any benefit. In 2012, the competition type of BRI & BNI and BRI & Mandiri also changed to predator-prey, in which BRI (predator) got a benefit through the increased market share gains, while BNI and Mandiri (prey) did not get any benefit. In addition, in the 2022-2023, all competition types changed. The competition type of BRI & BNI, BRI & BTN, and BNI & BTN changed to mutualism. In contrast, the competition type of BRI & Mandiri, BNI & Mandiri, and Mandiri & BTN changed to prey-predator, in which BRI, BNI, and BTN behaved as prey. In contrast, Mandiri behaved as a predator and benefited from increased market share gains. This information shows that the level of competition among the four banks was high and had a good impact on the four banks (Wibowo & Wibowo, 2019).

In 2012, the competition type of BRI & BTN and Mandiri & BTN changed to pure competition, in which the three banks competed quite fiercely with each other. When observed from the market share values, the decline in Mandiri's market share (0.149) (see Table 3). Besides, from 2013 to 2021, the four banks had the same competition type (see Table 2). It was pure competition, in which the four banks competed quite fiercely. When observed from the market share values, the market share of BRI, Mandiri, and BTN tended to increase. The market share of BNI only tended to increase in 2013-2020, while it tended to decrease in 2021 (see Table 3).

These results align with previous studies(Anhert & Martinez-Miera, 2021; Ferreira, 2023). The research conducted by Anhert and Martinez-Miera (2021) found that increased bank competition or transparency contributes to increasing deposit rates, costly withdrawals, and, thus, bank fragility. Another study concluded that higher banking market competition does not increase banking stability (Ferreira, 2023). So, the pure competition type is identified as the competition-fragility hypothesis.

Generally speaking, from 2010 to 2023, there were three types of competition among the four state-owned banks: mutualism, predator-prey, and pure competition. Based on the estimation, the three competition types increased the total market share of the four banks (see Figure 4). In addition, there were two scenarios that we could

take to obtain the total maximum market share gain: (1) The suitable competition type of the four state-owned banks must be pure competition. This competition type lasted for nine years and continued to provide an increased total market share, and (2) the suitable competition type of the four state-owned banks must be a mix of mutualism and predator-prey. Especially for Scenario 2, mutualism is the suitable competition type for BRI, BNI, and BTN. However, BRI, BNI, Mandiri, and BTN are predator-prey, with Mandiri as the predator, while BRI, BNI, and BTN are the prey (see Tables 2 and 3). The two scenarios support previous research by Yin (2021). Policymakers understand the value of bank competition and then try to establish policies that stimulate competition, such as banking deregulation.

After estimating the market share, we can determine the stability of the competition model. The stability analysis is important because by knowing the stability property of the model, we can determine the behavioral tendencies of each bank resulting from the competition. Based on the estimation, the stability property of the four state-owned banks tended to be unstable (see Table 4 and Figure 5). This instability was caused by the competition type varying in 2010-2023. This finding aligns with previous research conducted by Ekananda (2023). The research found that banking transactions and activities affect a country's financial stability. The impact of banking competition on financial stability can change at certain regime levels. Nonlinear impact occurs according to the regime.

One of the indicators that a model can be used as a reference for predicting the dynamics of competition in the future is the model's accuracy. A tiny error usually proves this (Marasco et al., 2016a). Of the two ways (MSE and MAPE) to measure the magnitude of the error produced by the Lotka-Volterra model, all have tiny errors (see Table 5). Thus, the model we use is a very reliable basis for forecasting. Market share forecasting for the assets of the four state-owned banks is carried out for 2024-2028. Based on the competition types (see Table 6), mutualism was the competition type of BRI & BNI, BRI & BTN, and BNI & BTN in the 2024-2028 period. The competition type of BRI & Mandiri and BNI & Mandiri is the same as that of Mandiri & BTN, which is predator-prey, with BRI, BNI, and BTN as the prey and Mandiri as the predator.

Only Bank of Mandiri market share gains are predicted to increase in 2024-2028 (see Figure 6 and Table 7). On the other hand, although Mandiri gained market share during this period, the total market share gains for the four state-owned banks declined sequentially. Consequently, the total market share outside the state-owned banks increased significantly (see Figure 7). Based on the literature, this decline in market share gain can be overcome by adopting the latest technology and new policies within state-owned banks that support the increase of market share gains. This needs to be done because there are quite several private banks, insurance companies, pawn shops, and so on that move as competitors in the same field. Since they compete with state-owned banks to get potential markets, these competitors will adopt new technologies and policies that will enable them to dominate the market.

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CONCLUSION

Determining competition type and forecasting market share values for the assets of the four state-owned banks has been conducted using the Lotka-Volterra (LV) model approach with very accurate estimation results. The competition type of the four banks from 2010-2023 varies greatly. There have been three competition types among the four state-owned banks: mutualism, predator-prey, and pure competition. The stability property of the four state-owned banks tended to be unstable. This instability was caused by the competition type varying in 2010-2023. Besides, the forecasting of market share for the assets of the four state-owned banks is conducted for the 2024-2028 period. By looking at the gains of market share for assets since 2023, only Mandiri's gains will increase in 2024-2028. On the other hand, although Mandiri gained market share during this period, the total market share gains for the four state-owned banks declined sequentially.

Building on the forecasting results, this study proposes a significant opportunity for the Indonesian government to influence the market dynamics. By considering policies that can alter the competition types for the four banks (pure competition or a mix of mutualism and predator-prey), the government can potentially enhance the market share values. Therefore, the key policy recommendation from this research is to maintain the market share of bank Mandiri, while strategically increasing the market share of BRI, BNI and BTN.

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Islamic Banks Stability in Indonesia: Assesing the Role of Islamicity Performance Amidst the Pandemic Challenges

Siti Amaroh[1*], Ely Masykuroh[2], Husnurrosyidah Husnurrosyidah[3], Maimunah Ali[4]
[1,3]**Institut Agama Islam Negeri Kudus, Indonesia**
[2]**Institut Agama Islam Negeri Ponorogo, Indonesia**
[4]**Johor Business School, Universiti Tun Hussein Onn Malaysia, Malaysia**
E-mail: [1]sitiamaroh@iainkudus.ac.id, [2]masykuroh@iainponorogo.ac.id,
[3]husnurrosyidah@iainkudus.ac.id, [4]maimunah@uthm.edu.my
[*)]**Corresponding Author**

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Abstract

Research Originality: Islamicity performance reflects adherence to Sharia principles, which are fundamental to Islamic banking operations. Research that emphasizes the contribution of Islamicity performance to the stability of Islamic bank requires additional studies.

Research Objectives: This research examines the influence of banks' internal factors, Islamicity performance, and macroeconomic factors on the Islamic bank stability amidst the pandemic challenges using financial intermediation theory.

Research Methods: A random effects test was performed on a balanced panel data covering the period of 2017.1-2023.3 on 10 Islamic banks continuously publishing quarterly financial reports.

Empirical Results: Credit risk and eficiency affect stability. Higher expenses enhance stability during pandemic. Reserves for uncollectible debt reduce stability. Islamicity performance in profit-sharing financing may reduce stability. Economic growth and inflation negatively affect stability pre-pandemic. Interest rate and dummy variables have positive effects.

Implications: These findings imply the significance of preemptive risk management, cost-effective operations, prudent reserves allocation, and regulatory compliance to enhance stability in Islamic bank across varying economic circumstances.

Keywords:

Islamic banks; Islamicity performance; stability; profit sharing

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INTRODUCTION

At the end of 2023, rumors began to circulate about the resurgence of the COVID-19 virus, evoking memories of events from a few years previously. In March 2020, the World Health Organization (WHO) officially declared the spread of the COVID-19 virus as a global pandemic. The Director-General of WHO stated that hundreds of thousands of people from various nations were affected by COVID-19 at the time. Furthermore, the pandemic prompted government and business to anticipate its impact on the financial, social, and economic spheres (Bhattacharya et al., 2021).

Since February 2020, Indonesia's Financial Services Authority (FSA) has implemented economic stimulus policies in the banking, stock market, and non-banking industry to mitigate the coronavirus outbreak's countercyclical impact. The country's president announced the first confirmed case of COVID-19 in Indonesia in early March 2020. Subsequently, The FSA issued several policy packages to address and mitigate the spread of COVID-19 within the financial sector. These regulations addressed the adaptation of new services in the financial services sector.

Table 1. The Performance of Islamic Banks in Indonesia (in percent)

	2017	2018	2019	2020	2021	2022	2023
FDR	79.61	78.53	77.91	76.36	70.12	75.19	79.06
PSF	35.22	36.56	39.89	39.03	38.85	38.72	43.20
PL	3.29	3.47	2.70	3.46	4.65	4.45	3.67
CAR	17.91	20.39	20.59	21.64	25.71	26.28	25.41
ROA	0.63	1.28	1.73	1.40	1.55	2.00	1.88

Source: Islamic Banks Statistic, FSA (2023)

Table 1 depicts the performance indicators of Islamic banks, including Financing Deposit Ratio (FDR), Profit-Sharing Financing (PSF), Potential Loss (PL), Capital Adequacy Ratio (CAR), and Return on Assets (ROA) during the period 2017-2023. The data provided showed that FDR reached its highest level in 2017 at 76.61% and continuously declined, with the lowest ratio occurring in 2021 at 70.12%. The PSF performance was recorded at 35.22% in 2017 and experienced a fluctuating increasing trend over several years, reaching its highest at 43.20% in 2023. The PL had its lowest value in 2019 at 2.70% and increased over the following years, peaking at 4.65% in 2021. Meanwhile, CAR was at its lowest at 17.91% in 2017 and increased, with the highest percentage at 26.28% in 2022. The ROA ranged from 0.63% in 2017 to 1.88% in 2023, with the highest value at 2% in 2022. The data suggests that there has been a movement in the performance of Islamic banks, particularly evident from 2020 to 2021 across several indicators.

According to Gurley (1956), in the financial intermediation theory, the function of the banking sector is to promote economic growth within a nation by serving as an intermediary between entities with surplus and deficit funds. Consequently, banks

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streamline the payment process, contribute to financial stability, and act as intermediaries for monetary policy. Banks must receive attention to promote sound finances as suppliers of funds and their stability (Daoud & Kammoun, 2020). The safety and health of banks are important because a bank default can potentially damage the entire financial system (Isa & Rashid, 2018). Banking instability can manifest as bank runs or insolvency issues (Ngalawa et al., 2016). In mirroring conventional banks, Islamic banks encounter sharia constraints, which may have contributed to instability concerns (Gulzar et al., 2021).

The impact of the COVID-19 pandemic on bank stability across countries has been widely researched. Shabir et al. (2023) found that the pandemic adversely affects bank stability, yet this influence is contingent upon bank characteristics and market structure. Elnahass et al. (2021) revealed that COVID-19 negatively impacts bank stability, although this impact is less pronounced for Islamic banks. Ho et al. (2023) discovered a negative impact of the pandemic and suggested bank managers consider diversifying income streams, mainly through fee-based services, trading activities, and foreign exchange, to enhance bank performance and stability during the period. Mansour et al.(2022) demonstrated non-uniform responses among Islamic banks, where Saudi Arabia, UAE, and Kuwait tend to be less affected than in other countries.

Previous studies have indicated variations in findings regarding the factors influencing bank stability. Isnurhadi et al. (2021) discovered that capital and efficiency positively impact bank stability. Ali et al. (2023) found that credit risk is a factor utilized to assess the soundness and stability of the financial system. Ariffin et al. (2009) have affirmed that Islamic banks are particularly susceptible to credit and liquidity risks. Jabari and Muhamad (2022) concluded that opting for excessive risks leads to bank instability. Miah and Uddin (2017) discovered that banks with significant capitalization levels are ineffective despite being more stable. According to them, conventional banks are typically more stable than Islamic banks, although they are momentarily more solvent. Serly and Handayani (2020) analyzed conventional banks as having superior asset quality and stability, whereas Islamic banks are more efficient than conventional. Belkhaoui et al. (2020) constructed a conceptual model to investigate the impact of risk-taking, efficiency, and financing methods on the profitability of Islamic banks in GCC nations. The study found that cost-effectiveness had a positive effect on earnings. However, *mudharabah* and *musyarakah* financing increases the risk for Islamic banks.

Taktak (2010) proposed using loan-loss reserves (LLRs) to communicate credit portfolio quality to stakeholders, aiming to improve asset quality. However, Akram and Rahman (2018) found that increasing LLRs led to decreased loan portfolios. Ayagre et al. (2022) also found that LLRs negatively affected bank loan aggregates. Meanwhile, Incekara and Çetinkaya (2019) emphasized the vulnerability of Islamic banks in a dual banking system. Ghenimi et al. (2017) investigated the causes of bank vulnerability with a sample of 49 banks in the MENA region during the 2006-2013 period. According to the research, bank stability is determined by z-score lagged 1, liquidity risk, ROA, CAR, GDP, inflation, and other variables. Using quarterly data, Ghassan and Guendouz (2019) examined the stability of Islamic and conventional banks in Saudi Arabia. They

discovered that the stability of banks was negatively impacted by inflation. Meanwhile, Pham et al. (2021) discovered that inflation positively impacts bank stability in Vietnam, while Ullah et al. (2024) revealed that inflation does not affect bank stability.

Gulaliyev et al. (2021) developed a comparison methodology of efficiency in the economy and Islamic banks. The study demonstrated a significant relationship between GDP growth and financial institutions in Azerbaijan, Turkey, and Iran. Neifar and Gharbi (2023) investigated the sensitivity of banking stability and insolvency toward the 2011 revolution, both conventional and Islamic banks in Tunisia, for 2005-2014. The research confirmed that macroeconomic and bank-specific factors influence bank stability. Bank stability increases if GDP growth and foreign investment increase, while stability will decrease if inflation, interest rates, and exchange rates increase.

It is fascinating to research how bank interest policies affect bank stability. Nurfalah and Rusydiana (2021) found that high interest rates negatively affect bank stability since the number of defaulted loans increases. According to Boukhatem and Djelassi (2022), when Bank Indonesia increases the BI7DRR interest rate in a dual banking system like Indonesia, Islamic banks will increase yields as conventional banks increase interest rates. Hafidh (2021) comfirmed empirically that interest rates produce a negative response in the third month after the policy issuance. The exchange rate is also a significant element influencing its financial stability. If the value strengthens, a country's financial condition strengthens as well. Several studies have shown that the currency rate negatively impacts banks' financial performance and stability (Neifar & Gharbi, 2023; Nurfalah & Rusydiana, 2021; Widarjono, 2020).

The performance of Islamicity in a dual banking system is also negligible. Mutia et al. (2019) suggested Islamicity performance, which uses the profit-sharing ratio to assess the performance of Islamic banks. Meanwhile, Al-Suhaibani and Naifar (2014) thought that risk sharing should be the foundation of the existing financial system. Lenders may only receive cash benefits if it is a result of commercial endeavors. Danlami et al. (2022) found that CAMELS supports Islamic bank stability, *and mudharabah* contracts reduce Islamic bank stability. However, *musyarakah* contracts stimulate Islamic bank stability. Meanwhile, Bakhouche et al. (2022) proposed the "Islamicity-Stability" hypothesis to test Islamic banking stability. By considering a sample of Islamic banks in 14 Muslim-majority nations, the study concluded that he stability of Islamic banks is not impacted by the Islamic environment.

To ascertain the impact of the pandemic on the stability of Islamic banks in Indonesia, it is imperative to evaluate whether these banks possess vigorous financial fundamentals to withstand the ensuing challenges. Therefore, it is crucial to examine whether these internal bank factors, Islamicity performance, and macroeconomics influence the stability of Islamic banks in Indonesia both pre-pandemic and during the pandemic using updated data. The primary emphasis of this research is to reevaluate whether Islamicity performance saves stability amidst the pandemic. Investigating the link between Islamic performance and bank stability in the Islamic banking system offers insights into how adherence to Islamic

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financial principles impacts stability. Lastly, testing the "Islamicity-Stability" hypothesis advances understanding Islamic banking systems' distinctive features.

METHODS

This study examines the impact of various factors, including credit risk, efficiency, lending risk reserves, Islamicity performance, GDP Growth, inflation, interest rate, and exchange rates, on the stability of Islamic banks. It employs balanced panel data on Islamic banks in Indonesia, which have published financial statements for the first quarter of 2017 to the third quarter of 2023. From these criteria, 10 Islamic banks are identified as suitable research samples. Some of these banks include the Bank of Aceh Sharia, Bank of Muamalat Indonesia, Bank of Mega Sharia, Bank of Panin Dubai Sharia, Bank of Sharia Bukopin, Bank of BTPN Sharia, Bank of Victoria Sharia, Bank of BCA Sharia, Bank of BJB Sharia, and Bank of Aladin Sharia.

This study employs a panel data methodology because it assists in managing individual heterogeneity, reducing concerns associated with multicollinearity, and elucidating the time-varying between dependent and independent variables. Panel data regression offers more informative results, more significant variability, less multicollinearity, and an increased degree of freedom compared to other regression methods. In this study, three estimators were tested: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM).

Model tests were performed to ascertain the most suitable model among the three estimators. The Chow test or likelihood ratio compared the CEM and FEM models to assess differences in individual effects. The Hausman test was employed to compare the FEM and REM models by examining the relationship between independent factors and individual errors. The REM is favored over the FEM when a correlation between individual errors and independent variables is present. The Breusch-Pagan Lagrange Multiplier (BP-LM) test was utilized to determine the most effective model between the CE and REM by assessing the relationship between composite errors. The CEM is preferred over the REM if there is no correlation between composite errors.

The dependent variable in this study is the stability of Islamic banks, measured by ZSCORE, while the independent variables encompass banks' internal factors, Islamicity Performance, and macroeconomic factors. Banks' internal factors are measured by three variables. First, credit risk assessed through Non-Performing Financing (NPF). Second, efficiency evaluated using Operating Expenses Ratio (OER). Third, lending risk reserves determined by Loan Loss Reserves Ratio (LLRR). Islamicity performance is measured by the Profit-Sharing Ratio (PSR). Additionally, macroeconomic factors are incorporated by Gross Domestic Products Growth (GDPG), inflation (INF), Bank of Indonesia 7-Day (Reverse) Repo Rate (BI7DRR), and the logarithm natural of the exchange rate (LnEXC). Table 2 presents a detailed description of each variable.

In this work, panel data regression is used since the data combine cross sectional data with time series data. The regression equation proposed is as follows:

$$ZSCORE_{it} = \alpha_0 + \sum_{j=1}^{3} \beta_j BIF_{it} + \varphi_j IP_{it} + \sum_{j=1}^{4} \theta_j ME_{it} + \varepsilon_{it} \quad (1)$$

Where i is the bank individually; t refers to time (quarterly); α is an intercept; β, φ, and θ are coefficients; BIF is a vector of 3 banks' internal factors which include NPF, OER, and LLRR. IP is Islamic Performance as measured by PSR; ME is a vector of macroeconomic factors including 4 variables, namely GDPG, INF, BI7DRR, and the LnEXC; and ε is the error term

Table 2. Variables Description

Variables	Description	References
Z-SCORE	The sum of Return on Assets (ROA) and Capital Adequacy Ratio (CAR) divided by the standard deviation of ROA. ZSCORE is used to measure bank stability	Srairi (2019), Asmild et al. (2019), Hassan et al. (2021), Yunita (2022), Banna et al. (2022)
NPF	Financing in an Islamic bank's potfolio that do not generate the expected income or profit due to delayed or missed payments by the borrowers	Mohd Isa and Abdul Rashid (2018), Nurfalah and Rusydiana (2021)
OER	A financial metric that assesess the efficiency of an Islamic bank's operations by comparing its operating expenses to its operating income	Puteh et al. (2018)
LLRR	A financial indicator utilized by bank to evaluate sufficiency of their reserved funds designated to mitigate potential losses arising from non-performing loan/financing	Taktak et al. (2010)
PSR	A financial arrangement in Islamic banking such as mudharabah and musyarakah contracts where profits are distributed on eachh party's contribution, risks, and roles	Guizani (2021); Mutia et al. (2019)
GDPG	An indicator used to measure the rate of national economic activity	Gulaliyev et al. (2021); Neifar and Gharbi (2022)
INF	An economic phenomenon characterized by a sustained increase in the general prive level of goods and services in an economy over a period time	Ghenimi et al. (2017); Ghassan and Guendouz (2019)
BI7DRR	A key monetary policy tool used by central bank in Indonesia to influence short-term (7-day) interest rate and manage liquidity in the financial system	Boukhatem and Djelassi (2022); Hafidh (2021)
LnEXC	A logaritma Natural from the value of one currency expressed in terms of another currency. This proxy is used to measure the exchange rate of The Indonesia Rupiah against the US Dollar	Neifar and Gharbi (2023); Widarjono (2020)
Dummy	Categorical variable to distinguish between different conditions where 0=pre-pandemic and 1=pandemic period	Shabir et al. (2023); Elnahass et al. (2021)

Whereas in the second panel data regression equation model is conducted without differentiating the period, but through dummy variables. The purpose of this test is to ascertain whether the impact of each variable has changed. The regression equation with dummy is as follows:

$$ZSCORE_{it} = \alpha_0 + \sum_{j=1}^{3} \beta_j BIF_{it} + \varphi_j IP_{it} + \sum_{j=1}^{4} \theta_j ME_{it} + \delta_j D_{it} + \varepsilon_{it} \quad (2)$$

Where δ is the coefficient; and D is a dummy where 0 is for before the pandemic and 1 is for the pandemic period.

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RESULTS AND DISCUSSION

Empirical Result

This section presents descriptive statistics to summarize the characteristics of the variables examined in this study. Table 3 contains the observations, mean, median, and standard deviation. Mean, median, and standard deviation are used to measure different aspects of a dataset. The mean provides the average value of the data, the median represents the middle value when the data is arranged in ascending order, and the standard deviation quantifies the dispersion or spread of the data points around the mean. Mean, median and standard deviation are measures of central tendency in data and provide insights into the typical value of a variable.

Table 3. Statistics Descriptive

Variables	Observations	Mean	Median	Standard Deviation
ZSCORE	270	12.662	5.982	20.330
NPF	270	1.699	1.330	1.635
OER	270	97.257	92.720	48.967
LLRR	270	2.427	1.710	2.994
PSR	270	44.180	49.975	31.775
GDPG	270	0.933	0.870	1.234
INF	270	3.066	3.120	1.185
BI7DRR	270	4.667	4.500	0.902
LnEXC	270	9.584	9.576	0.049

Source: EViews Output

The correlation test is essential in research as it evaluates the connection between variables, identifies patterns, and validates hypotheses. It aids in recognizing dependencies, patterns, and associations, thereby improving the credibility and comprehensiveness of research outcomes by facilitating decision-making grounded in empirical evidence. A positive correlation means that as one variable increases, the other variable also increases, while a negative correlation indicates that as one variable increases, the other variable decreases.

Table 4. Correlations

	NPF	OER	LLRR	PSR	GDPG	INF	BI7DRR	LnEXC
NPF	1.0000							
OER	-0.0207	1.0000						
LLRR	0.2573	-0.0786	1.0000					
PSR	0.5423	-0.1177	0.0076	1.0000				
GDPG	-0.0408	0.1146	0.0338	0.0334	1.0000			
INF	-0.0800	-0.0186	0.0323	0.0207	-0.0519	1.0000		
BI7DRR	-0.0253	-0.1315	-0.0134	-0.0110	-0.5329	0.3715	1.0000	
lnEXC	-0.1171	0.0579	-0.1727	0.1192	-0.0446	0.1047	0.1801	1.0000

Sources: EViews Output

The correlation between independent variables was presented in table 4, indicating that PSR and NPF exhibited the highest correlation of 0.5423. these findings suggest that there are no concerns regarding multicollinearity, and the level of correlation remains moderate. This outcome is aligning with the guideline proposed by Trabelsi and Trad (2017), stating that the correlation between independent variables should not exceed 0.70.

Model selection in research using EViews with panel data is used to assess how well the chosen statistical model fits the observed data. It measures the degree of agreement between the value predicted by the model and the actual value in the dataset. A good model fit indicates that the chosen model effectively captures the patterns and relationships in the data, providing reliable estimates and predictions. This assessment is important for ensuring the validity and accuracy of the research findings, allowing researchers to draw meaningful conclusions and make informed decisions based on the results.

This section will display the results of the common, fixed, and random models used for panel data analysis. Subsequently, model selection tests are conducted to obtain appropriate models for the processed data. The Chow test detects changes in the model, the Hausman test aids in analyzing panel data, and the LM test assesses heteroscedasticity in regression models. The comprehensive outcome of these tests will be meticulously displayed in table 5, providing an insightful overview of the model selection process.

Tabel 5. CE, FE, and RE Models (2017.1-2023.3)

Variables	**CE**		**FE**		**RE**	
	coeff	t-stat	coeff	t-stat	coeff	t-stat
Intercept	-207.606	-1.2282	-292.1255	-2.4148**	-293.6637	-2.5106**
NPF	-2.8945	-4.4794***	-1.5212	-2.2257**	-1.7872	-2.8687***
OER	0.2483	14.3832***	0.1126	7.9537***	0.1259	9.0919***
LLRR	-0.2823	-0.9671	-0.9317	-4.2236***	-0.8421	-3.9259***
PSR	-0.1399	-4.3124***	-0.1601	-2.4379**	-0.1746	-3.6784***
GDPG	-0.1028	-0.1278	0.3484	0.6542	0.2998	0.5632
INF	-0.7908	-1.0351	-0.4488	-0.8855	-0.4868	-0.9615
BI7DRR	-0.6756	-0.5638	-1.5661	-1.9592*	-1.5073	-1.8964*
LnEXC	22.285	1.2554	32.775	2.5555**	32.881	2.6652***
Observations	270		270		270	
R-Squared	0.5756		0.8221		0.4101	
F-Statistics	44.244***		68.5180***		22.677***	
Chow (CE vs FE)						
Cross-Section F				38.8139***		
Hausman (FE vs RE)						
Chi-Square Statistics						0.0000
Lagrange Multiplier (CE vs RE)						
Breusch-Pagan		557.6877***				

*** significance at 1%; ** significance at 5%, * significance at 10%
coeff= coefficient; t-stat= t-statistics
Source: EViews Output

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The findings of the model selection test are outlined in Table 5, indicating that the RE is the most suitable for this study. The significant F-statistic value in the Chow test leads to the rejection of the null hypothesis, favoring the FE. However, the RE is preferred as the Hausman test reveals a non-significant Chi-Square value. Furthermore, the LM test shows a significant Breusch Pagan value, supporting the selection of the RE as the preferred estimator. The RE model, using the Generalized least-squared approach, is superior due to its ability to account for a panel data structure (Hassan et al., 2021), and it is more suitable for studies using identical indicators across all subjects (Srairi, 2019).

Table 5 also presents the results of the Random Effect (RE) test on variables influencing the stability of Islamic banks without a dummy variable. The overall observation test covering the period from 2017 quarter 1 to 2023 quarter 3 reveals that NPF, LLRR, PSR, and BI7DRR exhibited adverse effects on bank stability with various significance levels. Meanwhile, OER and LnEXC demonstrated a positive effect on bank stability with a significance level of 1%. On the other hand, GDPG and INF showed no significant influence on bank stability.

Table 6. Results of Random Effects Test and Dummy

Variables	RE					
	Pre-Pandemic (2017.1-2019.4)		Pandemic Period (2020.1-2023.3)		All Observations (2017.1-2023.3)	
	Coeff	t-stat	coeff	t-stat	Coeff	t-stat
Intercept	48.2467	0.2427	189.4889	0.7513	23.322	0.1279
NPF	0.7388	1.2324	-2.1599	-2.4789**	-1.4854	-2.3494**
OER	-0.0522	-1.7310*	0.1165	6.4338***	0.1222	8.851***
LLRR	-0.5566	-3.7955***	-3.4842	-3.6029***	-0.8196	-3.8486***
PSR	-0.4608	-6.8042***	-0.2001	-6.4338***	-0.2134	-4.2442***
GDPG	-1.5095	-1.6595*	0.1452	0.2148	0.5947	1.0942
INF	-3.1447	-2.6501***	0.289	0.4051	-0.3532	-0.6988
BI7DRR	0.4993	0.4817	-1.4561	-0.9462	0.2410	0.2179
LnEXC	-0.7698	-0.0368	-16.7417	-0.621	-1.2607	-0.0645
Dummy	-	-			5.1778	2.2546**
Observations	120		150		270	
R-Squared	0.4879		0.3774		0.4201	
F-Statistics	13.2207***		10.684		20.91	

Source: EViews Output

Based on the testing on the pre-pandemic period (2017.1-2019.4) presented in Table 6, it was revealed that OER, LLRR, PSR, GDPG, and INF negatively affected bank stability in various significance levels. Meanwhile, NPF, BI7DRR, and LnEXC did not significantly impact bank stability. The results of the pandemic (2020.1-2023.3) also varied. It was found that NPF, LLRR, and PSR negatively impacted bank stability with various levels of significance. Conversely, OER positively impacted bank stability. However, GDPG, INF, BI7DRR, and LnEXC did not affect bank stability. In a test to

determine the influence of the pandemic, a dummy variable was examined throughout the observation period from 2017.1 to 2023.3. The testing indicated that NPF, LLRR, and PSR negatively impacted bank stability with various significance levels. Meanwhile, the OER positively affected bank stability, while the Dummy variable positively influenced bank stability. However, macroeconomic variables such as GDPG, INF, BI7DRR, and LnEXC did not affect bank stability.

DISCUSSION

This study investigated the factors influencing Islamic banks' stability, particularly emphasizing Islamicity performance as its distinguishing characteristic. All tests on the random model throughout the observation period revealed that Islamic bank stability was negatively impacted, partly due to credit risk or financing risk in the model full model without dummy variables during the pandemic period and testing with dummy variables. The findings corroborated the study by Jabari and Muhamad (2022), which asserts that high risks lead to bank instability. However, this study found that credit risk did not affect the stability of Islamic banks before the pandemic period. This condition can be attributed to the fact that Islamic banks operate on the principles of Sharia with various types of contracts, namely profit-sharing and non-profit-sharing contracts, thereby presenting different risks (Muljawan et al., 2004). Islamic banks must enhance their credit risk management practices to ensure stability, particularly during economic uncertainty like the pandemic. This practice entails developing strategies to mitigate the impact of credit risk on bank stability.

Banks are deemed efficient if they have low operating expense ratios, indicating that higher ratios lead to inefficiency. However, this study presented contrasting results where higher expense-to-income ratios can enhance the stability of Islamic banks during the pandemic period. These findings supported research by Adem (2023), suggesting that banks with high liquidity, elevated costs, and large deposit ratios encourage faster resilience. The coronavirus outbreak has incurred costs beyond medical expenses, encompassing sociological, psychological, and economic impacts (Yang et al., 2020). Increased costs are necessary to navigate uncertainties during the pandemic and address the rising expenses of adapting services. The heightened reliance on banks is due to increased online transactions resulting from stay-at-home measures and social isolation. While conventional wisdom suggests that efficient operations lead to stability, this study reveals that higher expense-to-income ratios can bolster Islamic banks' stability. Therefore, Islamic banks should optimize their expense-to-income ratios to improve stability.

The negative impact of reserves for uncollectible debt on the stability of Islamic banks was evident across all tests. These findings suggested that setting aside reserves for uncollectible debt can diminish stability. This observation corresponds with an earlier study that provisions for loan losses reduce the loan portfolio (Akram & Rahman, 2018; Ayagre et al., 2022). A reduction in the nonperforming loan portfolio can adversely affect financial distress, undermining Islamic banks' stability. The negative

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impact of reserves for uncollectible debt on the stability of Islamic banks accentuates the importance of prudent reserve management. Islamic banks should reassess their policies regarding reserve allocation to ensure sufficient coverage for potential losses while preserving stability.

The adverse effect of Islamicity performance on the overall test suggested that the higher profit-sharing-based financing may reduce the stability of Islamic banks. However, it's important to note that despite these challenges, Islamic banks have historically demonstrated resilience during crises. The findings of this study provide further support for the research conducted by Bakhouche et al. (2022) which indicated that the Islamic aspect becomes irrelevant in the dual banking system. Challenges associated with profit-sharing financing include increasing monitoring costs and depositors' reluctance to take risks (moral hazard). These results affirm the study of Danlami et al. (2022) that mudharabah contract can decrease bank stability. Islamic financial institutions must conduct a thorough assessment of the consequences of profit-sharing-base financing on stability. Despite their historical resilience during crises, this study suggests that increased reliance on profit-sharing financing may diminish stability. Hence, Islamic banks should evaluate the equilibrium between profit-sharing financing and stability to mitigate potential risks.

Economic growth, in this study, had a negative impact before the pandemic, whereas in other tests, it did not affect the stability of Islamic banks. This result implies that economic growth may decrease the stability of Islamic banks. These results did not confirm the finding of Neifar and Gharbi (2023) that GDP growth enhances bank stability. Inflation also had a negative influence before the pandemic but did not affect other periods, including during the pandemic period. These results support previous research conducted by Ghassan and Guendouz (2019), which found that inflation had a negative effect on bank stability. Economic growth and Inflation findings highlight the complex relationship between macroeconomic factors and bank stability. Islamic banks should meticulously observe economic indicators and adapt strategies to uphold stability in fluctuating economic conditions.

The interest rate negatively affected the testing of all observations without dummy variables. The stability of Islamic banks increases as interest rates decline. These findings confirm previous studies by Nurfalah and Rusydiana (2021), which stated that the interest rate would weaken bank stability. This research outcome also aligns with the studies conducted by Boukhatem (2022) and Hafidh (2021), which found a negative response of Islamic banks' performance to an increase in interest rates. Conversely, the exchange rate has a positive impact on the stability of Islamic banks in the testing of the entire sample without dummy variables. These results also contradict the research conducted by Widarjono (2020), which found that the exchange rate negatively influences bank stability. However, this finding aligns with the research by Kasri and Azzahra (2020), indicating a positive influence of the exchange rate on bank stability.

Meanwhile, the dummy variable has a positive effect on the stability of Islamic banks. This finding supports the research conducted by Mansour et al. (2022), which highlighted variations in the stability of Islamic banks during the pandemic. In the case of Indonesia, Islamic banks demonstrated stability amid the pandemic, attributed to internal policies focusing on bolstering capital adequacy and managing operational costs.

CONCLUSION

This study delved into the factors influencing the stability of Islamic banks, with a specific focus on Islamicity Performance as a distinguishing characteristic. The findings revealed several noteworthy insights. Firstly, the study identified that the stability of Islamic banks was adversely affected by credit risk or financing risk, particularly evident during the pandemic. However, it was observed that credit risk did not significantly impact the stability of Islamic banks before the onset of the pandemic, possibly due to the diverse risk profiles inherent in Islamic banking operations. Contrary to conventional understanding, higher expense-to-income ratios were found to enhance the stability of Islamic banks. This unexpected result challenges traditional notions of bank efficiency and underscores the need for a nuanced understanding of operational dynamics in Islamic banking.

Moreover, the study highlighted the detrimental impact of reserves for uncollectible debt on the stability of Islamic banks, emphasizing the crucial role of prudent reserves management in mitigating financial distress. Additionally, economic indicators such as economic growth and inflation were found to have complex relationships with the stability of Islamic banks, with varying impacts across different testing periods. Interest rates were observed to negatively affect bank stability, while exchange rates had a positive influence. Overall, the study underscores the need for Islamic banks to carefully manage risk factors, optimize operational efficiency, and adapt to changing economic conditions to maintain stability. Additionally, regulatory compliance and capital adequacy are crucial for enhancing the resilience of Islamic banks against economic uncertainties. These findings contribute valuable insights for policymakers, regulators, and practitioners in fostering a stable and robust Islamic banking sector.

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Does the Merger of the Indonesian Islamic Bank Matter for Its Social Mission of Economic Empowerment?

Ainul Fatha Isman[1], Nur Hidayah[2*]
[1,2]**Universitas Islam Negeri (UIN) Syarif Hidayatullah, Indonesia**
E-mail: [1]ainulfathais@gmail.com, [2]nurhidayah@uinjkt.ac.id
[*)]**Corresponding Author**

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Abstract

Research Originality: Economic empowerment through financing Micro Small Medium Enterprises (MSMEs) is one dimension of the social mission of sharia banking in Indonesia. The merger action of Bank of Sharia Indonesia (BSI) raises the question of whether the performance of economic empowerment has changed.

Research Objectives: This research aims to analyse the differences in the BSI's performance of economic empowerment during pre- and post-merger periods and analyse the issues and strategies for improving BSI's post-merger economic empowerment performance.

Research Methods: It is a research using mixed method combining a quantitative explorative analysis approach using Wilcoxon Test, and a qualitative one using Analytic Network Process.

Empirical Results: This research finds that BSI's economic empowerment performance has increased in terms of the quantity but decreased in terms of proportion in the post-merger period. ANP research demonstrates that risk management is a priority issue for the BSI post-merger period. The social mission of economic empowerment indicates several priority issues, namely, the relatively higher rate of profit margin than interest, the inadequate supervision model, the low rate of risk management literacy, and the relatively higher risk of profit loss sharing (PLS)-based financing. The strategy analysis indicates that policy intervention for BSI's MSMEs financing is a top priority in improving the performance of its economic empowerment.

Implications: This research recommends some recommendations for sharia banks' MSMEs financing equivalent to the one of conventional banks. Economic digitalization as technological means to widen accessibility of economic empowerment and distribution segmentation focusing more on the halal sector.

Keywords:
economic empowerment; performance; Islamic banks; merger

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INTRODUCTION

Several policies have been implemented to develop and improve the performance of Sharia banking, including the spin-off policy. Al Arif et al. (2017) stated that one of the reasons for the spin-off policy was to create growth in the Indonesian Islamic banking industry. This policy is expected to increase the number of full-fledged Islamic banks and make the industry more competitive, which will improve the performance of the Islamic banking industry. The merger policy is considered an alternative policy for developing the Sharia banking sector in Indonesia. The discourse on the merger of Sharia state-owned banks has existed since 2015 by merging Bank of Sharia Mandiri (BSM), bank of BRI Sharia (BRIS), Bank of BNI Sharia (BNIS), and Bank of BTN Sharia (BTNS). However, this policy was only realized on February 2, 2021. The government officially formed the Bank of Sharia Indonesia (BSI), which resulted from the merger of BSM, BRIS, and BNIS (Akram et al., 2021).

The three Sharia banks that have merged are a large force of Sharia banks, which account for around 40% of the total assets of all Sharia banks. The merger process of the three state-owned banks ensures that core capital will increase so that they can enter the ranks of commercial banks for business activities (Buku) level 3. The Sharia bank merger policy has been carried out so that Indonesia owns a large Sharia bank that can compete with conventional and Sharia banks on the global stage. This policy has been implemented to facilitate Indonesia's vision of being the center of the global Sharia economy and finance. After the merger, BSI occupied the seventh position in banking in Indonesia and entered the top 10 Sharia banks in the world.

This merger has made BSI a Sharia bank with huge assets that reached Rp. 240 trillion, core capital more than Rp. 22.60 trillion, total Deposit Funds of Rp. 210 trillion, and a total financing of Rp. 157 trillion. BSI's consolidated profits are supported by more than 1,241 branch offices, 2,447 ATM (Automated Teller Machine) networks, and more than 20 thousand employees spread throughout Indonesia (OJK, 2021). The presence of BSI further emphasizes that Indonesia is a powerful country in the sharia financial sector. However, such a merger has also faced some challenges and moral responsibilities. Several previous literatures have indicated that banking mergers have both positive implications and side effects.

Merger policy as a way to expand business externally has resulted from countries' tendency to embrace higher levels of globalization and deregulation (Kunwar & Paudel, 2023). Merger has become a significant tool for corporations' growth, restructuring, and diversification. However, mergers also can create and destroy some values on a large scale (Cumming et al., 2023). In his study, Hasan (2022)) stated that inappropriate merger policies could impact banking liquidation. Al-Binali (2023) noted that merger activity does not affect solvency performance and investment ratios. Some other negative impacts of mergers include some issues of risks in efficiency (Kaddumi & Al-Rimawi, 2022), asset quality, management (Yadav & Jang, 2021), return on value, and resources (Sethy, 2017).

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Studies of the impact of banking mergers have yet to reach a conclusive consensus regarding the effects of these policies. Post-merger requires efforts to overcome all shortcomings in the short and long terms with better management and wise financial policies. This policy is also a challenge for BSI in terms of strategic steps that need to be developed. Apart from financial performance aspects, some fundamental aspects need to be considered. As a Sharia-based bank, Islamic banks have different philosophies and goals from other business entities.

Sharia banking needs to refer to the basic concepts of Islamic economic philosophy. Islamic economic philosophy has been established based on the triangle concept, namely the philosophy of God, humans, and nature. This philosophical dimension has differentiated Islamic economics from other systems and has influenced the nature of sharia banking. Sharia banks are commercial business entities and carry the social mission to contribute to social welfare, prosperity, justice, and public benefit. This philosophy can be reflected in Sharia banking nature, which has a social mission, especially economic empowerment.

Sharia banking is essential in supporting the growth of Micro, Small, and Medium Enterprises (MSMEs) and bridging economic needs through financing models. Economic empowerment is central to the foundation of Islamic finance (Hassan et al., 2021). However, BSI in the post-merger stage has faced a tough challenge in building its capacity, especially due to pessimism regarding its impact on economic empowerment (Isman et al., 2023). The reason is that the distribution of financing to MSMEs is relatively low, which is only around 0.01 percent, where in practice, the distribution of financing by Islamic banks to the MSME segment never reaches 20 percent of the total distribution (Akram H et al., 2021). At the same time, Sharia banking, as a result of the merger, is required to produce optimal profits and reduce costs effectively (Al Arif et al., 2020). This raises concerns that the portion of the financing for MSMEs will decrease compared to that for corporate businesses.

Economic empowerment relies on a shift from merely financial inclusion to economic inclusion by establishing economic value chains that provide a supporting ecosystem (Jouti, 2019). Working within an ecosystem will enable all stakeholders to utilize financial resources optimally, determine impact indicators, identify gaps, and adopt remedial measures. Economic empowerment through financing and value chain implementation can guarantee business sustainability by offering solutions to obstacles such as business opportunities, finance, investment, and others. Linkage with the real economic sector, especially the halal industry, is needed in economic empowerment because financial inclusion alone is not enough to achieve the goals of economic empowerment (IDB Report, 2020).

The growth of a country can be reflected in the success of economic productivity, which is expected to increase every year. One of the appropriate policies to boost economic growth is carrying out empowerment activities in the financial sector. This empowerment involves providing capital assistance and must be supported by strengthening institutions, human resources, business partnerships, and facilities and infrastructure (Latifah et al., 2021). Empowerment programs at Islamic financial institutions can offer solutions when

financial inclusion is low by reducing risk and promoting equality, social welfare, and economic security (OECD, 2020). By implementing such policies, Indonesia can become a huge global player in Sharia finance for economic empowerment.

Financial performance is an issue that has been widely researched during the post-merger of BSI. However, more research is needed to study the performance of its social mission. Therefore, this research aims to fill in such a gap by assessing the BSI's performance in terms of economic empowerment. Many Sharia banking economic empowerment is implemented through financing for Micro, Small, and Medium Enterprises (MSMEs). Law no. 4 of 2023 concerning the Development and Strengthening of the Financial Sector outlines several Sharia bank financing models, namely cards financing, rental or ijarah financing, and profit and loss-sharing financing consisting of mudharabah and musyarakah. Sharia banking's economic empowerment is widely implemented through business capital assistance to Micro, Small, and Medium Enterprises (MSMEs). The aim is to help strengthen small businesses to increase their income and standard of living.

The big goal of the Sharia banking merger is to improve financial performance. Studies of banking mergers related to financial performance from various aspects have been carried out, such as post-merger bank profitability by Hassan & Giouvris (2021) in the UK that banks that carry out mergers have positive implications for profitability, Ahmed et al. (2022) in Pakistan describe the post-merger performance of the banking sector on profitability and loans/deposits which is entirely satisfactory, and Adhikari et al. (2023) in Nepal stated that mergers had various impacts on financial performance ratios. Still, there was a significant increase in return on assets, net interest margin, and earnings per share. Post-merger bank efficiency by Patel (2018) in India, Hamid et al. (2018) in Malaysia, and Al-Hroot et al. (2020) in Jordan revealed similar findings to Coccorese & Ferri (2020), who found that the financing ratio aspect in banking in Italy has improved due to the merger.

Previous studies have studied many aspects of financial performance, such as financial ratios, profitability, efficiency, and effectiveness. Research on banking mergers concerning social missions such as economic empowerment still needs to be completed, especially in Sharia banking. This research is essential as a basic framework for assessing changes after the merger policy regarding economic empowerment and analyzing the main issues and strategic priorities of Sharia banking in Indonesia.

METHODS

This research uses a mixed method with quantitative and qualitative approaches through two stages. The first stage is through quantitative explorative and statistical non-parametric tests, such as the Wilcoxon Signed Rank Test. The second stage is the Analytic Network Process (ANP), which is part of the qualitative method. Data collection in this research is primary and secondary data. Primary data was obtained from interviews with Islamic banking practitioners and academics or experts in Islamic banking. The

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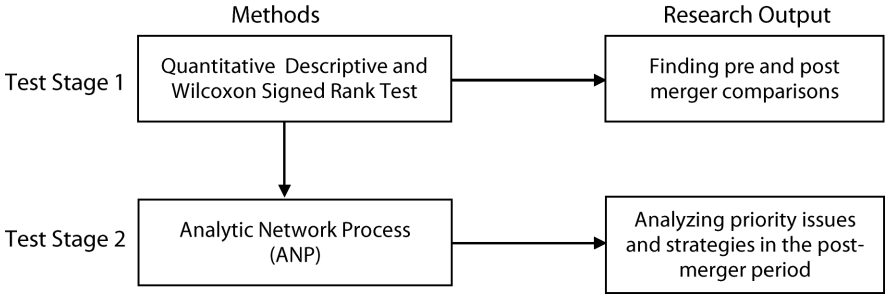
secondary data used are Sharia banking financial reports and Sharia banking statistics obtained from the Financial Services Authority reports for the pre-merger period (2019-2020) and post-merger one (2021-2022).

Figure 1. Stage of Research



Source: Processed by Authors

Statistical testing of the nonparametric Wilcoxon Signed Rank Test observes several aspects of economic empowerment pre and post-Islamic banking merger in Indonesia. The Wilcoxon test compares observations before and after treatment and determines the effectiveness of the treatment. The basis for decision-making for the nonparametric Wilcoxon Signed Rank Test is based on a probability value of 5% or 0.05. If the probability value is > 0.05, there is a significant difference, whereas if the probability value is < 0.05, there is no significant difference. The descriptive statistical analysis can be seen in the Sharia banking financial report data tabulation and the mean value in the pre and post-merger comparison data output.

The economic empowerment research variable refers to several Sharia bank financing models outlined in Law no. 4 of 2023 concerning the Development and Strengthening of the Financial Sector, namely cards financing, rental or ijarah financing, profit-loss sharing financing consisting of mudharabah and musyarakah. Qardh financing is financing with funds or bills between a Sharia bank and the borrower, requiring the borrower to make installments within a certain period. Profit-loss sharing financing is financing with a profit-sharing agreement when the owner of funds/capital provides capital (100%) to entrepreneurs as managers to carry out productive activities on the condition that the profits generated will be shared according to a previously determined agreement. Rental financing involves an agreement to transfer use rights to goods or services by paying rental fees.

The Analytic Network Process (ANP) method is a powerful tool that can analyze the level of importance (priority) of various parties or elements by considering the interrelationships between them. ANP, a mathematical theory, can analyze influences using assumed approaches to solve problems. This method is used as a solution by considering adjustments to the issue's complexity through synthetic decomposition accompanied by priority scale analysis, which produces the greatest priority effect. Moreover, ANP can explain the dependent factor model systematically (Saaty, 2001).

Table 1. Criteria, Clusters, and Nodes for the ANP Development

Criteria	Cluster	Node	
		Problems	**Strategies**
Economic Empowerment	Sharia-Based Financing Procedures	- MSME financing procedures are more complex than conventional ones - Profit-sharing margin is greater than the interest - Many financing problems	- Economic empowerment market segmentation mapping - Improving the quality of human resources - Improvement of supporting facilities and technology - Business risk management training, assistance, and mentoring - Islamic Bank MSME financing policy intervention
	Supervision of MSMEs	- The supervision model is inadequate - MSME financing is not well-targeted supervision model is inadequate - Empowerment supervision is a formality	
	Risk Management	- Low-risk management literacy - Economic empowerment is less priority-based - Risk of return on PLS financing	

Our analysis through the ANP approach model is comprehensive, aiming to build a robust model for developing sharia banking in Indonesia post-merger. We focus on the main issues and strategic priorities in the aspect of economic empowerment, providing a thorough discussion of its development, including problems and strategies in the post-merger period. To ensure a comprehensive understanding, in-depth interviews were conducted with several Sharia banking experts, including academics and Sharia banking practitioners, as well as regulators on the issue of Sharia banking mergers. The in-depth interview results revealed the following criteria, clusters, and nodes for the development of sharia banking in Indonesia post-merger.

Table 2. List of Informants/Research Respondents

No	Respondent List
1	Director of Sharia Ecosystem Infrastructure KNKES/Associate Professor at Gunadarma University
2	Secretary for Sharia Banking DSN-MUI/Professor of UIN Syarif Hidayatullah Jakarta
3	Head of KNKES Sharia Banking Division
4	Director of Sharia Banking Licensing Department OJK (Financial Services Authority)
5	Senior Deputy of BI Sharia Economics and Finance Department (Bank Indonesia)
6	Central Executive of MES (Sharia Economic Society)/Lecturer in Islamic Economics, University of Indonesia
7	Vice President Syariah Business and Retail Banking Analytics
8	Central Management of IAEI (Association of Islamic Economic Experts) for Sharia Banking
9	Chair of IAEI (Association of Islamic Economic Experts) Yogyakarta/Head of Islamic Finance Masters Study Program, Gadjah Mada University
10	Branch Manager of PT. Bank Syariah Indonesia Tbk
11	Director Priority Banking of PT. Bank Syariah Indonesia Tbk

The informants in this research were selected using purposive sampling, considering the suitability and understanding of the informants regarding the issue of sharia banking

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mergers in Indonesia. Data collection was carried out from August 2023 to March 2024. The number of informants consisted of 11 people who were considered competent regarding the research theme. In ANP analysis, the number of samples/respondents is not used as a benchmark for validity. The condition for valid respondents in ANP is that the informants are experts with special skills regarding the research theme being studied. The research sources shown in Table 2.

Model construction begins by compiling a network of groups or components and elements relevant to each control criterion. Each control criterion has its elements determined, and each one is connected according to the influence of dependence from the outside (outer dependence) and from within (inner reliance). The Analytic Network Process (ANP) has three work stages: creating an ANP framework or model construction, model quantification, and synthesis and analysis of results.

RESULT AND DISCUSSION

Comparative Analysis of Indonesian Sharia Bank's Economic Empowerment Performance during Pre and Post Merger Period

BSI's MSMEs financing financial reports before and after the merger consist of qardh, rental, and profit-sharing financing. The economic empowerment of BSI through qards financing and rental financing increased after the merger, while profit-sharing funding decreased. This report means that economic empowerment at BSI has been implemented through the financing sector for MSMEs but has yet to be maximized in profit-loss sharing financing modes. However, the economic empowerment of MSMEs with qardh, rental, and profit-loss sharing financing schemes has increased after the merger policy.

Table 3. Economic Empowerment of Sharia Banking Pre and Post-Merger

Period	Year	Economic Empowerment (million IDR)			Amount
		Qardh Financing	Ijarah Financing	Profit-Loss Sharing Financing	
Pre-Merger	2019	5,665.39	15,592.19	8,272.10	29,530.13
	2020	8,424.47	17,918.44	13,641.49	39,984.40
Post-Merger	2021	9,468.01	21,091.99	13,023.34	40,409.78
	2022	9,370.07	26,011.30	12,657.03	43,119.08

Source: Quarterly Sharia Banks (Financial Services Authority) reports, 2019-2022.

Economic empowerment at BSM, BRIS and BNIS has been implemented well through the financing sector for MSMEs pre-merger. It has remained consistent during the post-merger period and even increased. One of the factors causing MSME financing to increase during the post-merger period was the pandemic, which aimed to provide economic stimulus to the real sector that was experiencing difficulties. In addition, the greater number of assets has also contributed to a positive effect on the bigger amount of financing provided to the MSME sector.

The economic empowerment that continues to be provided to MSMEs shows that BSI continues to pay attention to the welfare of society. BSI has undertaken economic empowerment for MSMEs because it has to comply with the provisions of the Sharia Banking Law, which defines *Islamic banks* as banks with a social mission, including economic empowerment. Islamic finance should ensure the circulation of funds to contribute to the real economic sector (Sarker et al., 2020). Islamic banks have a role in the success of the business sector. The flexibility of service development and support provided by Islamic banks is a factor that plays a role in economic empowerment (Tawfiqi et al., 2018).

Comparative Analysis of Pre and Post Merger Economic Empowerment Performance

To compare BSI's economic empowerment performance during pre and post-merger, we calculated the average qardh, ijarah, and profit sharing (mudharabah and musyarakah) financing. The mean of economic empowerment ratio in qardh financing during post-merger, namely 9419036.13, is greater than that of pre-merger, namely 7843154.50. This condition indicates that BSI's qardh financing has increased during post-merger compared to pre-merger. The mean value of rental financing during post-merger, 23551641.75, is greater than that of pre-merger, 16755312.38. This data indicates that BSI's rental financing has increased post-merger compared to pre-merger. The mean value of profit-sharing financing during post-merger, 12840181.00, is greater than that of pre-merger, 10956797.13. This data indicates that BSI's profit-loss sharing financing has increased during post-merger compared to pre-merger.

Table 4. Research Variable Statistical Summary

Variable	Period	Mean	Minimum Value	Maximum Value
Qardh Financing	Pre-Merger	7843154,50	5798977	9280855
	Post-Merger	9419036,13	8874875	10050966
Ijarah Financing	Pre-Merger	16755312,38	15259814	19245186
	Post-Merger	23551641,75	19443347	26893337
Profit-Sharing Financing	Pre-Merger	10956797,13	7682590	17891391
	Post-Merger	12840181,00	12313210	13564475

Source: Processed by SPSS, 2024

This finding confirms the results of previous research, which shows that merger corporate actions can increase the company's nominal financing. Sun et al. (2017) found that mergers of state-owned companies have increased financing capacity. Cui and Leung (2020) study found that the stronger the management capability, the higher the companies' long-term operating performance and financing ability due to mergers in America. Bindal et al. (2020) found that American companies can promote small and medium financing capabilities post-merger. Tang and Han (2018) found that large-scale mergers can result in more significant asset inflows from target firms.

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Table 5 shows that the economic empowerment aspect has a significant value. This result means that BSI's economic empowerment pre-merger was significantly different from its post-merger empowerment. This difference proves that BSI's economic empowerment was better than before the merger. The discourse regarding the differences in economic empowerment after banking mergers is also relatively minimal. However, some studies explaining economic empowerment through access to post-merger financing are still an academic debate. Bank mergers can harm marginal borrowers; namely, groups served only by small banks, because they have the potential to be ignored by larger banks, which has negative impacts on development and inequality (Coccorese & Ferri, 2020). Nissen and Zarakol (2021) even stated that non-elite groups could be frustrated due to less-than-optimal empowerment.

Table 5. Nonparametric wilcoxon test

Z	-1.829[b]
Asymp.Sig (2-Tailed)	.000

Source: Processed by SPSS, 2024

Our comparative analysis indicates that BSI's MSME financing has increased nominally during the post-merger period. However, the proportion of financing distributed to MSMEs has decreased compared to that distributed to the large business sector. One of the reasons for the merger is to improve a more significant portion of financing to corporations. However, in terms of quantity, the nominal funding has continued to increase for the MSMEs financing sector. Mergers have led to more significant economies of scale, so the reach and target market have also widened. This condition has a consequence in a smaller proportion of financing to MSMEs. The decline in the ratio for MSME financing post-merger is attributed to the fact that before the merger, among the three banks that merged, only BRIS focused on MSME financing. BNIS and BSM had yet to make MSME financing their primary focus. When all three banks become BSI, adjustments are made to prioritize segments.

In the post-merger period, BSI has more significant assets and more considerable third-party funds that should be able to become a benchmark for increasing economic empowerment, even though they prioritize financing to large-scale sectors. Suppose the issue of economic empowerment receives excellent attention. In that case, the stimulus for BSI during post-merger through economic empowerment can trigger business actors to be more productive, play an essential role in the economy, and revive the entrepreneurial ecosystem. Once implemented, BSI, as one of the Islamic banks, can compete with large banks in capital and assets but retain its identity as Islamic banks oriented towards social missions through economic empowerment.

Cluster Analysis of Post-Merger Sharia Banking Economic Empowerment Issues

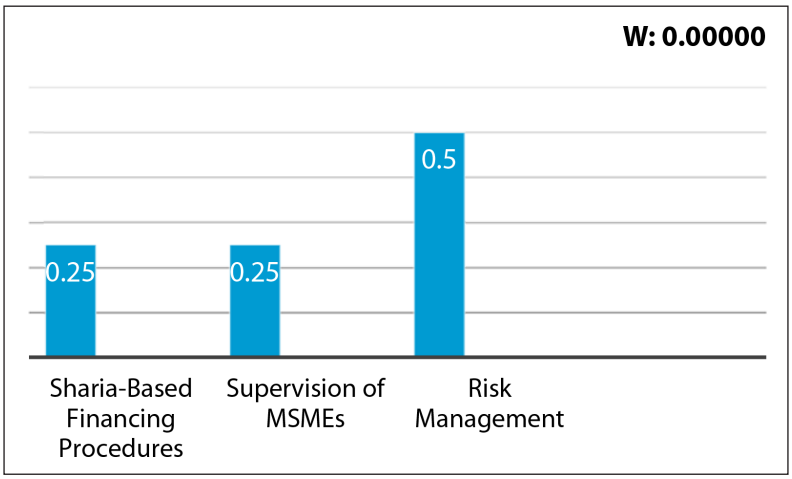
Our research finds that the social mission of economic empowerment BSI during the post-merger period has indicated several issues and problems. Essential issues in

economic empowerment after the Sharia banking merger policy are procedural aspects of Sharia-based financing, supervision of MSMEs, and risk management. There are three procedurs of Sharia-based financing. First, procedural problems for MSME financing are more complex than conventional ones. Second is the greater rate of profit-sharing margins the bank charges more than interest. Third, some other financing problems.

MSME supervision includes problems with inadequate supervision models. Furthermore, MSME financing needs to be on target, while in practice, many MSME financing schemes are not on target. Risk management comprises low-risk management literacy, less priority-based economic empowerment, and a higher risk of returns on PLS financing.

The rater agreement level for BSI's economic empowerment after the merger is 0.00000. This high level of agreement, where all respondents determined fairly balanced priorities, provides reassurance about the robustness of our research process. Figure 3 shows that risk management is a priority issue in post-merger BSI's economic empowerment with a value of 0.5000. This is followed by a procedural rater assessment of Sharia-based financing, supervision of MSMEs of 0.2500.

Figure 3. Priority Issues on *Economic Empowerment*



Source: Processed by ANP, 2024.

Risk management is the most crucial issue that BSI has faced in terms of economic empowerment. BSI needs to help entrepreneurs manage the business risk by identifying, analyzing, evaluating, and managing the risks. Diagnosing risk sources in SMEs is the most important risk management phase because preventive measures can be designed to eliminate identified risks. The bad consequences of not having business risk management threaten the existence of a business. These include its inability to pay debts, employee salaries, or unfavorable financial indicators. These side effects translate into business bankruptcy and often lead to liquidation (Dvorsky et al., 2021).

Banks are institutions exposed to various risks, including credit, market, liquidity, and operational risks. A sound financial strategy allows banks to identify, measure, and

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manage these risks effectively, ensuring they are within acceptable limits (Calandro & Flynn, 2007). Banks need to meet expected business needs, causing great uncertainty for banks. Islamic banks have broader responsibility and can pose a risk known as a moral hazard. Profit and loss sharing implemented to avoid risks will threaten banks (Miah & Suzuki, 2020). Profit-sharing financing has the potential for imperfect information to occur, causing asymmetric information. An imbalance in information between both parties can create risks that cause losses and increase non-performing financing for banks.

Having well-defined risk management, banks can reduce the possibility and impact of financial losses caused by unexpected events (Calandro & Flynn, 2007). Understanding risk management will create a business that is relevant to developing business model trends. Theoretical and practical studies regarding risk management in MSMEs will support and protect the company, increase value, and gain significant benefits from managing various types of risks.

Table 6 shows that the rater agreement cluster level on Sharia-based financing procedural problems during post-merger is 0.05156. This result means that all respondents determine their priorities variedly, so the agreement value is low. The level of cluster rater agreement regarding the supervision of Islamic banking MSMEs post-merger is 0.00000. This result means all respondents determined fairly balanced priorities, so the agreement value was high. The rater agreement level for the cluster of risk management problems post-merger is 0.03044. This result means all respondents determined fairly balanced priorities, so the agreement value was high.

Table 6. G-Mean Priority of Economic Empowerment Problems

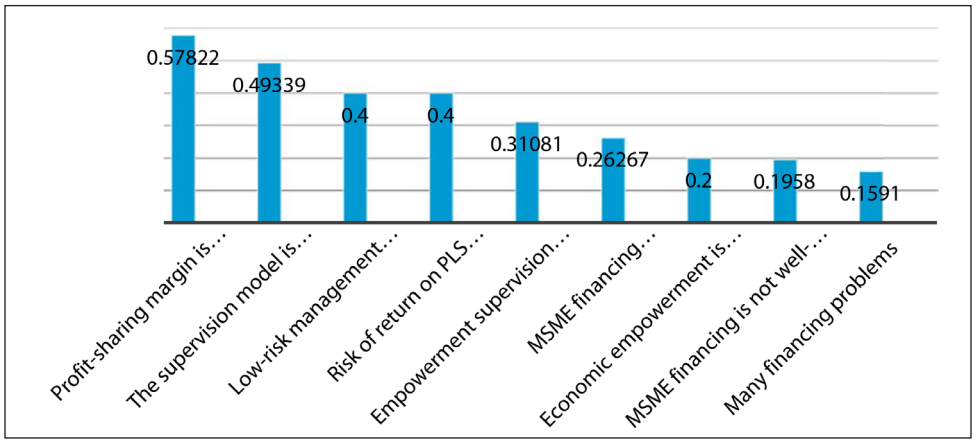
Problem Clusters	Rater Agreement	Problem Nodes	G-Mean
Sharia-Based Financing Procedures	0.05156	MSME financing procedures are more complex than conventional ones	0.26267
		Profit-sharing margin is greater than the interest	0.57822
		Many financing problems	0.15910
Supervision of MSMEs	0.00000	The supervision model is inadequate	0.49339
		MSME financing is not well-targeted supervision model is inadequate	0.19580
		Empowerment supervision is a formality	0.31081
Risk Management	0.03044	Low-risk management literacy	0.40000
		Economic empowerment is less priority-based	0.20000
		Risk of return on PLS financing	0.40000

Source: Processed by ANP, 2024.

The issue of the higher rate of profit-sharing margin charged by the bank than interest is a top priority in the economic empowerment of Sharia banking post-merger with

a rater agreement of 0.57822. This is followed by the issue of an inadequate supervision model of 0.49339, the issue of low-risk management literacy and the risk of return on PLS financing of 0.40000, the issue of formality empowerment supervision of 0.31081, the procedural issue of MSME financing being more complex than conventional at 0 .26267, the issue of economic empowerment not being prioritized is 0.20000, the issue of MSMEs financing not being on target is 0.19580. The lowest is the issue of lots of problematic funding with a value of 0.15910..

Figure 4. Priority Problems on Economic Empowerment



Source: Processed by ANP, 2024.

This argument is explained in research, and many still do not use Sharia bank products because they think borrowing funds from Sharia banks is more expensive than conventional bank interest rates (Ismartono, 2023). The merger policy changes Sharia banking conditions regarding assets, capital, size, and financing ratios (Shawtari et al., 2018). Jedidia (2020) outlines that higher margin figures are positively related to banks with large capital, a high ratio of loans to total assets, and larger bank size. The profit-sharing margin in Sharia banking is greater than the interest applicable in conventional banks. However, this margin is considered balanced with the benefits received. In traditional banking, bank interest follows the market, so there can be fluctuations, but Sharia banking uses a flat profit-sharing concept. This assumption is the basic paradigm for people who consider Islamic banks not to be an alternative, but the advantages of large margins have yet to be discovered. The risk is shared if there are obstacles to the financing process, adjusted to certain conditions.

Supervising the development of MSMEs is necessary for Islamic banks. However, supervision must be arranged in such a way that the supervision functions as guidance. Apart from that, supervision must also be carried out periodically and in a more structured manner. Therefore, the problems faced by MSMEs can be detected from the start to develop their business (Indarti, 2020). The proactive role of supervision in detecting and solving problems instills confidence in the support provided by Islamic banks. Supervisory behavior includes moral and professional support, building a healthy work culture, and

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helping to improve performance (Min et al., 2020). Post-merger, Islamic banks faced the challenge of developing the MSME sector with a supervision model that could support and produce excellence in banking financing performance.

The approach applied to MSMEs for risk management has yet to be specifically studied and understood. Some parts of risk management, such as financial and management risk management, could be better understood (Lima & Verbano, 2020). Goncharenko (2020) identified that risk management knowledge is a core element of strategic management. Nurdin & Yusuf (2020) found the importance of management knowledge in improving organizational performance, emphasizing the urgency of this aspect. Knowledge has business benefits through service planning and design.

This result is achieved if conditions are created by management knowledge to develop, acquire, transfer, and run a business and establish appropriate business strategies. This condition will result in product quality, increased revenue, and achieved a competitive advantage. Management knowledge in Islamic banks is very diverse because of the two educational backgrounds: Islamic and conventional ones. Knowledge in Islamic banking is integrated through mechanisms to produce general knowledge to suit the Islamic banking context.

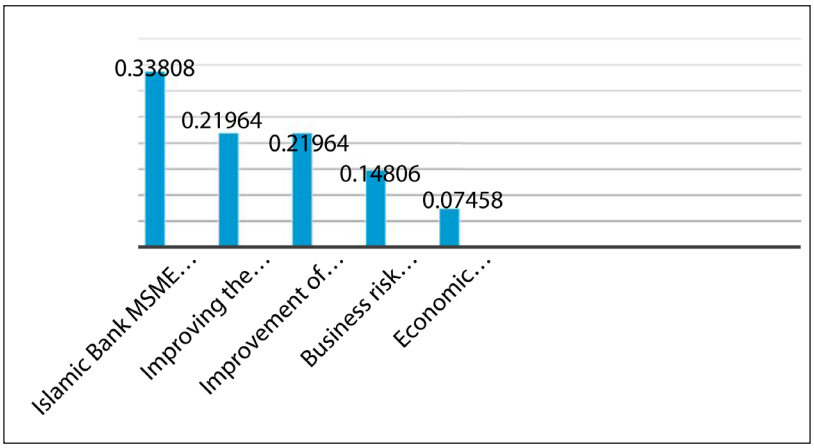
Priority Strategy for BSI's Economic Empowerment Development in the Post-Merger Period

Based on the complexity of the issue of post-merger Islamic banking economic empowerment, there are several strategies to improve Islamic banking economic empowerment, namely mapping the economic empowerment market segment, improving the quality of human resources, improving supporting facilities and technology, training and mentoring on business risk management, as well as MSMEs financing policy interventions. The rater agreement value for the economic empowerment aspect of the strategy is 0.03044. This result means that all respondents determined fairly balanced priorities, so the agreement value was high.

As per the strategy analysis, the BSI's MSMEs financing policy intervention is identified as the linchpin of the post-merger Sharia banking development strategy in the economic empowerment aspect, with a substantial value of 0.33808. This underscores its paramount importance in our future plans. It is followed by a plan to enhance the quality of human resources and improve supporting facilities and technology, which hold a value of 0.21964. The strategy of business risk management training and mentoring follows with a value of 014806, and the final strategy, mapping the economic empowerment segment, holds a value of 0.07458.

Financing the MSMEs sector is still a challenge for all banks. The risk of providing financing to MSMEs is quite large, so what is needed is how to manage the risk of MSMEs financing. Interestingly, risk management already has standards and guidance from the regulator in the form of POJK, which regulates sharia and conventional bank financing regulations at the same level.

Figure 5. Sharia Banking Economic Empowerment Strategy Priorities Post-Merger



Source: Processed by ANP, 2024.

Al-Melahi et al. (2022) recommend specific supervisory policies and regulations that will support the management of banking financing businesses. Access to finance is the dominant factor influencing the growth of small and medium enterprises. Policymakers must build an efficient, strong, and well-functioning financial market system to provide MSMEs affordable finance and sustainable services. Sharia banking stakeholders need to improve the performance of MSMEs financing and avoid risks that could harm banks and MSMEs.

KUR (Small Business Credit) is still the choice for MSMEs when choosing financial access because of the low interest rates. Policy intervention must be carried out to determine the profit-sharing margin to balance the interest rate on KUR. If the financial access policy in Sharia banking is relevant to the needs of MSMEs, it will increase Sharia banking financing. A detailed monitoring plan model is also needed through steps that lead to business improvement. The real sector is the most important in the Islamic economic system because it is directly related to increasing output and improving people's welfare. All components of the economy are directed at encouraging this real sector for business actors.

Economic empowerment requires interaction between the bank and the customers, so improving the quality of human resources is important. Such an effort will improve the quality of economic empowerment by assisting customers. BSI has significant funds that can be used more efficiently in management. It is expected that BSI will consistently distribute funds. First, of course, with an orientation towards empowerment. Second, BSI can also provide training not only to large players but also to small businesses. Third, sustainable empowerment is in the form of mentoring. Some of them have attended training programs and understand the business's basics, but assistance is still needed. One expert said, "Don't let training be provided, but then they have to run the businesses alone because there is no assistance provided."

A critical element in advancing small and medium businesses is the availability of human resource management (Arief et al., 2021). Improving human resources quality means facing global challenges (Jamaluddin & Abdullah, 2019). Arief et al. (2021) prove in

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their study that quality human resource management relationships will help SMEs achieve their goals. Improving HR governance is a continuous effort to develop quality staff and personnel by MSMEs with various work skills. Nurani et al. (2021) emphasize that small and medium enterprises (SMEs) can only operate effectively with quality human resources.

The first principle of good governance for an organization is the selection of appropriate and high-quality human resources (Malib et al., 2022). In essence, improving the quality of human resources is crucial for every business job. This condition is based on quality human resources who can master all skill requirements and become market leaders nationally and internationally (Dangles & Casas, 2019). Human resource development must be carried out in a way relevant to the needs of MSMEs (Arief et al., 2021).

BSI also provides economic empowerment through BSI Maslahat Sociopreneur, where this program aims to produce undergraduate graduates with alternative careers so they are no longer oriented as job seekers but as job creators. BSI Maslahat Sociopreneur is a business incubator scholarship program that prepares students to become Muslim entrepreneurs with business skills and social impact. This program is committed to carrying out a series of business incubation and training processes for students from various regions of Indonesia who have talent in the entrepreneurial sector.

Human resource empowerment is seen as the ability that humans have to be utilized to run an organization or business so that it is efficient and successful. Human resource development is developing human qualities or skills through planning, education, training, and management to achieve optimal results (Adla et al., 2020). Empowerment means focusing on the problem of how individuals, groups, or society try to shape a better future (Adams et al., 1998). Community empowerment can be interpreted as an effort to restore or increase a community's capacity to act following their dignity in carrying out their rights and responsibilities as citizens. Economic empowerment involves succeeding financially and acting on financial decisions.

Improving the quality of human resources is carried out by conducting internal training programs on banking products and Sharia banking risk management. Integral empowerment based on Islamic principles includes empowering access to capital (financial institutions), marketing (market access), and capacity building (assistance and training) (Saripudin et al., 2020). Training is very much needed to develop human resources related to business products and administrative training. The aim is to help MSME owners manage their businesses and create further training programs to drive innovation in developing MSME skills (Malib et al., 2022). The training process is a procedure that improves human resource skills in supporting MSMEs (Wuen et al., 2020).

Sharia banks would carry out training and capacity-building programs to support the sustainability of the MSMEs business of Sharia banks (Nurdin & Yusuf, 2020). Bank intermediation in MSME projects is a credible signal for banking reputation. A diversity of bank products is needed to meet the needs and expectations of MSMEs (Hachimi & Salahddine, 2019). Improving the quality of human resources includes further improvement steps in Islamic financial infrastructure and Sharia banking in the future (Marlina et al., 2021).

Access to finance is the dominant factor influencing the growth of small and medium enterprises. Policymakers must build an efficient, well-functioning financial market system to provide MSMEs with affordable finance and sustainable services. Sharia banking stakeholders need to pay attention to supporting human resource development in improving MSME's financing performance and avoiding risks that could harm banks and MSMEs.

CONCLUSION

There are significant differences in the economic empowerment performance of the Islamic bank, using BSI as a case study, during pre and post-merger periods. This difference proves that Sharia banking's economic empowerment performance is better in the post-merger period in terms of quantity, reflected in the more significant amount of financing distributed to MSMEs. However, in terms of proportion, there has been a decreasing percentage of financing distributed to MSMEs compared to the ones distributed to corporate financing. This condition can be explained by the shifting focus of BSI from three relatively smaller Sharia banks (BSM, BNIS, and BRIS) to a bigger Sharia bank. The economic empowerment performance of Sharia banking through qardh financing and rental financing has increased during the post-merger period, while profit-loss sharing funding has decreased. This result means that economic empowerment at Bank Syariah Indonesia has been implemented through the financing sector for MSMEs but has yet to be maximized in profit-sharing financing modes. However, overall, the economic empowerment of MSMEs with qardh, rental, and profit-sharing financing schemes has increased in the post-merger period.

The ANP analysis indicates that risk management is a priority issue in the post-merger BSI's economic empowerment. This is then followed by the issues of sharia-based financing procedures and supervision of MSMEs. In the aspect of economic empowerment issues, the issue of higher rate of profit-sharing margins charged by the sharia bank than interest is the main priority in the economic empowerment of BSI's post-merger period. This is followed by the issue of inadequate supervision models, low-risk management literacy, risk of return on PLS financing, more formalistic empowerment supervision, more MSME financing procedures than the ones of conventional banks, less priority economic empowerment, unreached MSMEs financing target, and the larger number of problematic financings in the form higher NPF. Strategy analysis shows that the sharia bank needs a policy intervention in MSMEs financing. This is a key strategy to make the sharia bank more competitive and attractive to MSMEs. This is followed by a strategy to improve the quality of human resources, improve supporting facilities and technology, training and mentoring on business risk management, and the final strategy, namely mapping the economic empowerment segment.

This research recommends the intervention of the sharia Bank's MSME financing policy that are balanced with conventional banks so that the sharia bank can become the public's choice in financing the MSMEs sector. The yield policy at sharia banks can be equated with the low KUR interest rate at conventional banks. If there is no

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policy intervention on this issue, MSME business actors will prefer conventional banks and may turn away from Islamic banks, which have a social mission of economic empowerment. Another recommendation is to strengthen the economic digitalization of financing distribution to the MSMEs sector as a technological means to support the accessibility of economic empowerment and distribution segmentation to focus more on the halal industry from upstream to downstream. The research contribution can be used as a reference for strategic studies, sharia banking policy makers, and the development of literature related to banking mergers that integrate aspects of financial performance with economic empowerment. BSI's presence as a large bank should be ready to compete with conventional banks. Still, it is crucial for BSI to maintain its identity as a Sharia bank oriented towards social missions through economic empowerment.

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The Impact of Financial Development on Unemployment: The Case of the People's Republic of China (PRC)

Liu Yixin[1], Naziatul Aziah Mohd Radzi[2*], Ma Mengqi[3], Normaizatul Akma Saidi[4]
[1,2&3]**Faculty of Economics and Management, Universiti Kebangsaan Malaysia, Malaysia**
[4]**Faculty of Hospitality, Tourism and Wellness, Universiti Malaysia Kelantan, Malaysia**
E-mail: [1]josie98556@gmail.com, [2]naziah.radzi@ukm.edu.my, [3]xiaova6678@163.com, [4]akma.s@umk.edu.my
[*)]**Corresponding Author**

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Abstract

Research Originality: As a populous country with a population of 1.4 billion, China faces the imperative issue of employment. This paper focuses on the impact of financial credit and financial deposits on different levels of unemployment in an attempt to analyse the unemployment problem in China.

Research Objectives: The paper explores the impact of financial development on unemployment in China.

Research Methods: Using panel data from 31 provinces and cities in China (spanning from 2007 to 2021), categorizing unemployment situations, employing quantile regression models to assess the impact of financial development on different levels of unemployment in China.

Empirical Results: The findings indicate a negative correlation between financial development and unemployment levels in China. The study reveals that financial credit significantly impacts unemployment in provinces where the economy is higher than average GDP. However, in regions where the economy is lower than average GDP, the impact of financial deposits on unemployment is significant.

Implications: This study establishes that the adoption of financial expansionary policies by the government can reduce unemployment and help guide the formulation of more precise and effective economic policies.

Keywords:

financial development; unemployment; quantile regression; deposit; credit

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INTRODUCTION

As a significant concern in both developed and emerging nations, unemployment results in economic and social challenges (Seth et al., 2018). Unemployment poses economic challenges by reducing income tax collection and productivity and causing several other issues (Adarkwa et al., 2017). Similarly, Al-Habees and Rumman (2012) argued that unemployment is a multi-faceted phenomenon, encompassing economic and social aspects. It manifests as fluctuations in economic activity and their influence on social structures as a social phenomenon. Unemployment varies based on a country's structure and the specific form of unemployment, which may lead to severe hardship and economic inefficiency resulting from a country's inability to employ its workforce (Baah-Boateng, 2016) efficiently. From another angle, Anghel et al. (2017) opined that unemployment, as a macroeconomic indicator, signifies a country's inefficiency in efficiently exploiting its abundant labor resources.

Currently, China's evolving employment structure has led to new challenges in the job market, impacting the workforce's supply and demand significantly. Colleges and universities are increasing admissions, leading to many graduates entering the job market annually, many of whom struggle to secure employment (Li et al., 2014). China's economic growth has resulted in cities accommodating more rural laborers, leading to a growing number of farmers opting to work in urban areas rather than on farms (Frijters et al., 2015). China's industry upgrades and restructuring have increased unemployment among middle-aged employees (Song et al., 2012). These three reasons will result in a rise in China's workforce. China is currently experiencing a crucial stage of economic development in relation to workforce demand. The market and government are working together to enhance economic development, leading to a phase of consistent economic growth. This condition implies diminishing the significance of economic growth in increasing employment. Therefore, how can China's labor market achieve steady and high-quality economic development while also increasing employment?

Past research has mostly focused on theoretical analyses indicating that higher levels of financial development stimulate job creation; however, empirical research is scarce on the impact of financial development on unemployment. Some researchers have examined the empirical link between financial advancement and firm dynamics (Arellano et al., 2012). Still, limited research has examined its effect on employment market dynamics. Some scholars argue that financial development promotes employment (Chen et al., 2021; Epstein et al., 2019; Pagano & Pica, 2012). However, the negative correlation between financial development and unemployment varies across countries, indicating a strong inverse relationship between these macroeconomic variables (Raifu et al., 2023).

The choice to study the impact of financial development on unemployment in China is due to the emerging importance of finance in the Chinese economy. There needs to be more previous research on this relationship, and this paper analyses it using different measures of financial development to explore findings that are more relevant to the Chinese context and to discover the mechanisms by which financial deposits and financial credit affect unemployment. In-depth analyses of these two indicators can

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provide a more accurate understanding of the impact of different financial activities on unemployment and provide a basis for more precise policy formulation. Using a multi-indicator research methodology also allows for a more comprehensive assessment of the impact of China's financial development on unemployment, making the study's conclusions more in-depth and comprehensive.

By distinguishing between different levels of economic development, the paper reveals the different impacts of financial development on unemployment and provides meticulous data analyses and quantitative regression results. In addition, the paper uses quantile regression to explore the impact of different levels of unemployment in-depth, providing a new perspective for understanding the dynamics of China's economy and job market. Based on Okun's law, the present study focuses on the influence of financial advancement on the unemployment rate. Okun's law was proposed by American economist Arthur Okun and approximates the inverse correlation between the unemployment rate and real GDP. According to this law, a 2% decrease in real GDP growth relative to potential GDP growth increases the unemployment rate by about 1%. In comparison, a 2% increase in real GDP growth relative to potential GDP growth decreases the unemployment rate by about 1%.

Different scholars have different standards of measurement for the development of finances. King and Levine (1997) were pioneers in proposing using bank ratios as an indicator of financial growth, which laid the groundwork for the modern theory of financial development. Subsequently, Levine (1999) proposed that the best way to quantify financial sector growth is by assessing its capacity to analyze the financial system, identify successful businesses, regulate firms, handle risks, attract savings, and ease transactions. These definitions are important for the efficiency of financial institutions and stock markets. The present study provides an overview of financial development measurement based on the categorization of financial development measures by Valickova et al. (2015).

Economists have extensively studied the topic of unemployment. Addressing unemployment and boosting the employment rate is intricately linked to economic growth, social stability, and enhancing living standards. Scholars have emphasized macroeconomics as a significant issue. Levine (2012) emphasized that throughout economic growth, the path of production expansion depends on the combined growth rates of both labor supply and labor productivity. When real GDP growth exceeds the rise in labor productivity, employment increases; if job growth exceeds the expansion of the workforce, unemployment rates will decrease. Soylu et al. (2018) found that economic growth and unemployment are connected at the primary level of normalization, where economic growth impacts unemployment levels. Specifically, when GDP rises, unemployment falls.

The correlation between labor productivity increases and unemployment has been the subject of extensive theoretical and empirical discussions. Nevertheless, economists generally concur on the long-term positive impacts of labor productivity. Gallegati et al. (2014) found that productivity initially leads to short- and medium-term unemployment but eventually leads to increased employment. Similarly, Chen and Semmler (2018) used data from the United States to demonstrate that short-term productivity growth

might lead to higher unemployment. However, long-term productivity growth might be inversely related to unemployment. From another perspective, Wauthy and Zenou (2002) applied the classic theory of imperfectly competitive macroeconomics to show that the diversity of the labor force results in interconnected equilibrium wages, with each enterprise requiring its employees to cover training expenses. The lower the skills, the higher the training costs, and the harder it is to find a job. In this scenario, those with lower qualifications are at a higher risk of unemployment due to the excessive expenditures associated with their training. This situation also applies to the low-skilled workforce. Zeren (2019) found that technological progress does not reduce employment but creates new jobs and reduces unemployment. On the contrary, Casey (2018) and Md. Muinuddin et al. (2019) contended that technical advancements lead to higher long-term growth rates for salaries and output but also cause a rise in unemployment and a decrease in the percentage of labor income.

From a labor market perspective, the correlation between rural-urban migration and unemployment has attracted the attention of many economists. Todaro (1969) posited that labor migration occurs when workers anticipate higher pay in a different location. To establish a balance in employment between urban and rural regions, equalizing the anticipated earnings in both locations is essential. Similarly, Hussain et al. (2014) asserted that rural-urban migration is acknowledged as a major factor leading to a surplus workforce in urban areas. Unemployment in urban regions continues to rise due to the disparity in economic and structural development between urban and rural areas. Gorry (2013) examined the correlation between the minimum wage and unemployment and discovered that the minimum wage had a notable impact on increasing unemployment among young workers in France. Reducing or abolishing the minimum wage might lead to a decline in fresh unemployment in France.

On the contrary, Islam et al. (2017) discovered that implementing minimum wage legislation had a beneficial impact on decreasing unemployment in Malaysia. Kim and Lim (2018) found that although raising the minimum wage reduces labor demand, which increases the unemployment rate, it does not affect labor supply. Kilimova and Nishnianidze (2017) concurred with the notion that nations with higher levels of education tend to have lower rates of unemployment. This is because higher education workers receive more advanced training than secondary vocational education workers. The production process becomes more complex, and employers are more interested in higher-education individuals.

Enhancing financial resources may greatly enhance production and business circumstances for enterprises by providing credit access, which can encourage firms to generate additional job opportunities. Epstein et al. (2019) showed a significant negative link between financial development and unemployment volatility in developing nations through their study of the impact of financial expansion on labor market dynamics. Developed economies follow the opposite rationale. This is because input credit is less prevalent in developed economies than in developing ones. Raifu et al. (2023) discovered a significant negative impact of financial services development on unemployment across all

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quantiles. Nevertheless, this impact decreases when one transitions from lower to higher quantiles. In a unidirectional manner, financial development is typically causally linked to unemployment, especially in the cases of adolescent, adult, and female unemployment. The causal relationship stems from economic growth and unemployment.

Some experts contend that financial growth exacerbates unemployment (Ibrahiem & Sameh, 2020; Shabbir et al., 2012). Shabbir et al. (2012) examined the correlation between unemployment and several indices of Pakistan's economic progress from 1973 to 2007, using autoregression with distributed lags, Granger integration, and causality tests. They found that most indicators exhibit a detrimental long-term influence on unemployment. Furthermore, advocates emphasizing the negative consequences of financial expansion on employment point to three ways it might harm employment. In other words, credit constraints cause decreased labor productivity, perhaps leading to employee layoffs (Dromel et al., 2010). Epstein et al. (2019) assert that heightened financial development results in a rise in investment prospects. Simultaneously, the number of non-performing assets is increasing, which might lead to a significant recession if a crisis occurs. Extending the recession period of the economic cycle leads to an increase in the length of unemployment, thereby causing a rise in the unemployment rate.

Ajide (2020) discovered a stable relationship between financial sector progress and unemployment based on the International Monetary Fund's new composite index of financial sector development. Positive variables have a more significant influence on unemployment than the adverse effects of financial development on unemployment. Chen et al. (2021) suggested that excessive financial development might hinder economic progress, particularly in nations with stringent labor market regulations. Financial systems that are highly dependent on the normal functioning of the financial sector, i.e., financial systems that are overly reliant on banks or lack market orientation, may impede investment and entrepreneurship, particularly in countries with flexible labor market regulations.

This study examines how the degree of financial development affects unemployment. The primary explanatory variables influencing unemployment are analyzed descriptively. An analysis is conducted using panel data from 31 Chinese provinces and cities over a fifteen-year period to categorize the provinces into economically developed and less developed regions based on GDP. This study then analyses how the level of financial development impacts unemployment in regions with varying economic development levels. This approach can help us better understand the mechanisms through which financial development affects unemployment across different economic levels.

The study examines how financial development influences unemployment in China. Economically developed regions may offer more job opportunities due to advanced financial systems, while underdeveloped regions face financial resource constraints. Comparing regions of varying economic levels helps understand financial development's impact on unemployment pathways. Quantile regression analysis is conducted on panel data to explore how financial development's influence varies across different unemployment levels. This approach enhances research accuracy by capturing unemployment complexity and diversity. Categorizing unemployment levels aids in formulating targeted policies to

address diverse unemployment situations effectively. This study offers insights for crafting and implementing employment policies in China.

METHODS

The statistics in the present study are sourced from the National Bureau of Statistics of China, a website that collects data from 31 provinces and cities in China, excluding Hong Kong, Macau, and Taiwan. This study examines the relationship between financial growth and unemployment in China using provincial-level data from 2007 to 2021. The data collected from 31 provinces and municipalities in China was separated into two categories based on the average GDP. The first category consists of provinces with GDP levels that are higher than the average, such as Beijing, Hebei, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Shandong, Henan, Hubei, Hunan, Guangdong, and Sichuan. The second category consists of provinces with GDP below the average, such as Tianjin, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Jiangxi, Guangxi, Hainan, Chongqing, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

The present study uses the quantity of unemployed individuals in the 31 provinces of China as a measure of the explanatory factors. Cross-country studies typically use the private sector loan-to-GDP ratio as a measure of financial progress (Ghirmay, 2004). There are no provincial-level substitutes available for China's data. Thus, the present study utilises the following two indicators: Cre is the total credit to GDP ratio in the financial system, while Dep is the total deposits to GDP ratio in the financial system. These ratios indicate the disposable income for consumption and the liquidity crucial for firms' survival (Li & Wye, 2023; Zhang et al., 2012).

Table 1. Variables Definition Summary

Types	Names	Symbols	Explanation
Dependent variable	Unemployment	U	the number of unemployed in each province of China
Control variables	Gross Domestic Product	GDP	the GDP of each province in China
	Birth Rate	BR	the birth rate by province in China
	Education	Edu	the government's financial education expenditure for each province in China
	Wage	W	the average wage of each province in China
Independent variables	Deposits	Dep	the ratio of total deposits to GDP in China's provincial financial systems
	Credits	Cre	the ratio of total credit to GDP in China's provincial financial systems

The present study examines how financial development affects regions with varying degrees of economic development using a two-way fixed effects model to analyse two datasets. The study examines the relationship between financial development and unemployment across various economic conditions to see if the effect is positive or

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negative. The data is thoroughly studied using the quantile model to see if the impact of financial growth on unemployment varies at different quantile levels.

This study utilises Stata to regress and evaluate the data. Outliers significantly impact the sum of squares of the residuals in the least squares model, leading to skewed regression results. The findings from this study use the Koenker and Bassett (1978) quantile regression model. Quantile regression is an extension of inverse mean regression that assesses the impact of explanatory factors on dependent variables at various quantile levels. Quantile regression has fewer stringent assumptions and is less affected by outliers with extreme values and heavy tails in the data distribution, which helps prevent biases. Quantile regression is known for its robustness and ability to evaluate data effectively, even in the presence of severe outliers (Galarza Morales et al., 2017; Nie et al., 2020; John, 2015). This study constructs a quantile regression model.

$$\ln U_{i,t}(\tau|x_{i,t}) = \beta_0 + \beta_1 \ln GDP_{i,t} + \beta_2 BR_{i,t} + \beta_3 \ln W_{i,t} + \beta_4 \ln Edu_{i,t} + \beta_5 \ln Dep_{i,t} + \beta_6 \ln Cre_{i,t} + \varepsilon$$

In this model, lnU is the dependent variable, which is calculated using the logarithm of the number of unemployed. $\ln U_{i,t}$ represents the logarithm of the amount of unemployment in province i in year t. τ is the τth quantile. $\ln GDP_{i,t}$ is an independent variable that stands for the GDP of each province in China. $BR_{i,t}$ is another independent variable, signifying the birth rate for each province. $W_{i,t}$ is wage, which is measured by the average wage in this study. $\ln Edu_{i,t}$ is another independent variable for the government's financial education expenditure in each province. $\ln Dep_{i,t}$ and $\ln Cre_{i,t}$ are the independent variables for financial development.

RESULT AND DISCUSSION

This study explores the relationship between financial development and unemployment in China by employing a two-way fixed effects model and quantile regression analysis using provincial data from 2007 to 2021. The paper begins with descriptive statistics and correlation analyses. The regression analysis shows that financial development significantly negatively impacts unemployment. In particular, the ratio of deposit to GDP significantly affects the unemployment rate in highly developed and relatively underdeveloped regions. However, the impact of credit on unemployment is concentrated in provinces with above-average GDP.

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
U	25.676	14.907	1	82.5
GDP	21423.161	20376.899	344.1	124719.5
BR	11.107	2.827	3.59	17.89
W	58823.882	29136.311	18144	194651
Edu	7958932.3	6350134.5	405548	44990678
Dep	1.849	0.723	0.848	5.233
Cre	1.399	0.491	0.55	2.996

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 displays the descriptive statistics of the raw data used. The average GDP of provinces and municipalities is around 21423 billion Yuan. Provincial governments and cities had a birth rate of 11% and spent 7,958,932,000 Yuan on education, respectively. The average unemployment rate is 26 individuals, and the average salary is 58,823 Yuan, ranging from a high of 194,651 Yuan to a low of 18,144 Yuan. The table shows that the total deposits-to-GDP ratio in the financial sector is greater than the total credit-to-GDP ratio.

Table 3 presents the correlation coefficient analysis of the main independent variables and control variables in the sample data. The most significant finding is a strong negative association between the number of unemployed individuals (the dependent variable) and the extent of financial development (the primary independent variable) at a 1% significance level. This indicates a clear negative correlation, with many variables showing low correlation coefficients.

Table 3. Correlation coefficient

	lnU	lnGDP	BR	lnW	lnEdu	lnDep	lnCre
lnyU	1.000						
lnGDP	0.812***	1.000					
BR	-0.456***	-0.382***	1.000				
lnW	-0.051	0.364***	-0.218***	1.000			
lnEdu	0.663***	0.938***	-0.283***	0.557***	1.000		
lnDep	-0.362***	-0.102**	-0.233***	0.589***	0.037	1.000	
lnCre	-0.313***	0.020	-0.250***	0.705***	0.175***	0.780***	1.000

Three tests were conducted on the two sets of data to establish the efficiency specifications: the redundant fixed effects test, the Breusch-Pagan test, and the Hausman test. The results in Table 3 indicate that the null hypothesis for the redundant fixed effects test is rejected, suggesting the use of the fixed effects (FE) model; the null hypothesis for the Breusch-Pagan test is rejected, suggesting the use of random effects (RE); and the null hypothesis for the Hausman test is rejected, indicating the use of the fixed effects (FE) specification. The test results suggest that the FE model suits provinces with greater and lower GDP.

Table 4 shows a clear negative impact of GDP on unemployment in Chinese provinces and cities with GDP levels below the average, as shown in Model 2. Scholars have widely recognized the negative relationship between GDP and unemployment (Epstein et al., 2019). Model 1 does not show a statistically significant correlation between GDP and unemployment. In developed economies, input credit is less significant compared to developing economies, while the inverse is true for developing economies (Epstein & Shapiro, 2019). Both models show that the birth rate significantly impacts unemployment, indicating that as fertility rates rise, so does unemployment. According to Adsera (2005), increased unemployment may result from pregnant women leaving the job market as a result of higher fertility rates.

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Table 4. Results of Panel Regression for Provinces with Above-Average GDP and Below-Average GDP

	Above-Average GDP	Below-Average GDP
	Model 1	**Model 2**
lnGDP	-0.0042	-0.3427*
	(0.9891)	(0.0428)
BR	0.0489*	0.0311*
	(0.0420)	(0.0456)
lnW	0.6013	-0.1445
	(0.2409)	(0.5268)
lnEdu	-0.6877	0.2663*
	(0.0700)	(0.0499)
lnDep	0.8268*	-0.7864***
	(0.0183)	(0.0009)
lnCre	-0.4339*	0.0853
	(0.0392)	(0.5416)
_cons	7.1235	3.2912
	(0.2358)	(0.1065)
N	169	232
adj. R^2	0.8823	0.9718
F-test	31.31***	26.20***
B-P	345.00***	275.68***
Hausman	23.58***	78.30***
model	FE	FE

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Government financial funding for education in Model 2 has a statistically positive effect on unemployment in provinces with below-average GDP levels. This aligns with the concept that higher education levels are associated with higher unemployment rates in less economically developed regions, as proposed by Nepram et al. (2021). Having an education does not necessarily ensure employment. Additionally, the cause of the unemployment issue is not a lack of demand for workers but rather a mismatch between workers' abilities and the standards set by businesses (Binuomoyo, 2020). Model 1's findings indicate that government financial expenditure on education does not significantly affect unemployment. This discrepancy may be due to the distinct effects of formal schooling on unemployment. Factors such as educational attainment and certification can affect how education spending impacts unemployment rates (Riddell & Song, 2011).

Interestingly, the average income does not have a statistically significant impact on unemployment in both Models 1 and 2. This result suggests that wages do not significantly impact either encouraging or reducing unemployment. One possible explanation is that minimum wage increases have a minimal impact on employment levels (Totty, 2017).

Deposits to the GDP ratio significantly affect unemployment in both Models 1 and 2. This impact is beneficial in provinces with a GDP above average. This is because areas with more advanced financial development provide greater investment prospects.

Simultaneously, the number of non-performing assets is increasing, which might result in a significant economic downturn during a crisis. Prolonging a recession in the economic cycle leads to a rise in unemployment, causing an increase in the unemployment rate (Epstein et al., 2019). Credit constraints in financial markets worsen both the level and duration of unemployment (Dromel et al., 2010). Conversely, in areas with lower-than-average GDP, the impact of economic growth on unemployment is negative, aligning with Çiftçioğlu and Bein's (2017) findings. Financial system deposits, as part of financial depth, together with private sector lending and financial liquidity, have the potential to greatly decrease unemployment. Over time, banking system deposits have a negative and significant impact on the unemployment rate (Çiftçioğlu & Bein, 2017). As a result, in less developed economies, it is crucial to encourage financial growth by raising savings, underlining the importance of this endeavor.

The credit-to-GDP ratio has a significant adverse impact only on provinces with GDP levels above the average. Financial development facilitates increased credit accessibility and reduced loan expenses, enabling sovereign wealth funds to get credit and thus boost employment (Chen et al., 2021). Model 2 demonstrates no significant association between the loan-to-GDP ratio and the province's below-average GDP, aligning with Bayar's (2016) research findings. The financial sector benefits the actual economy once it reaches a certain level. During the first phases of economic development, the financial sector typically faces challenges in attracting enough money to generate and allocate sufficient capital for economic expansion. The lack of a link between financial development and unemployment may be attributed to an undeveloped financial sector.

Previous research on the varied impacts of financial expansion on unemployment in different economic regions of China has shown that deposits notably influence both highly advanced and relatively underdeveloped regions. The impact of deposits on unemployment is favorable in provinces with above-average GDP and negative in areas with below-average GDP. Credit only significantly impacts unemployment in provinces with GDP above the average. Quantile regressions on a panel of 31 provinces and cities in China will provide a more precise insight into the relationship between financial progress and unemployment in the country. The results indicate that financial development has a negative impact on unemployment.

A model is considered more robust when the majority of explanatory factors significantly impact the quality of employment across various quantile points, as seen in Table 5. The model coefficients for GDP show a substantial influence on unemployment in provinces with low unemployment levels, ranging from 25% to 90%, but not at the 10% quantile point. As unemployment levels rise in other provinces and cities, the influence of GDP on unemployment also grows, with GDP positively affecting unemployment. All five quantiles show negative regression coefficients for the birth rate, indicating that the birth rate has a detrimental impact on unemployment levels across China's labor market as a whole and in various quantiles. Varying regression coefficients across quantiles indicate that the impact of the birth rate on different degrees of unemployment is almost the same. At all five quantile points, the model coefficients show that the pay

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level has a negative impact on the degree of unemployment. Wages have a diminishing impact on unemployment as the unemployment rate rises, unlike the birth rate. The regression coefficients for government financial investment in education are statistically significant and positive between the 10% and 50% quantiles. This result suggests that more government spending on education leads to higher unemployment rates, although the impact lessens as unemployment levels rise.

Table 5. Quantile Regression Results for Provincial Panel Data

	10%	25%	50%	75%	90%
lnGDP	0.0767	0.2682**	0.4813***	0.5737***	0.6384***
	(0.4033)	(0.0014)	(0.0000)	(0.0000)	(0.0000)
BR	-0.0845***	-0.0763***	-0.0825***	-0.0903***	-0.0871***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
lnW	-0.9460***	-0.7759***	-0.5098***	-0.4745***	-0.3738***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
lnEdu	0.7864***	0.4614***	0.1730**	0.0778	0.0410
	(0.0000)	(0.0001)	(0.0091)	(0.3069)	(0.7426)
lnDep	-0.5709***	-0.5871***	-0.2489	-0.0119	-0.2607
	(0.0000)	(0.0021)	(0.0755)	(0.9342)	(0.2341)
lnCre	0.1053	0.0755	-0.2364**	-0.4151*	-0.2456
	(0.4410)	(0.6141)	(0.0044)	(0.0132)	(0.1581)
_cons	1.1335	2.6226**	2.3805***	2.7840***	1.8699
	(0.3059)	(0.0047)	(0.0000)	(0.0000)	(0.0788)
N	401	401	401	401	401
adj. R^2	0.7150	0.6759	0.6339	0.5650	0.5297

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Deposits to GDP ratio exhibits negative regression coefficients between the 10% and 25% quantiles and has a significant negative impact on unemployment levels, consistent with prior empirical findings on the fixed impacts of provinces with below-average GDP. For instance, Raifu (2019) found that establishing a financial depth-unemployment model will increase the proportion of financial system deposits to GDP, both in the short and long term, and reduce the unemployment rate in Nigeria. Other studies have also confirmed the negative correlation between financial deposits and unemployment (Aleiro et al., 2013; Çiftçioğlu & Bein, 2017). Between the 50% and 90% quantiles, the ratio of deposits to GDP does not significantly impact unemployment levels. The correlation between deposits and GDP does not impact unemployment in regions with elevated unemployment rates.

Similarly, the correlation between loans and GDP significantly impacts unemployment only within the 50%–75% quantile, aligning with prior research showing two-way fixed effects for provinces with higher-than-average GDP. Credit growth can decrease unemployment and encourage employment in more economically developed areas.

Previous research has also demonstrated that increasing private-sector credit deposits can reduce the unemployment rate (Raifu, 2019; Pagano & Pica, 2012). Financial development generally reduces the unemployment rate in all provinces except the one with the highest unemployment rate.

The financial development indicators, in all models, align with the a priori expectation as propounded by Arthur Okun in 1962. The results indicate that an increase in financial deposits and credits can both reduce unemployment, as they reflect an increase in the financial system's supply of funds, which helps to stimulate economic activity and industrial development. This finding should instill a sense of optimism about the potential of financial systems in reducing unemployment. Firstly, the increase in financial deposits enhances the deposit base of financial institutions, enabling them to provide more loans to businesses and individuals. Businesses can utilize these funds to expand production, explore new markets, and create more job opportunities. Secondly, the increase in financial credits means more funds flowing into the real economy, encouraging investment and expansion by businesses, which also helps to increase employment opportunities. Therefore, whether it's the increase in financial deposits or credits, both provide essential financial support to the economy, driving employment growth.

CONCLUSION

This paper examines the relationship between financial growth and unemployment in China using provincial data from 2007 to 2021. Regression analyses show that financial development, particularly the ratio of deposits to GDP, significantly affects unemployment in highly developed and relatively less developed regions. However, the effect of credit on unemployment is mainly found in provinces with above-average GDP. Quantile regression analyses provide further insights into the nuanced relationship between financial development and unemployment at different quantile levels. The findings emphasize the importance of financial development in reducing unemployment, mainly through increased deposits and credit, thereby stimulating economic activity and job creation.

Building on the study's findings, this paper offers key implications for policymakers. Firstly, it underscores the need to continue prioritizing financial development initiatives, especially in regions with relatively underdeveloped economies. Enhancing access to financial services and bolstering financial infrastructure can significantly contribute to economic growth and unemployment reduction. Secondly, while government investment in education remains crucial for long-term economic development, policymakers should ensure that educational resources are effectively distributed to address skills gaps and enhance employment outcomes. The study also suggests that the employability of the labor force can be enhanced through targeted interventions that combine education programs with industry demand. Lastly, the study highlights the importance of implementing targeted policies to address regional disparities in economic development. By promoting inclusive growth and tackling structural barriers to employment, policymakers can create more equitable opportunities for all citizens.

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While the present study provides valuable insights into financial development and unemployment reduction for the Chinese government, it is not without its limitations. The study categorizes the data into two groups based on GDP per capita: 13 provinces with above-average GDP and 18 provinces with below-average GDP. However, given the diverse economic levels across China's numerous provinces and cities, categorizing by average GDP may not fully capture the significant disparities in financial development. This could lead to variations in the impact of financial development on unemployment. If this assumption holds, a model representing the threshold impact of financial development in different provinces should be developed. However, this topic is beyond the scope of this paper and should be explored in future research. Additionally, due to data constraints, this study assesses financial development using the credit-to-GDP ratio and the deposit-to-GDP ratio. Future research could explore the use of these indicators when other suitable options are available.

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Adaptation of Islamic Finance to the Performance of MSMEs in The Halal Food Industry

Muji Gunarto[1*], Pitri Yanti[2]
[1]Universitas Bina Darma, Palembang, Indonesia
[2]Universitas Pendidikan Indonesia, Bandung, Indonesia
E-mail: [1]mgunarto@binadarma.ac.id, [2]pitri0816@upi.edu
[*)]Corresponding Author

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Abstract

Research Originality: The findings of this research will contribute to the Islamic finance literature by answering the research gap between the relationship between MSME adaptation of Islamic finance implementation and MSME performance and providing practitioner insight for policymakers and MSMEs in the halal food industry.

Research Objectives: This study aims to determine the adaptation of Islamic finance to the performance of MSMEs in the halal food industry.

Research Methods: The method used a quantitative and explanatory approach. The number of samples in this study was 212 MSME units taken by simple random sampling (SRS). The number of samples in this study is based on the needs of the analytical tools used. The analysis technique used is the structural equation model (SEM) approach with the help of the LISREL program.

Empirical Results: The main findings show that halal industry MSMEs that adapt to Sharia finance tend to have a higher level of innovation than those that do not. Data shows that financing by Sharia principles enables MSMEs to allocate their resources more effectively, strengthening their ability to innovate in products and services. Innovations carried out by halal industry MSMEs that adopt a Sharia financial approach are more consistent with Sharia values, which leads to increased acceptance by Muslim consumers.

Implications: MSME halal industry managers may consider adopting Islamic finance strategies as part of their business plans. This adoption includes using Sharia financing, investing according to Sharia principles, and managing their finances according to Sharia values. Managers also need to actively develop networks and collaborate with other stakeholders, including Sharia financial institutions, educational institutions, and other companies in the halal industry ecosystem.

Keywords:
halal food industry; Islamic finance; innovation; performance

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INTRODUCTION

Halal food is essential for Muslims. The word halal means broadly, which not only means it is suitable for consumption but also that the halal logo means that the product has met the requirements of sharia law for Muslims. In addition, for non-Muslims, the halal logo means the product's quality, safety, and cleanliness.

The development of the halal food industry in Indonesia increased significantly in 2019. Indonesia is not in the top 10 countries, but in 2021, Indonesia is ranked 4th in halal food out of 15 countries included in the top 15 global Islamic economy indicator score rank. This condition is because Indonesia is the highest Muslim-majority country in the world. Muslims in Indonesia account for 87.17% of the total population of 209.12 million people and 13% of the world's population (Rasyid & Dewi, 2019). Moreover, by 2030, the Muslim population is projected to be around 2.2 billion, about 26.4% of the global population (Hassan et al., 2021). Despite successfully improving the halal food sector, Indonesia has yet to become the world's leading producer, even though Indonesia is the main halal food consumer, ranking at USD 114 billion.

So, although Indonesia is still the largest consumer, it has yet to become the world's leading producer. Most non-Muslim countries still dominate the most significant halal food exports (Brazil, Indonesia, USA, Russia, and Argentina). Though the rapid development of the halal food industry globally will increase the demand for halal products, thus creating many opportunities for micro, small, and medium enterprises (MSMEs) in the halal food industry (Haji Shahlehi et al., 2024). MSMEs are essential contributors to the economies of many countries, especially in developing countries, and play an essential role in poverty alleviation and job creation. However, MSMEs often need help accessing financing, which limits their ability to grow and compete. Islamic finance has emerged as an alternative financing mechanism for MSMEs facing challenges in accessing traditional financing. Islamic finance is a system based on Sharia principles that prohibits interest-based transactions and promotes profit and risk sharing. The principles of Islamic finance are consistent with Islamic ethical and moral values, which emphasize the importance of social justice, fairness, and equality (Zayed et al., 2022).

This study identifies empirical gaps in the use of Islamic finance in Indonesia's halal food MSME industry. While recent research recognizes the potential benefits and government support, it also identifies significant barriers to broader implementation. These challenges include a lack of understanding and experience in the field of Islamic finance, inadequate regulations, cases of fraud, and limited reach of Islamic banks, especially in remote areas (Amer, 2024; Hartanto et al., 2023; Menne et al., 2022; Sabrina & Majid, 2020). Adaptation of Islamic Finance to MSME finance can positively or negatively impact company performance, so a mediator variable is needed to mediate between adaptation and MSME performance. The mediator that can be used is innovation, and further research is also needed to find out its function in helping the acceptance of Islamic finance ((Pusung et al., 2023; Sudjatmoko et al., 2023 in Hartanto et al., 2023). Apart from that, there is evidence that applying Islamic finance can create new market opportunities and improve business performance. However, a more comprehensive

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understanding of its impact on the growth of MSMEs in Indonesia needs to be more comprehensive. Therefore, this research aims to bridge this gap by examining the specific mechanisms used by Islamic finance to influence the development of MSMEs in the halal food sector, considering the challenges and opportunities (Menne et al., 2022).

Islamic financial innovation and literacy enable MSMEs to select Sharia-compliant financial instruments and manage their finances according to Sharia principles, leading to improved financial performance and sustainability (Haruna et al., 2024). This study aims to build an Islamic finance adaptation model for the performance of MSMEs in the Indonesia halal food industry. This study will explore the potential benefits of Islamic finance for MSMEs, the challenges faced by MSMEs in accessing and adapting to Islamic finance, and the Islamic finance regulatory framework in the halal food industry. The findings of this research will contribute to the Islamic finance literature by answering the research gap between the relationship between MSME adaptation of Islamic finance implementation and MSME performance and providing practitioner insight for policymakers and MSMEs in the halal food industry.

METHODS

This research was conducted through a survey on MSMEs in the food sub-sector in Palembang City. The growth of MSMEs in Palembang City, which continues to increase along with the end of the COVID-19 pandemic, has made people passionate about carrying out their economic activities. MSMEs in Palembang City have experienced a very rapid increase, especially in the culinary sector. The number of MSMEs in Palembang City has only reached 1,103, even though the number is predicted to reach 160,000. For this reason, this study uses the population recorded at the Palembang City Cooperative and MSME Office, which is 1,103 MSMEs. The research object studied to improve the performance of MSMEs in Palembang City involves three observation variables: MSME performance, innovation, and adaptability.

The sampling technique in this research was carried out purposively with criteria including: (1) MSMEs in the culinary sector registered with the Cooperative and MSME Office; (2) Have a number of employees from 10 to a maximum of 100 people; (3) MSMEs have been operating for at least three years. The questionnaire was distributed to 220 respondents (20% of the population), and those who could be further analyzed amounted to 212 MSMEs in Palembang City, which were taken by simple random sampling (SRS). The scale technique in this study uses the Likert scale with a score of 1 (strongly disagree) to a score of 7 (strongly agree) from respondents' perceptions of various statements on the instrument developed from operational definitions (Table 1).

The data analysis in this research is robust and reliable, employing both descriptive and inferential statistics. Descriptive statistics are used to explain variables univariately, while inferential statistics are employed to test hypotheses using structural equation methods (SEM) with the LISREL program package. The SEM analysis is conducted in two stages: measurement models and structural models. The measurement model is

rigorously tested for validity and reliability through confirmatory analysis of indicators, ensuring the validity and reliability of the indicators (Gunarto, 2018; Hair et al., 2014). The structural model analysis is then carried out to draw conclusions on the tested hypothesis.

Table 1. Operational Definition of Research Variables

Variables and references	Operational Definition	Indicator	Scale
Adaptation (Bryndin, 2019; Maden-Eyiusta et al., 2022; Park & Park, 2019; Quansah et al., 2022; Soltani & Koechlin, 2022; Ward et al., 2018)	Ability to take advantage of opportunities, information, support, and resources.	1. Business Flexibility. 2. Access Information and Resources. 3. Availability of Reserve Funds 4. Networking and Collaboration 5. Responsiveness to market changes 6. Product or Service Innovation 7. Technology Utilization Rate 8. Reaction to Competition.	Scale 1-7
Innovation (Fang et al., 2021; Lee et al., 2020; Parkman et al., 2012; Zhang et al., 2016)	The company's level of ability to make significant product, process, and organizational improvements, such as specifications, components, and materials, use friendliness, or other functional characteristics of the product.	1. New or Improved Products 2. Efficient Production Process 3. Market Penetration Rate 4. Research and Development Cooperation 5. Customer Acceptance of Innovation 6. Rate of Organizational Change 7. Acquisition of Patent or Copyright 8. Employee Engagement Rate	Scale 1-7
MSME Performance (Alraja et al., 2022; Chigara, 2021; Effiom & Edet, 2020; Fang et al., 2021; Gunarto et al., 2021; Utami & Lantu, 2014)	The final result of various activities of the enterprise (Wheelen et al., 2015). Company Performance is also interpreted as a multidimensional concept that defines the success of a business, as well as the level of achievement of its business goals (Civelek et al., 2015).	1. Annual Sales Revenue 2. Sales Growth Rate 3. Number of Sales Transactions 4. Number of New Customers 5. Customer Retention Rate. 6. Customer Satisfaction Level. 7. Gross Profit 8. Profit Margin 9. ROI (Return on Investment)	Scale 1-7

RESULTS AND DISCUSSION

A survey was conducted on 212 MSMEs, and respondents were distributed. Most respondents (82%) became owners and managers of MSMEs. Most respondents have employees < 10 employees (76%), a turnover of < 50 million rupiah (90%), and 5-10 years of business experience (54%).

Analysis of the measurement model uses confirmatory factor analysis (CFA) by looking at the value of the loading factor with a minimum number of ≥0.5. The results

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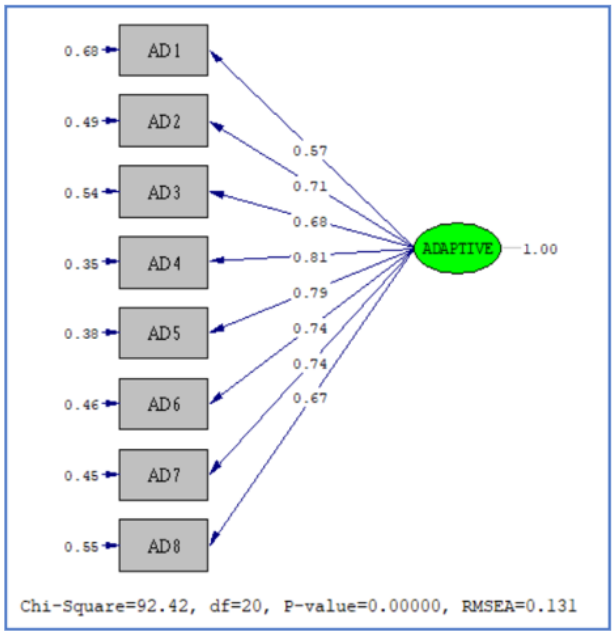
of the loading factor test on the Islamic financial adaptation variable found that all indicators had a value above 0.5, so eight indicators on the measurement of the Islamic financial adaptation variable were declared all valid, and the most dominant indicator for this variable is networking and collaboration Therefore, networking and collaboration are the most dominant factors that shape adaptation in its implications for the halal food industry at 65.61%. The final value of the loading factor in this study is shown in Figure 1.

Figure 1. Results of the Islamic Financial Adaptation Variable Measurement Model



The results of the loading factor test on the Islamic financial adaptation variable found that all indicators had values above 0.5, so eight indicators on the measurement of the innovation variable were declared all valid, and the most dominant factor innovation variable is the rate of organizational change at 68.89%. The final value of the loading factor in this study is shown in Figure 2.

The results of the loading factor test on MSME performance variables found that all indicators had values above 0.5, so nine indicators on the measurement of innovation variables were declared valid. The most dominant indicator that shapes MSME performance is the percentage of sales transactions, 77.44%. The final value of the loading factor in this study is shown in Figure 3.

The results of the loading factor test on the Islamic financial adaptation variable found that all indicators had values above 0.5, indicating that eight indicators on the measurement of the innovation variable were declared all valid. A construct is considered reliable if the construct reliability (CR) value is> 0.7 and the average value of variance extracted (AVE) is> 0.5. The results of the reliability test showed that the variables of Islamic financial adaptation (CR = 0.87 and AVE = 0.62), the variables of Innovation

(CR = 0.92 and CR = 0.70), and the variables of MSME Performance (CR = 0.88 and AVE = 0.67) all met these criteria, leading to the declaration of the measurement model in this study as reliable. This should instill confidence in the robustness of our research.

Figure 2. Results of the innovation variable measurement model

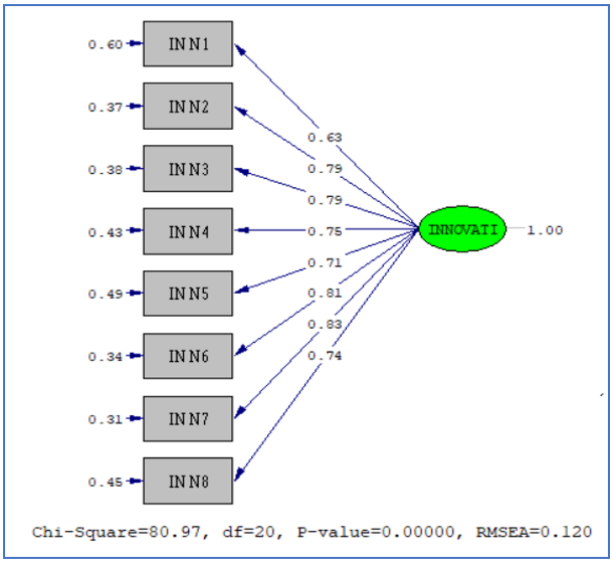
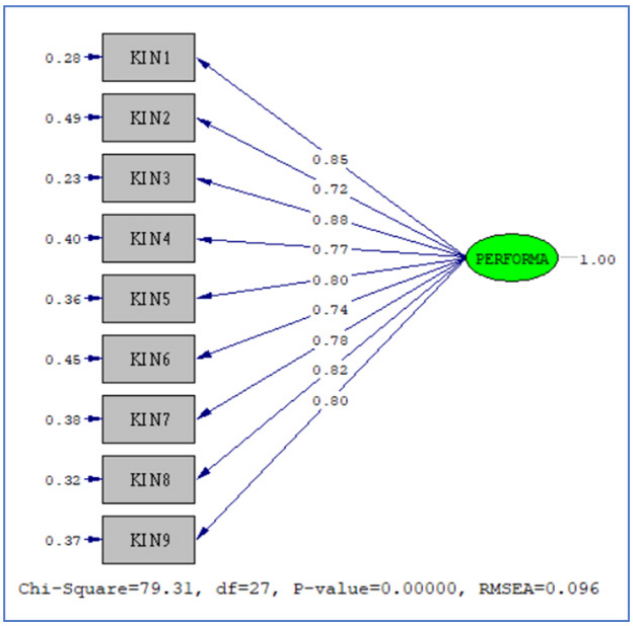


Figure 3. Results of MSME Financial Variable Measurement Model



Structural Model Analysis, the results of the formation of the overall model (Figure 4) show the magnitude of the influence of each exogenous variable on endogenous and show the value of loading factors on each construct-forming indicator. Figure 4. shows that Islamic financial adaptation positively affects MSME innovation by 0.84. There is

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a positive influence between Islamic financial adaptation and MSME performance of 0.43 and a positive influence between MSME innovation and MSME performance of 0.49. Figure 5 shows test results from measurement models and structural models. In the structural model, the path diagram between latent variables is shown.

Figure 5. Test Results on Measurement and Structural Models

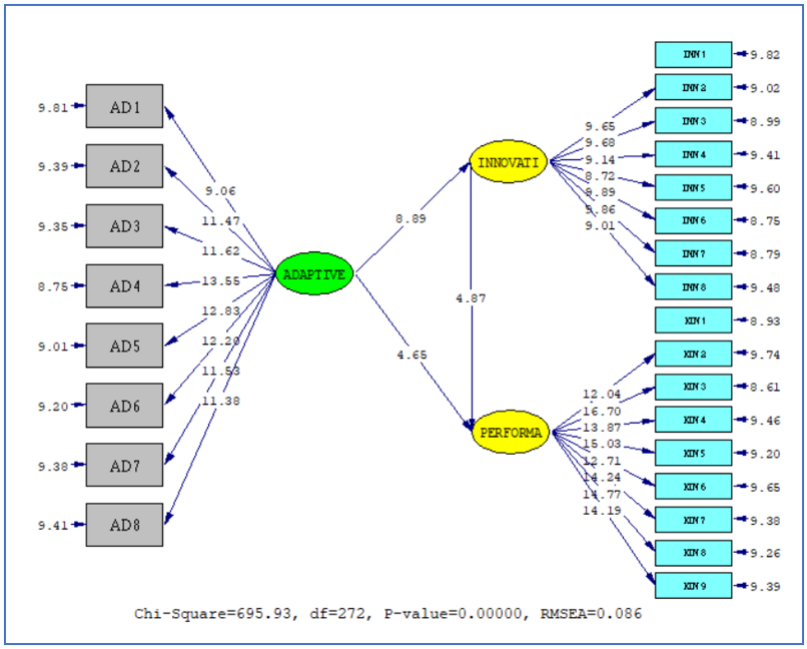

Figure 5 explains the result of the t-value in this research. In summary, the results of hypothesis testing are presented in Table 2. Table 2 shows the results of hypothesis testing, which explains the direct relationship of exogenous variables to endogenous variables. The estimated value shows the magnitude of the influence of each exogenous variable on the endogenous, and all relationships show a positive and significant influence. The significance value is determined from the t-value, greater than the t-table value of 1.96.

Table 2. Results of testing research hypotheses on direct influence

Hypothesis	Relationship	Estimate	S.E.	t-value	Label
H_1	Adaptive → Innovati	0.84	0.094	8.89	sign
H_2	Adaptive → Performa	0.43	0.093	4.65	sign
H_3	Innovati → Performa	0.49	0.10	4.87	sign

Note: sign= significant, S.E.= Standart Error

The test results in H4 were carried out by looking at the amount of Standardized Indirect Effects, namely the influence of Islamic financial adaptation on MSME performance through innovation of 0.41. Because the amount of direct influence is greater than indirect, innovation is not an excellent mediating variable for the adaptation relationship with MSME performance.

Based on the results, The adaptation of Islamic finance has proven to have a positive influence on innovation in various economic sectors. The most significant implementation factor that forms the adaptation variable in the halal food industry is networking and collaboration at 65.61%; the innovation factor that forms the most significant innovation variable is the rate of organizational change at 68.89%, and the highest factor that shapes the performance of Halal food MSMEs is the number of sales transactions of 77.44%. The influence of Islamic finance adaptation on innovation refers to a paradigm shift in the financial system that encourages creative and sustainable change. Adapting Islamic finance, based on ethical principles and Islamic values, has provided an important impetus for innovation in various aspects of the economy (Lumpkin & Dess, 2001). Sharia principles that avoid the practices of usury, gharar, and maysir not only create a fairer basis for transactions but also encourage the creation of an environment that supports sustainable economic growth (Setiawan, 2021). Ultimately, this environment creates conditions that support stronger and more sustainable innovation. In the conventional financial system, interest constraints and inherent risks can often restrict MSMEs and individual innovators from accessing capital and innovating (Alraja et al., 2022; Effiom & Edet, 2020; Utami & Lantu, 2014). However, through Islamic financial instruments such as mudharabah (profit sharing) and musharakah (cooperation), risks and benefits are shared fairly between capital owners and entrepreneurs. This condition reduces pressure on MSMEs and innovators, giving them the confidence to explore new ideas and innovate in products, services, or business processes.

The adaptation of Islamic finance encourages greater involvement in the real sector of the economy, which in turn fuels demand for new and innovative solutions. In addition, Islamic financial adaptation can create a conducive climate for research and development. Because Sharia principles emphasize ethics and integrity in business, innovators are encouraged to focus on solutions that are not only economically beneficial but also compatible with the values of justice and humanity. It encourages innovation that is more sustainability-oriented and positively impacts society and the environment. Islamic finance principles emphasizing risk and profit sharing provide a stronger safety net for innovators. Innovation often involves risk, and Islamic finance encourages an environment where risk can be faced with more confidence.

The adaptation of Islamic finance promotes sustainable business models, instilling a sense of responsibility and long-term planning among MSMEs. It ensures MSMEs have easier and fairer access to financing, helping them overcome financial barriers and obtain the necessary capital to grow their businesses (Alraja et al., 2022; Fang et al., 2021; Utami & Lantu, 2014). Islamic finance principles, such as the prohibition of riba and speculation, encourage MSMEs to focus on business practices that are fair, transparent, and guided by social justice values. This creates a better reputation for MSMEs in the business community and can help increase the trust of customers and business partners. Since financing in Islamic finance is often related to investment in real assets and productive projects, MSMEs are encouraged to produce products or services that have long-term added value. It encourages innovation in products,

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processes, and business strategies, which can improve MSMEs' competitiveness and long-term performance. The adaptation of Islamic finance creates a more collaborative business community. Involvement in Islamic financial institutions, such as Islamic banks or Islamic cooperatives, often brings MSMEs into a wide business network. This opens up opportunities to collaborate with other business people, share knowledge and experience, and access new opportunities for growth and expansion (Adam & Gunarto, 2021; Grewal et al., 2006; Ismail et al., 2021).

Overall, Islamic financial adaptation has a significant positive impact on the performance of MSMEs. Implementation adaptation toward From fairer access to financing to encouraging better business ethics, Islamic finance creates an environment that supports sustainable growth and empowerment of MSMEs. Through principles oriented towards justice, sustainability, and moral values, Islamic financial adaptation becomes a powerful tool to improve the performance and contribution of MSMEs in the economy. The results of this study state that Islamic financial administration can play an important role in improving the performance of MSMEs through one of its performance measures in the form of increased innovation (Bae & Yoo, 2015; Banks et al., 2000; Alexander & Contreras, 2016; Grewal et al., 2006; Marques & Ferreira, 2009; Parmentier & Mangematin, 2014; Prahalad & Ramaswamy, 2000; Shah, 2006; von Hippel, 2009; Von Hippel & Katz, 2002).

Empirically, this result can be understood because very rapid technological developments encourage business actors' competence to adapt. Adaptability will create innovation for MSME players, so it boils down to product creation and development. However, it does not directly increase sales growth as a measure of organizational performance and the growth of successful new products in the market as a measure of operational performance. For this reason, researchers examine more deeply how adaptation competence is a driver for the creation of innovation and its impact on the performance of MSMEs. Based on the contingency model that became a novelty in this study, it was found that innovations that developed in the MSME environment were not able to significantly moderate the relationship between adaptability and MSME performance so adaptability that initially did not contribute positively to performance achievement became able to positively influence 37% on improving MSME performance in Palembang City.

CONCLUSION

Islamic financial adaptation has emerged as a pivotal factor in driving innovation and enhancing the performance of MSMEs, particularly within the halal industry. By facilitating easier access to sharia-compliant financing, it not only empowers MSMEs to explore novel ideas and revamp their products, services, and operational methodologies, but also fosters increased access to capital. This phenomenon not only bolsters the reputation and competitiveness of MSMEs but also underscores their commitment to halal principles. Moreover, the positive impact of Islamic financial adaptation extends

beyond mere innovation, as it encourages participation in tangible economic ventures, and promotes more effective risk management strategies. The resultant innovations within the halal industry have significantly contributed to the improved performance of MSMEs, offering higher-quality products imbued with halal values. Consequently, Islamic financial adaptation not only serves as a direct catalyst for enhancing MSME performance but also fuels the development of sustainable innovation to meet market demands and societal needs. Furthermore, this research holds promise in enriching Islamic financial literacy by deepening the understanding of financial practices aligned with Islamic principles. By addressing knowledge gaps in this field, it lays the groundwork for advancing Islamic finance theory and fostering greater financial inclusivity.

Based on these findings, policy implementation should prioritize expanding networking and collaboration support, encouraging cooperation and information sharing, and fostering organizational change innovations that promote sustainability-oriented innovation. Implementing these policy recommendations allows policymakers to capitalize on the favorable effects of Sharia-compliant financial adaptation on MSME performance, supporting long-term growth, innovation, and empowerment in the MSME sector. This method not only boosts the halal business but also improves Islamic financial literacy by improving understanding of Islamic-compliant financial practices and encouraging broader financial inclusion.

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Human and Social Capital as Antecedents of Spiritual Capital on MSME Innovation

Bima Cinintya Pratama[1*], Amrizah Kamaluddin[2], Azmi Fitriati[3], Shukriah Saad[4], Maulida Nurul Innayah[5], Siti Syaqilah Hambali[6]

[1,3,5]**Universitas Muhammadiyah Purwokerto, Purwokerto, Indonesia**
[2,4,6]**Universiti Teknologi MARA (UiTM), Puncak Alam, Malaysia**
E-mail: [1]BimaCinintyaPratama@ump.ac.id, [2]amrizah@uitm.edu.my, [3]azmifitriati@gmail.com, [4]shukriah736@uitm.edu.my, [5]nanamaulida@gmail.com, [6]syaqilah9972@uitm.edu.my
[*)]**Corresponding Author**

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Abstract

Research Originality: The originality of this paper lies in its inclusion of the mediating role of human capital and social capital in the connection between spiritual capital and MSME innovation capability.

Research Objectives: This study examined how Innovation in MSMEs by using antecedents of their spiritual capital, human capital, and social capital.

Research Methods: This study using sample from MSME operators and owners located in the western part of Central Java Province. The analysis conducted in this study was using Structural Equation Model.

Empirical Results: The results found that spiritual capital, human capital, and social capital has a significant positive effect on innovation capability. In addition, human capital and social capital can mediate the relationship between spiritual capital and innovation capability.

Implications: From the results of this study, it can be implied that spiritual capital, human capital, and social capital is very important for MSMEs managers and owners to create innovation to make value-added for their business. Therefore, MSMEs should concern on the management of those capitals.

Keywords:

spiritual capital, human capital, social capital, innovation capability, micro small medium enterprises

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INTRODUCTION

It is impossible to separate the growth of Sharia tourism from the phenomenal increase in the world's Muslim population. According to the Global Islamic Economy Report 2016 - 2017, released by Thomson Reuters (2016), Muslim spending on halal food and beverages worldwide in 2015 amounted to US $ 1.173 billion, or 16.6 percent of total global food and beverage expenditure. By 2021, these expenses will rise to $1.914 trillion, accounting for 18.3 percent of global food and beverage spending. In 2015, Muslims throughout the globe spent more than US $ 151 billion on travel, or around 11.2% of total spending. By 2021, experts predict the number would have climbed to US $ 243 billion, or 12.3 percent of total global travel industry expenditures (excluding Hajj or Umrah). In 2015, the Muslim world spent over US$243 billion on the fashion sector, accounting for almost 11% of global spending (Thomson Reuters, 2016). This number is expected to climb to US$368 billion by 2021. These numbers indicate the undeniable allure of the Muslim market worldwide for the tourism sector, both internationally and in Indonesia.

The information mentioned previously demonstrated the significance of the tourist industry in urban growth and building. Some parts of Indonesia have made tourism their top priority to bring in money for the local economy. One sector that is thriving right now is the Shariah-compliant travel industry, which has flourished not just in Indonesia but across the world.

Intellectual capital has become vital to the development of businesses. No method could disentangle Islamic tourism development in Indonesia from the importance of intellectual capital, a resource used by travel firms all around the country. However, the spiritual capital component is equally significant, particularly in the context of the halal tourism sector, which may consider a destination's religious features. Khalique et al. (2015, 2018) added a fourth concept to this already extensive framework: spiritual capital. He also reaffirmed the connection between spiritual capital and an organization's overall success.

Differences have emerged between the classical and neo-classical, governance-related perspectives. Propositions that urge more emerging professional practices excelling in contemporary organizational performances have been pursued in response to recent shifts in the domain of organizational work, as well as shifts in employee competitiveness, organizational performance-oriented working temperaments, and market structures. As a result, spiritual capital (Khalique et al., 2015) and intellectual capital (IC) (Khalique et al., 2015; Pratama et al., 2022) have emerged as distinguishing characteristics of successful companies, and the dissemination of novel propositions and sound ideas about products, services, procedures, and practices has become increasingly crucial for modern corporations. Increasing workers' creative performance has been identified as a key goal and target for leaders in the 21st century, and new studies back up these claims (Ghosh et al., 2017).

This research aimed to examine hypotheses about this relationship to better understand the relationship between spiritual capital and inventive performance in micro,

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small, and medium-sized enterprises (MSME). Since then, research into the previously mentioned paradigms has shown strong evidence linking them to increased employee creativity on the job (Dhar, 2016). Employees will place a higher value on their work if their employer demonstrates spiritual and ethical practices, such as when managers highlight the impact of their work on others, the team, the company, and even society as a whole and embed the meaning in the work itself. They will also be more willing to put up effort into developing novel ideas and concepts that may help advance company aims (De Hoogh & Den Hartog, 2008; Wang et al., 2017). Employees are more likely to feel emotionally safe proclaiming their new ideas, which encounter the status quo, and are more committed to sharing their information and knowledge with their colleagues (Janssen, 2003) when their managers exhibit spiritual capital, as evidenced by traits like altruism and honesty (Gardner et al., 2005), organizational commitment (De Hoogh & Den Hartog, 2008).

Managers who set an excellent example regarding their values are more likely to have workers channel their physical health into their jobs. As a result, those who follow them will have the tools to do their jobs effectively and creatively (Javed et al., 2017). All group members prefer to share their views if the organizations demonstrate ethical and spiritual principles. Therefore, this interactive feature of ethics and spirituality enhances the connections between the group and the workers. If workers generally agree that their managers encourage them to contribute to decision-making, communicate with one another, and feel safe voicing their opinions and offering suggestions without fear of retaliation, this can encourage a more creative and collaborative work environment (Freire & Bettencourt, 2020; Lee et al., 2019; Shafique et al., 2018). Therefore, spiritual capital may correlate with workers' propensity for creativity and new ideas. This explanation constitutes the relationship between spiritual capital and MSMEs' innovation capability.

However, two perspectives, human capital and social capital, whose fundamental theories suggest that the association between spiritual capital and employees' innovation capability can be further strengthened if the paradigm mentioned above status is investigated through these mediation perspectives, remain to be explored. It is argued that human and social capital are distinct (though linked) forms of intangible resources that affect workers' productivity in separate but complementary ways. Human capital is positively linked to employee and business performance and growth, according to a meta-analysis of 68 studies (Crook et al., 2011). Businesses rely heavily on human capital since it is this resource that both enables and propels the company's operations (Chadwick, 2017; Hatch & Dyer, 2004). However, to gain an advantage in competition over the long run, it is necessary to build up stocks of human capital, which is the driving force behind exceptional performance (Chadwick, 2017). Competitors also need help developing tacit knowledge of commercial practices and social systems (Hatch & Dyer, 2004). Therefore, human capital is sensitive to the influence of important company managers and is favorably correlated with employee and firm performance. As we saw in the last section, increasing the company's spiritual capital will likely increase its human

capital. In light of the above, it is plausible to postulate that human capital mediates the connection between spiritual capital practices and workers' innovation capability.

This study proposes social capital as a mediating variable between workers' spiritual capital and their capacity to innovate, expanding upon previous studies that focused only on the role of human capital. Employees' perceptions that their company cares for them, protects their employees, and gives them a voice are fundamental to the concept of social capital inside the organization (Hayton et al., 2012). Views and beliefs based on the norm of exchange (Burger et al., 2009) encourage the minds of people to feel an emotive commitment to the organization, a connection to the company, and an identity with the organization (Parzefall & Kuppelwieser, 2012). In turn, this motivates employees to put in more effort, which ultimately aids the company in reaching its goal by producing superior results (Meyer & Ohana, 2009; Ohana et al., 2013).

Higher levels of social capital may be established in the workplace if employees actively explore innovative opportunities to "pay back the cooperative and collaborative working atmosphere" (Parzefall & Kuppelwieser, 2012). It's also possible for them to acknowledge how their organization contributes to their social capital, such as encouraging collaboration and spreading new ideas among employees. It has been hypothesized in the literature that bonding (defined as "high-quality relations or connectivity among organizational members") motivates workers by boosting their sense of satisfaction and belonging at work (Carmeli & Spreitzer, 2009; Li et al., 2016). Given this background, it is reasonable to hypothesize that workers' social capital positively affects their propensity for innovative behavior.

Mostafa and Bottomley (2020) have confirmed the significance of social capital in the connection between spiritual and ethical practices and worker behavior. When leaders of an organization use their spiritual values to foster an environment that helps employees get along better, they contribute to the development of the firm's social capital, which employees may appreciate. Social capital may serve as a mediator between spiritual capital and workers' ability for innovation.

The contribution and significance of this research is because it is one of the initial attempts in Indonesia (and Central Java) setting to investigate the link between spiritual capital and the inventive capacity of workers at micro, small, and medium-sized enterprises (MSMEs) in several districts in the province's western region. This study also contributes by using a large sample of MSMEs in 5 (five) regencies in the western part of Central Java. Second, insufficient thought has been given to identifying how IC—here, "social and human capital"—improves workers' productivity (Dhar, 2016; Kashefi et al., 2019). The research focused on the link between social capital and workers' creative capacity, using resource-based theory (RBT) as the underlying theoretical framework. It then acknowledged the mediation mechanism of two types of IC (human and social capital). The findings from the current study have improved our knowledge of how ethical leadership may inspire creativity in the workplace. This study fills a gap in our understanding by examining the role of IC (human and social capital) as a mediator between spiritual capital and the innovation capability of workers.

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METHODS

The research was conducted using a survey method on MSMEs operated in tourism industries in the western part of Central Java Province. The population in this study were MSMEs operated in the western part of Central Java, namely Banyumas, Brebes, Pemalang, Banjarnegara, Cilacap, Kebumen, Purbalingga Regencies with sampling technique done by incidental sampling method, which is to choose any MSME that is suitable with the criteria in those regencies. This approach involves selecting MSMEs based on their availability and suitability according to predefined criteria within the designated regencies. Essentially, the researchers chose MSMEs that were conveniently accessible and met the study's requirements. This method offers a practical means of data collection. The "5 times rule" technique was used to determine sample adequacy (Hair et al., 2019), a guideline or heuristic frequently employed in sampling or statistical analysis. It recommended that the sample size be at least five times the number of variables evaluated. Therefore, the samples obtained reached 388 MSME operators and owners spread across those regencies.

This study consists of 3 (three) independent variables: spiritual capital, human capital, and social capital. Meanwhile, Human capital and social capital also act as mediating variables. Also, this study uses one dependent variable, which is innovation capability. The table below explains the operational definitions and indicators used in this study.

Table 1. Variable Operationalization

Variables	Variable Definitions	Indicator
Human Capital (Khalique et al., 2015, 2018)	Human capital is based on competence (in the form of education, professional skills, knowledge, and experimental knowledge), attitudes (in the form of motivation, leadership, and behavioral patterns), and intellectual agility (in the form of invention, creativity, flexibility, and adaptability).	1. Skills, knowledge & expertise 2. Attitude 3. Intellectual agility
Social Capital (Khalique et al., 2015, 2018; Nahapiet & Ghoshal, 2009)	Social capital is based on corporate accountability to justice, openness, honesty, and ethical principles.	1. Structural 2. Relational 3. Cognitive
Spiritual Capital (Khalique et al., 2015, 2018)	An organization's spiritual capital consists of its members' religious beliefs and moral standards.	1. Knowledge of religious 2. Ethical values
Innovation Capability (Liu, 2017)	Innovation capability is an innovative activity resulting from the ability of SMEs to apply collective knowledge, skills, and resources.	1. Innovative products 2. Innovative processes 3. Innovative behavior 4. Innovative resources

To test the relationship between spiritual capital, human capital, and social capital variables on innovation capability, the analytical method used in this study is component-based Structural Equation Modeling (SEM) or variance using Partial Least Square (PLS).

PLS is structural equation modeling (SEM) based on components or variance. According to Hair et al. (2019), PLS is an alternative approach that moves from SEM approach-based covariance to variance-based. Covariance-based SEM generally tests causality/theory; PLS is a predictive model. PLS is a powerful analysis method based on only a few assumptions. Besides confirming the theory, PLS can clarify the correlation among latent variables. PLS can at once analyze constructs formed with reflective and formative. Covariance-based SEM cannot perform it because it will be an unidentified model. The SEM-PLS model consists of two models: the measurement model, or the outer model, and the structural model, or the inner model. There are two stages of the measurement model used in the research; the first stage (first order) is the measurement model of the dimensions of the indicators, and the second stage (second order) is the model of measuring the latent variables on the dimensions. Meanwhile, hypothesis testing was carried out using the bootstrapping method with a 5% criterion.

RESULT AND DISCUSSIONS

This study's respondents were selected based on convenience sampling and conducted online and offline with 388 respondents. Below are several SME characteristics gathered from respondents. The respondents' characteristics regarding the age of owners are primarily between 31 and 40 years old. The length of SME establishment is chiefly 3-5 years, so most of them have already established businesses. Then, the number of employees is mostly around 1-4 employees.

Table 2. Description of SMEs respondents

		Frequency (Total)	Percentage (%)
Age	21-30 years	103	26.55%
	31-40 years	122	31.44%
	41-50 years	108	27.84%
	> 50 years	55	14.18%
Gender	Male	232	59.79%
	Female	156	40.21%
Length of Period the SME Established	<3 years	114	29.38%
	3-5 years	145	37.37%
	5-10 years	89	22.94%
	>10 years	40	10.31%
Number of Employees	1-4 employees	221	0.569620253
	5-10 employees	113	0.291139241
	11-20 employees	45	0.113924051
	> 20 employees	9	0.025316456

In the convergent validity test, an indicator with a correlation value less than 0,500 should be removed from the model because it is considered unreliable and insignificant. After that, a re-estimation of the model will be carried out. From Figure 1, it can be

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shown that all indicators in the variable have correlation values of more than 0.500, so it can be used as a measurement tool. Discriminant validity refers to the degree of nonconformity between attributes that the instrument and theoretical concepts of that variable should not measure. Discriminative validity can be said to be sufficient if Average variance extracted (AVE) values are greater than 0.5. The discriminant validity test used is the Fornell-Lacker Test.

Figure 1. Research Model

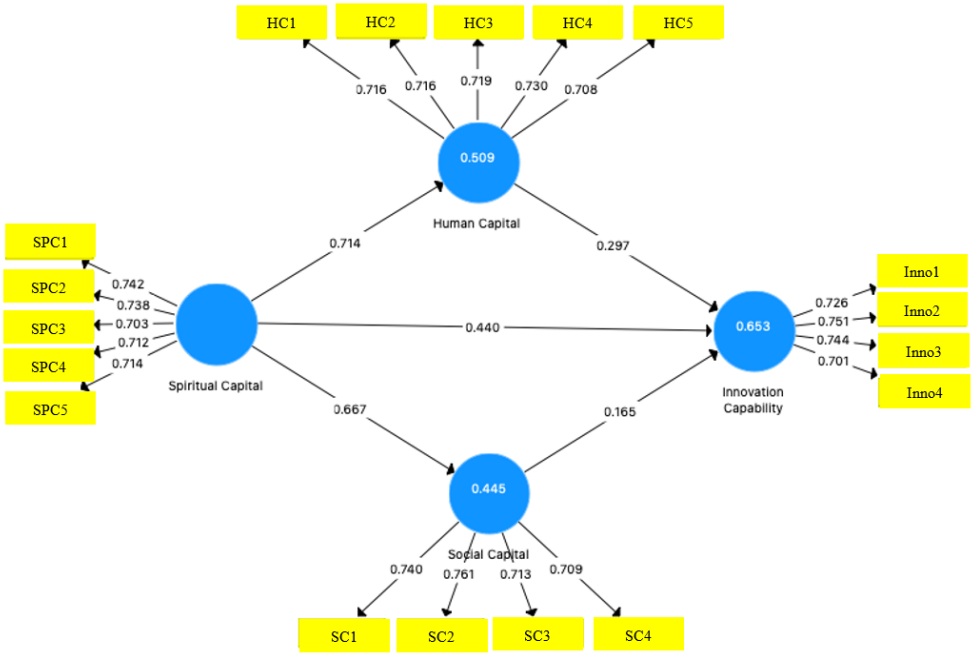

Table 3. Discriminant Validity

	Human Capital	Innovation Capability	Social Capital	Spiritual Capital	AVE
Human Capital	0.718				0.515
Innovation Capability	0.714	0.731			0.534
Social Capital	0.627	0.645	0.731		0.534
Spiritual Capital	0.714	0.762	0.667	0.722	0.521

Table 3 shows that the average value of variance extracted from all these variables is greater than 0.5. Thus, it can be stated that all variables have met the discriminant validity. A composite reliability test is done to test the reliability of research variables. Based on the data in Table 4, it can be seen that the composite reliability value of ethics, independence, and judgment is higher than 0.700. Thus, those variables are deemed reliable.

Table 4. The result of Composite Reliability Test

	Composite Reliability
Human Capital	0.842
Innovation Capability	0.821
Social Capital	0.821
Spiritual Capital	0.845

The results of the R-Square structural model test are presented in Table 5. Table 3 shows that the adjusted R-Square value is 0.651. This value means that spiritual capital, human capital, and social capital have an effect size of 65.1% on the innovation capability variable, and the other 34.9% are affected by other variables outside of this study.

Table 5. R Square

	R Square	R Square Adjusted
Innovation Capability	0.653	0.651

The results of the f-square structural model test are presented in Table 6. The result value on the human capital variable is 0.114, and social capital is 0.040. This result means that human capital and social capital have a small effect size on the dependent variable of innovation capability, referring to the f-square criterion. Meanwhile, the spiritual capital variable 0.229 has a medium effect on innovation capability.

Table 6. F-Square

	Innovation Capability
Human Capital	0.114
Social Capital	0.040
Spiritual Capital	0.229

Bootstrapping in the structural model analysis is performed by evaluating the estimation result of the path coefficient parameter and its significance level. In addition, the result of significance test of path coefficient of each variable can be seen in Table 7 for direct effect between variables and Table 8 for the indirect effect between variables.

Table 7 shows the overall value of the direct effect of spiritual, human, and social capital on innovation capability. Based on the result, the first hypothesis, which states that spiritual capital positively influences innovation capacity, was supported. Employees will place a higher value on their work if their company demonstrates spiritual and ethical practices, such as when management highlights the impact of their work on others, the team, the business, and even society at large, and embeds the meaning in the work itself. In addition, they will be more willing to put forth an effort in developing novel ideas and concepts that will aid in achieving the business's aims and objectives (De Hoogh & Den Hartog, 2008; Wang et al., 2017). Spiritual capital can affect the innovation capability of

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MSMEs by creating a strong sense of purpose derived from spiritual values, which can inspire MSMEs to pursue innovative solutions aligned with their mission, driving creativity and problem-solving. Also, a positive work culture fostered by spiritual values encourages employee engagement and collaboration, leading to many innovative ideas.

Additionally, spiritually grounded MSMEs demonstrate resilience, adaptability, and a long-term perspective, embracing change and investing in innovation capabilities that endure over time. Finally, spiritual values strengthen stakeholder relationships, enhancing understanding and relevance in innovation efforts. By nurturing spiritual capital, MSMEs create environments conducive to values-driven entrepreneurship and creativity, resulting in unique and impactful innovations that contribute to long-term success and sustainability. This condition establishes the link between spiritual capital and the capacity to innovate. Therefore, this result corroborates previous studies (Games et al., 2024; Juliana et al., 2024), affirming the positive relationship between spiritual capital and innovation capability.

Table 7. Parameter Coefficient and Statistical Values among Variables for Direct Effect

	Original Sample	Sample Mean	Standard Deviation	t Statistics	P Values
Human Capital -> Innovation Capability	0.297	0.298	0.044	6.687	0.000
Social Capital -> Innovation Capability	0.165	0.164	0.044	3.721	0.000
Spiritual Capital -> Human Capital	0.714	0.711	0.049	14.684	0.000
Spiritual Capital -> Innovation Capability	0.440	0.439	0.045	9.666	0.000
Spiritual Capital -> Social Capital	0.667	0.667	0.043	15.498	0.000

Next, the results of the hypothesis testing assert that human capital substantially influences innovation capability and suggest that the second hypothesis was supported. Companies rely heavily on human capital since it is this asset that animates and unifies all of the company's capabilities, including its capacity for innovation (Chadwick, 2017; Hatch & Dyer, 2004). A skilled and knowledgeable employee contributes diverse perspectives and expertise to the innovation process. Then, a culture that encourages learning, experimentation, and collaboration fosters an environment where employees can generate innovative solutions. This culture is often inspired and nurtured by strong leadership that prioritizes innovation and supports employee initiatives, thereby encouraging and motivating the workforce. By nurturing human capital in these ways, MSMEs can unlock their full potential for innovation and remain competitive in dynamic markets. Results of the current study provide new empirical support to the prescribed theoretical relationship between human capital and innovation capability, coinciding with the previous empirical findings (Karadag et al., 2023; Latifah et al., 2022; Segantini, 2024).

For the direct effect, this study also proves the role of social capital. The third hypothesis, which argues that social capital has a significant impact on innovation

capability, was supported, indicating that social capital has a strong positive effect on innovation capability. Employees' perceptions that their company cares for them, protects their employees, and gives them a voice are fundamental to the concept of social capital inside an organization (Hayton et al., 2011). This nurturing environment, fostered by social capital, provides a sense of security and value to the employees, which in turn, boosts their morale and productivity. Internal connections foster a collaborative culture, enabling employees to share knowledge and skills. In addition, external relationships provide access to resources, information, and support from stakeholders such as customers, suppliers, and industry peers, facilitating innovation. Finally, participation in networks and partnerships offers opportunities for learning, knowledge exchange, and joint problem-solving. Moreover, social capital builds reputation and credibility, attracting talent, investment, and partnerships essential for innovation. Lastly, social connections contribute to resilience, helping MSMEs navigate challenges and seize opportunities. Leveraging social capital effectively strengthens the innovation ecosystem, driving sustainable growth and competitiveness. Research has shown that when workers feel connected to and valued by their organization, they are more likely to take initiative and come up with creative solutions to problems (Carmeli & Spreitzer, 2009; Li et al., 2016). The findings of this study offer empirical evidence supporting the proposed theoretical connection between social capital and innovation capability, aligning with prior empirical study revealed by Karadag et al. (2023) and Zhang et al. (2024).

Table 8. Statistical Values among Variables for Indirect Effect

	Original Sample	Sample Mean	Standard Deviation	t-Statistics	P Values
Spiritual Capital -> Human Capital -> Innovation Capability	0.212	0.212	0.036	5.853	0.000
Spiritual Capital -> Social Capital -> Innovation Capability	0.110	0.109	0.031	3.589	0.000

In addition, this study also employs the mediating role of human and social capital in the relationship between spiritual capital and innovation capability. Table 8 shows that the P-value of the mediating effects of human and social capital between spiritual capital and capability to innovate is lower than 0.05, as determined by an indirect effect test using PLS analysis. As a result, the fourth and fifth hypotheses were verified, indicating that human and social capital may moderate the connection between spiritual capital and the capability to innovate. Human capital is essential in the performance of both individual workers and the company as a whole, and it is also susceptible to the impact of top executives (Karadag et al., 2023; Latifah et al., 2022; Segantini, 2024). Building spiritual capital is likely to lead to better human capital inside the company, as was said before. Considering the above, it becomes clear that human capital mediates the link between spiritual capital practices and workers' ability to innovate. A worker may similarly value the efforts made by the company to develop social capital, such as when organizational leaders use their spiritual values to foster an environment that helps improve

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the quality of social relations within the business (Ganguly et al., 2019; Martínez-Cañas et al., 2012). This result means that the presence of social capital may partially explain the link between workers' spiritual capital and their capability to innovate.

CONCLUSION

This study aims to determine the relationship between spiritual capital, human capital, and social capital on innovation capability and also the mediating effect of human capital and social capital on the relationship between spiritual capital and innovation capability. From the data analysis and discussion provided above, it is possible to draw the following conclusions about the relationship between spiritual capital, human capital, and social capital and the capability to innovate. The relationship between spiritual capital and the potential to innovate may also be mediated through human and social capital. The findings of this research suggest that managers and owners of MSMEs stand to gain significantly from investing in spiritual capital, human capital, and social capital. This investment can foster an environment conducive to innovation and, ultimately, value creation. As a result, MSMEs need to focus on raising that kind of capital.

Several implications may be helpful for MSME practitioners and related governments/regulators. Investing in spiritual, human, and social capital: MSME managers and owners can benefit significantly from investing in spiritual, human, and social capital. By nurturing these forms of capital within their organizations, they can create an environment conducive to innovation and value creation. This result suggests that efforts to cultivate a strong sense of purpose, values, and ethics (spiritual capital), along with enhancing the skills, knowledge, and expertise of employees (human capital) and fostering strong relationships and networks (social capital), can directly contribute to the innovation capability of MSMEs. Then, strategic focus on capital development: MSMEs should focus on raising spiritual, human, and social capital. This condition may involve initiatives such as providing training and development opportunities for employees to enhance their skills and knowledge (human capital), fostering a supportive and collaborative workplace culture that encourages knowledge sharing and networking (social capital), and promoting values-driven leadership and organizational mission (spiritual capital). By prioritizing the development of these forms of capital, MSMEs can enhance their ability to innovate and remain competitive in dynamic markets.

Finally, policy implications for government/regulators: government agencies and regulators play a crucial role in supporting MSMEs. By creating policies and initiatives that facilitate the development of spiritual, human, and social capital, they can significantly contribute to the growth and sustainability of MSMEs within their jurisdictions. This may include providing incentives or funding for training and skills development programs, promoting collaboration and knowledge-sharing initiatives among MSMEs, and encouraging the adoption of values-driven business practices. By recognizing the importance of these forms of capital in fostering innovation and value creation, policymakers can make a substantial difference in the MSME landscape. Meanwhile, the limitation of this study is that while the area used in this study is large, which covers large parts of western region

of Central Java consists of 5 (five) regencies, it may not represent a full area of Central Java. Therefore, future research is suggested to cover all regencies in Central Java, so that it can get a complete understanding of MSME conditions across whole of Central Java.

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Taxation and Income Inequality in ASEAN Countries

Angga Alexander[1], Beta Yulianita Gitaharie[2*]
[1,2]**Faculty of Economics and Business, Department of Economics, University of Indonesia, Indonesia**
E-mail: [1]anggalexander@gmail.com, [2]beta.ylaksono@gmail.com
[*)]**Corresponding Author**

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Abstract

Research Originality: This study contributes to literature by investigating the impact of taxation on income inequality, with a specific focus on Southeast Asian countries.

Research Objectives: To investigate the impact of taxation on income inequality in Association of Southeast Asian Nations (ASEAN) countries.

Research Methods: A panel data model focusing on ASEAN from 1998 to 2021 was used, and a two-stage least squares (2SLS) estimation method, incorporating fixed effects and instrumental variables was used. Tax instrument comprised two components, namely tax ratio, reflecting volume of tax; and tax structure, representing direct, indirect, and income taxes.

Empirical Results: The results showed that tax ratio, direct tax, and income tax reduced income inequality in Southeast Asia. However, the magnitude of the impact should be more significant. Prioritizing education and improving the quality of workforce could effectively reduce income inequality, as shown by Singapore's success in this area.

Implications: This study had significant implications for ASEAN policymakers, as it offered valuable insights into designing and implementing taxation policies to reduce income inequality and promote economic development across the region.

Keywords:

inequality; income inequality; tax; tax ratio, tax policy

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INTRODUCTION

Income inequality is a widespread economic issue affecting countries globally, and it arises from the ineffective distribution of income, a phenomenon that has persisted for many years. In 1936, Keynes observed that income inequality originated from economic policies that failed to address unfair income distribution. It is currently recognized as a growing global concern by the United Nations Development Program (UNDP) and a crucial focus of the Sustainable Development Goals (SDGs). Specifically, the UN's SDG 10 aims to reduce inequality by 2030. Addressing this could foster economic growth, promote job creation, and decrease unemployment rates. Several studies (Cingano, 2014; Mo, 2000; Ostry et al., 2014) showed a positive relationship between decreased income inequality and economic performance.

Fiscal policy significantly impacts economic performance. Taxation is considered a policy tool for reducing income inequality, increasing state revenue, incentivizing investment, and correcting market failures. With appropriate tax policy, the government can distribute income through tax collections. This concept corresponds with Mirrlees' optimal income taxation theory, explaining how tax collections and transfers can address income distribution issues (Mirrlees, 1971). The tax ratio, which measures the proportion or percentage of tax revenue to gross domestic product (GDP), is an indicator for assessing tax revenue performance. It also shows the government's ability to collect tax from the total economy, as measured by GDP, while tax percentage reflects its efficiency in meeting fiscal requirements. Studies have shown the importance of investigating taxation's influence on income inequality to promote social justice, equity, economic stability, and growth. Exploring the impact of tax policies on income distribution contributed to the continuous pursuit of fairness, addressed challenges related to economic stability, and facilitated sustainable growth.

Studies examining the impact of taxation on income inequality adopted various tax instruments, methods, and observation samples. Two taxation instruments were used, namely, tax volume and tax structure. Tax volume represents the ratio of tax revenue to a country's GDP, commonly referred to as tax ratio, as shown by Cevik & Correa-Caro (2020), Khan and Khan (2023), Messy & Ndjokou (2021), Martorano (2018), Nantob (2016), and Karakotsios et al. (2020). There were differences in empirical results, as some studies showed that government revenue from taxation could reduce income inequality (Cevik & Correa-Caro, 2020; Khan & Padda, 2021; Martorano, 2018; Messy & Ndjokou, 2021; Nantob, 2016). Karakotsios et al. (2020) showed that tax had a negative impact on income inequality in the long term but a positive causal impact in the short term. Khan and Khan (2023) found that tax positively correlated with income inequality. The influence of taxation on income inequality and policy design, specifically in developing countries, was challenging due to the substantial informal sector and the necessity for appropriate administrative structures (Mahon, 2004; Focanti et al., 2016).

Tax structure instruments are typically depicted with the ratio of direct and indirect taxes, tax rates, and progressivity levels. This current study focused on the ratio of direct or indirect tax revenue contributions to GDP, in line with Alves & Afonso

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(2019), Martinez-Vazquez et al. (2012), Martorano (2018), Messy & Ndjokou (2021), Mourfou & Ouedraogo (2021), and Nantob (2016). Martorano (2018) showed that direct and indirect taxes negatively impacted income inequality, contradicting Messy Jessy & Ndjokou (2021). Khan & Padda (2021) and Mourfou & Ouedraogo (2021) showed that direct tax had a negative impact, while indirect tax was statistically insignificant. Tax structure instruments also consider the ratio of specific tax types, such as direct and indirect taxes, to total tax revenue or GDP. Due to data limitations, this current study exclusively used the ratio of general income tax to GDP, exemplified by Messy & Ndjokou (2021), Martorano (2018), Nantob (2016), and Parro (2024). Martorano (2018) and Parro (2024) found a negative correlation between income tax and income inequality, while Nantob (2016) identified a positive correlation, and Messy & Ndjokou (2021) found no correlation.

Issues related to income inequality are prevalent in the Southeast Asian region, particularly in countries in the Association of Southeast Asian Nations (ASEAN). According to a report by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Southeast Asia is the only sub-region in Asia Pacific that has failed to reduce inequality (The ASEAN Post, 2018). In Indonesia, the top 10% controlled 26.6% of the total wealth in 1999, while the bottom 20% possessed only 9.2%. In 2018, the wealth of the top 10% had increased to 29.3%, while the wealth of the bottom 20% decreased to 6.9% (World Bank, 2021). Similarly, in Thailand, the top 1% owns 58% of the country's total wealth, and the top 10% earns 35 times more than the bottom 10%. Though with varying figures, related issues also persist in Vietnam, Malaysia, and the Philippines.

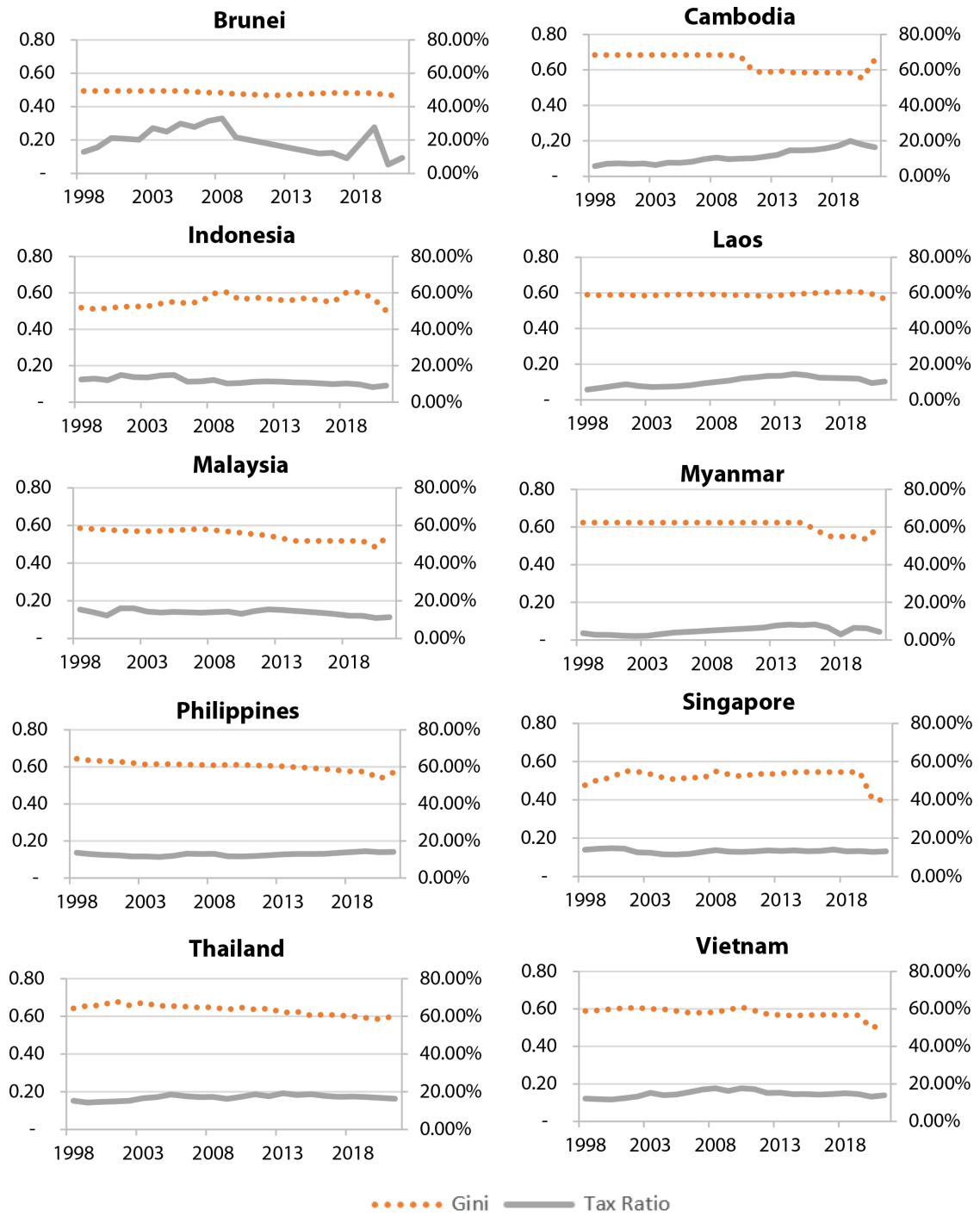
The problem of income inequality in ASEAN significantly contrasts with impressive economic performance. Southeast Asia has been one of the regions with the highest economic growth, averaging 5.3% from 1997 to 2015. Furthermore, the ASEAN region is the sixth-largest economy globally and the 3rd largest in Asia (ASEAN, 2017). According to the IMF (2019), the ASEAN economy is projected to grow more than 5.5% yearly. It could surpass the European Union and Japan to become the fourth-largest economy globally in 2050, trailing only China, India, and the United States (ASEAN, 2019). This projected growth can be attributed to the favorable demographics of over 380 million people under age 35, representing approximately 58% of the population (US-ASEAN Business Council, 2019).

Figure 1 shows distinct trends in tax ratio and income inequality for ASEAN. For instance, countries that have managed to reduce income inequality, as evidenced by a decrease in the Gini index, include Cambodia, Malaysia, Myanmar, the Philippines, and Thailand. These countries have a concurrent trend of increasing tax ratios and decreasing income inequality. Despite efforts to reduce income inequality, Malaysia presents a contrasting scenario where the tax ratio decreased from 15.4% in 1998 to 11.24% in 2021.

Increasing trends in income inequality are evident in Indonesia and Singapore, although tax ratio trends differ. Indonesia shows a declining trend in tax ratio, and

Singapore maintained a relatively stable tax ratio of approximately 13%. On the other hand, income inequality in Brunei, Laos, and Vietnam tends to undergo insignificant changes, with the three countries showing an increasing trend in tax ratio. Interpreting the influence of tax on income inequality solely based on the analysis of tax ratio and Gini index trends, as presented in Figure 1, can be challenging. Therefore, empirical studies and comprehensive testing are necessary to obtain more valid analytical results.

Figure 1. Gini Index and Tax Ratio



Source: Compiled from World Inequality Database & UNU-WIDER

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Previous studies used samples from various countries, including developed (Nantob, 2016), both developed and developing (Clark & Lawson, 2008; Karakotsios et al., 2020; Martinez-Vazquez et al., 2012), OECD (Akgun et al., 2017; Alves & Afonso, 2019; Iosifidi & Mylonidis, 2017), Latin American (Martorano, 2018), Sub-Saharan African (Messy & Ndjokou, 2021), West African (Mourfou & Ouedraogo, 2021), Central Asian (Khan & Khan, 2023), and South Asian countries (Khan & Padda, 2021).

While Karakotsios et al. (2020) focused on the Philippines and Vietnam only, the results might be generalizable to only certain ASEAN members. This current study, the first of its kind, aimed to bridge the gap by comprehensively investigating the impact of taxation on income inequality in the Southeast Asian region, specifically ASEAN, spanning from 1998 to 2021 using a panel data model. A two-stage least squares (2SLS) estimation method with fixed effects and instrumental variables was adopted. The tax instrument was divided into two components, namely tax volume, represented by tax ratio, and tax structure, defined by direct, indirect, and income taxes.

This study had two primary objectives: first, to investigate how taxation affected income inequality in Southeast Asia and the effectiveness of tax policies in reducing disparities in income distribution. Second, it aimed to fill a gap in existing literature by providing empirical evidence on the impact of taxation on income inequality in the region. The results could provide valuable insights to policymakers and practitioners about potential strategies for achieving more equitable economic outcomes.

METHODS

This empirical study model was based on the frameworks proposed by Martorano (2018) and Messy & Ndjokou (2021). It used a panel data approach and focused on a sample of ten Southeast Asian countries that became ASEAN members between 1998 and 2021. The specifications of the empirical model are as follows:

$$Gini_{it} = \alpha_i + \beta\ F_{it} + \gamma\ X_{it} + e_{it}$$

Where $Gini_{it}$ is the dependent variable, which measures the level of income inequality in country i during year t using Gini index. F_{it} is taxation variable comprising: (1) the ratio of tax revenues to GDP or tax ratio, (2) the ratio of direct tax to total GDP, (3) the ratio of indirect tax to GDP, (4) the ratio of income tax to GDP. X_{it} is a control variable consisting of GDP per capita, real effective exchange rate (REER), debt ratio, terms of trade, foreign direct investment (FDI), human capital (HC), social expenditure, inflation rate, and population density. Meanwhile, α_i represents a country fixed effect, and e_{it} denotes error terms.

The empirical model could be categorized into four, distinguished based on the tax variables used, while the dependent and control variables remain the same. Model (1) had a variable tax ratio with a sample of 10 countries from 1998 to 2021. Models (2), (3), and (4) focused on tax structure with a sample of 9 countries for the period 1998-2021, respectively addressing direct, indirect, and income taxes. Brunei Darussalam

was excluded from the samples for Models (2), (3), and (4) due to lack of tax on consumption and individual income.

Model (1) Tax Ratio

$$Gini_{it} = \alpha_i + \beta_1 TaxRatio_{it} + \gamma_{11} GDP\_perCapita_{it} + \gamma_{21} REER_{it} + \gamma_{31} Debt\_ratio_{it} + \gamma_{41} Terms\_ofTrade_{it} + \gamma_{51} FDI_{it} + \gamma_{61} HC_{it} + \gamma_{71} Social\_expenditure_{it} + \gamma_{81} Inflation + \gamma_{91} Popdensity_{it} + \varepsilon_{it}$$

Model (2) Direct Tax

$$Gini_{it} = \alpha_i + \beta_2 DirectTax_{it} + \gamma_{12} GDP\_perCapita_{it} + \gamma_{22} REER_{it} + \gamma_{32} Debt\_ratio_{it} + \gamma_{42} Terms\_ofTrade_{it} + \gamma_{52} FDI_{it} + \gamma_{62} HC_{it} + \gamma_{72} Social\_expenditure_{it} + \gamma_{82} Inflation + \gamma_{92} Popdensity_{it} + \epsilon_{it}$$

Model (3) Indirect Tax

$$Gini_{it} = \alpha_i + \beta_3 IndirectTax_{it} + \gamma_{13} GDP_{perCapita_{it}} + \gamma_{23} REER_{it} + \gamma_{33} Debt_{ratio_{it}} + \gamma_{43} Terms_{ofTrade_{it}} + \gamma_{53} FDI_{it} + \gamma_{63} HC_{it} + \gamma_{73} Social_{expenditure_{it}} + \gamma_{83} Inflation + \gamma_{93} Popdensity_{it} + \omega_{it}$$

Model (4) Income Tax

$$Gini_{it} = \alpha_i + \beta_4 IncomeTax_{it} + \gamma_{14} GDP_{perCapita_{it}} + \gamma_{24} REER_{it} + \gamma_{34} Debt_{ratio_{it}} + \gamma_{44} Terms_{ofTrade_{it}} + \gamma_{54} FDI_{it} + \gamma_{64} HC_{it} + \gamma_{74} Social_{expenditure_{it}} + \gamma_{84} Inflation + \gamma_{94} Popdensity_{it} + \varphi_{it}$$

Table 1 shows the relationship between the main variables, control variables, and income inequality. Gini index data were sourced from the World Inequality Database (WID, 2021, 2023). The Gini index ranges from 0 to 1, where 0 represents perfect income distribution, and 1 signifies perfect or greater inequality. The taxation variable was measured as a percentage (%) of GDP. Data for this variable were obtained from various sources, including the Government Revenue Dataset (GRD) by the United Nations University World Institute for Development Economics Research (UNU-WIDER, 2021, 2023), World Development Indicators (World Bank, 2021, 2024) by the World Bank, OECD stats by OECD (2021, 2023), and Government Financial Statistics (GFS) by the International Monetary Fund (IMF, 2021, 2023). Other data related to control variables were sourced from WDI (World Bank, 2021, 2024), Bruegel Datasets (Bruegel Datasets, 2021, 2023), United Nations Conference on Trade and Development (UNCTAD, 2021, 2023), and IMF (IMF, 2021, 2023).

A minimum of two issues necessitated an appropriate empirical strategy in the current study, namely the missing values in the data and the existence of endogeneity issues between taxation and income inequality (Dao & Godbout, 2014). A practical method to address missing values included interpolating and extrapolating the data to create a balanced panel. Missing values can compromise the quality of panel data by reducing the number of observations used in the model, thereby weakening the statistical power of a test. When data contains numerous missing values, the possibility of estimation

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inefficiency significantly increases. In addition, when missing data are non-random, panel data estimation may be biased, complicating the validity of exogenous assumptions.

Table 1. Hypothesis

Variable	Parameter	Hypothesis (expected) sign)
Tax Ratio	β_1	$\beta_1 < 0$
Direct Tax	β_2	$\beta_2 < 0$
Indirect Tax	β_3	$\beta_3 < 0$
Income Tax	β_4	$\beta_4 < 0$
GDP per Capita	$\gamma_{11}, \gamma_{12}, \gamma_{13}, \gamma_{14}$	$\gamma_{11}, \gamma_{12}, \gamma_{13}, \gamma_{14} < 0$
REER	$\gamma_{21}, \gamma_{22}, \gamma_{23}, \gamma_{24}$	$\gamma_{21}, \gamma_{22}, \gamma_{23}, \gamma_{24} < 0$
Debt Ratio	$\gamma_{31}, \gamma_{32}, \gamma_{33}, \gamma_{34}$	$\gamma_{31}, \gamma_{32}, \gamma_{33}, \gamma_{34} > 0$
Terms of Trade	$\gamma_{41}, \gamma_{42}, \gamma_{43}, \gamma_{44}$	$\gamma_{41}, \gamma_{42}, \gamma_{43}, \gamma_{44} < 0$
FDI	$\gamma_{51}, \gamma_{52}, \gamma_{53}, \gamma_{54}$	$\gamma_{51}, \gamma_{52}, \gamma_{53}, \gamma_{54} < 0$
HC	$\gamma_{61}, \gamma_{62}, \gamma_{63}, \gamma_{64}$	$\gamma_{61}, \gamma_{62}, \gamma_{63}, \gamma_{64} < 0$
Social Expenditure	$\gamma_{71}, \gamma_{72}, \gamma_{73}, \gamma_{74}$	$\gamma_{71}, \gamma_{72}, \gamma_{73}, \gamma_{74} < 0$
Inflation	$\gamma_{81}, \gamma_{82}, \gamma_{83}, \gamma_{84}$	$\gamma_{81}, \gamma_{82}, \gamma_{83}, \gamma_{84} > 0$
Population Density	$\gamma_{91}, \gamma_{92}, \gamma_{93}, \gamma_{94}$	$\gamma_{91}, \gamma_{92}, \gamma_{93}, \gamma_{94} > 0$

Table 2. Missing Value Data

Country	Missing Value	Total	Data
Brunei	2010-2014, 2019	6	Tax Ratio
Laos	2018-2019	2	Tax Ratio
Myanmar	2006-2011	6	Tax Ratio
Total		**14**	**Tax Ratio**
Myanmar	2006-2011	6	Direct Tax
Myanmar	2006-2011	6	Indirect Tax
Myanmar	2006-2011	6	Income Tax
Brunei	1998-2000	3	Debt Ratio
Brunei	2019	1	Social Expenditure
Cambodia	1999	1	Social Expenditure
Laos	1998-1999, 2019	3	Social Expenditure
Myanmar	1998-1999	2	Social Expenditure
Philippines	1999	1	Social Expenditure
Vietnam	1998-1999	2	Social Expenditure
Total		**10**	**Social Expenditure**
Missing Value Total		**45**	

Source: Data processing

Regarding the endogeneity problem, governments could alter tax structure in response to pre-existing income inequality (Messy & Ndjokou, 2021). This correlates with the two regressors and the error terms (Martinez-Vazquez et al., 2012). Given

the heterogeneity between countries, ordinary least squares (OLS) cannot effectively address endogeneity, as it may produce biased and inconsistent estimation coefficients. Two estimation methods can be used to address endogeneity, namely two-stage least squares with instrumental variables (2SLS-IV) and the generalized method of moments (GMM) estimator. However, with a relatively small N, both the cluster-robust standard errors test and the Arellano-Bond autocorrelation test were unreliable (Martinez-Vazquez et al., 2012), making the use of GMM unsuitable for this study. The consideration of the structure of the panel data model, 2SLS-IV with a fixed effect, could be the most suitable method to address endogeneity.

RESULTS AND DISCUSSION

Table 3 shows a statistical summary of each study variable. The level of income inequality in ASEAN was relatively high, with an average Gini index value of 0.576. Singapore had the lowest Gini index value in 2020, while Cambodia recorded the highest value of 0.684 in 1999-2009. The average tax ratio for ASEAN was 12.86%, which was lower compared to countries in the Asia Pacific region, which had 21%, and OECD countries, which had 33%. Furthermore, the ASEAN average tax ratio was below the African continent's average of 16.6% in 2018 (OECD, 2019). Myanmar had the lowest value of 2.14% in 2002, while Brunei had the highest value of 32.94% in 2008. The average direct tax ratio was 5.17%, with Cambodia recording the lowest value of 0.47% in 1998 and Malaysia having the highest score of 10.98% in 2012. The average indirect tax ratio was 6.78%, with Myanmar recording the lowest value of 1.03% in 2003 and Cambodia having the highest value of 15.35% in 2019. For the average income tax ratio of 4.97%, Cambodia had the lowest value of 0.43% in 1998, while Malaysia recorded the highest value of 11.14% in 2012.

Table 3. Descriptive Statistics

Variable	Symbol	Observation	Mean	Standard Deviation	Minimum	Maximum
Gini Index	$Gini_{it}$	240	57.5569	5.591	39.9698	68.446
Tax Ratio	$TaxRatio_{it}$	240	12.858	4.791	2.143	32.938
Direct Tax	$DirectTax_{it}$	216	5.169	2.587	0.474	10.984
Indirect Tax	$IndirectTax_{it}$	216	6.777	2.833	1.030	15.350
Income Tax	$IncomeTax_{it}$	216	4.968	2.570	0.432	11.140
PDB per Capita	$GDP\_perCapita_{it}$	240	10,438	15,826	260	67,176
REER	$REER_{it}$	240	108.502	17.079	51.094	159.587
Debt Ratio	$Debt\_ratio_{it}$	240	50.696	37.318	0.288	252.784
Terms of Trade	$Terms\_ofTrade_{it}$	240	105.876	29.043	66.288	256.131
FDI	FDI_{it}	240	5.549	6.128	-2.315	32.691
HC	HC_{it}	240	7.210	2.290	2.900	11.930
Social Expenditure	$Social\_expenditure_{it}$	240	6.004	2.952	0.041	16.249
Inflation	$Inflation_{it}$	240	5.957	12.431	-2.315	125.272
Population Density	$Popdensity_{it}$	240	798.996	2087.249	22.290	8044.526

Source: Data processing

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There was a significant gap in GDP per capita in ASEAN, as evidenced by the minimum value of GDP per capita of 260 USD for Myanmar in 1998 and the highest value of 67,176 USD for Singapore in 2021. Real Effective Exchange Rate (REER) represents the currency value with an index of 100, with 2007 as the base year. Indonesia recorded the lowest value of 51.09 in 1998, while Laos had the highest value of 159.69 in 2016. The average debt ratio in ASEAN was 49.8%, with Brunei recording the lowest value of 0.28% in 2005 and Myanmar having the highest value of 252.78% in 2001. The average term of trade in ASEAN was 105.876 with an index of 100, where Cambodia had the lowest value of 66.33 in 2021, and the highest score of 256.13 was recorded by Brunei in 2008. Foreign Direct Investment (FDI) in ASEAN averaged 5.549%, with Indonesia recording the lowest value of -2.75 in 2000 and Singapore having the highest value of 32.69 in 2021.

Table 4. Estimation Result

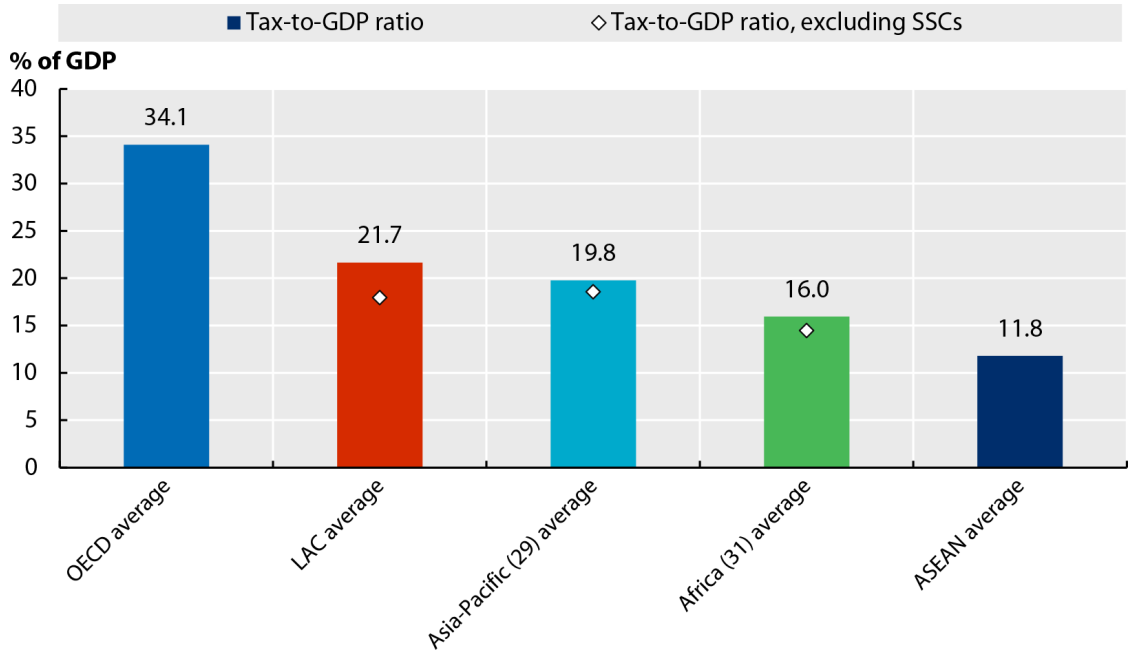
VARIABLE	(1)	(2)	(3)	(4)
Tax Ratio	-0.181**			
	[0.092]			
Direct Tax		-0.510**		
		[0.236]		
Indirect Tax			-0.181	
			[0.226]	
Income Tax				-0.504**
				[0.236]
GDP per Capita	-0.000	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]
REER	0.008	-0.029*	-0.023	-0.026
	[0.017]	[0.016]	[0.016]	[0.016]
Debt Ratio	-0.031***	-0.030***	-0.031***	-0.031***
	[0.011]	[0.011]	[0.011]	[0.011]
Terms of Trade	0.017**	0.084***	0.093***	0.084***
	[0.008]	[0.017]	[0.018]	[0.017]
FDI	-0.065	0.029	0.029	0.038
	[0.062]	[0.074]	[0.086]	[0.076]
HC	-2.216***	-1.440***	-1.734***	-1.641***
	[0.339]	[0.382]	[0.341]	[0.331]
Social Expenditure	-0.029	-0.092	-0.072	-0.082
	[0.101]	[0.097]	[0.102]	[0.097]
Inflation	-0.003	-0.008	-0.013	-0.008
	[0.016]	[0.020]	[0.018]	[0.020]
Population Density	0.005**	0.009***	0.009***	0.010***
	[0.002]	[0.002]	[0.002]	[0.002]
Constant	75.100***	66.827***	65.471***	67.549***
	[2.377]	[2.384]	[2.612]	[2.534]
Observation	230	207	207	207
R-squared	0.824	0.782	0.782	0.784

Robust standard errors in brackets
Significant at ***α=1%, **α=5%, *α=10%
Source: Data processing

Human Capital, measured by the average number of education years, had the lowest value of 2.9 in Myanmar in 1998, while Singapore recorded the highest value of 11.9 in 2020 and 2021. The average social spending in ASEAN was 6%, with Cambodia recording the lowest value of 0.04% in 2019 and Malaysia having the highest value of 16.25% in 2020. Brunei recorded the lowest inflation rate of -2.31% in 2002, and Laos had the highest rate of 90.98% in 1998. The average inflation rate of ASEAN was 5.96%, and the average population density was 799 people per km2. Singapore was the most populous country, with 8,045 people per km2 in 2019, while Laos recorded the lowest with 22 people per km2 in 1998. The regression results for the relationship between taxation and income inequality are presented in Table 4.

The results showed a negative correlation between tax ratio and income inequality, which was statistically significant at a 5% level. Specifically, a 1% increase in total tax revenue to GDP decreased 0.00181 in the Gini index. For instance, a 1% increase in the Indonesian tax ratio could cause a decline in the Gini index from 0.603 to 0.602. The result was in line with the initial hypothesis of this study based on Mirrlees's (1971) theory that tax and transfers could help reduce inequality. It was also consistent with Cevik & Correa-Caro (2020), Khan & Padda (2021), Martorano (2018), Messy & Ndjokou (2021), Mourfou & Ouedraogo (2021), and Nantob (2016).

Figure 2. Average Tax Ratio Comparison



Notes: 2021
Source: Compiled from Revenue Statistics in Asia and the Pacific 2023 (2023) & UNU-WIDER (2023)

The estimation results reveal that the tax ratio, while not sufficiently effective in reducing income inequality, holds significant potential for impact. The average tax ratio for ASEAN in 2021 was 11.8%, a figure that falls below the average tax ratio

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of countries in the Asia-Pacific region at 19.8% and OECD countries at 34.1%, and even below African countries at 16.6% in 2018 (OECD, 2023), as depicted in Figure 2. The formulation of an ideal tax ratio is therefore of paramount importance. UNDP has observed that a minimum tax ratio of 20% is necessary to achieve the Millennium Development Goals (MDGs), particularly in reducing income inequality (UNDP, 2010). However, Hang et al. (2020) found that the optimal tax ratio for ASEAN countries was 15.33%, suggesting that a higher tax ratio could potentially impede economic growth.

Regarding direct tax, the estimation results showed a negative and statistically significant correlation with income inequality at 5% and a coefficient value of -0.51. This result showed a 1% increase in direct tax revenue to GDP, reducing the Gini index by 0.0051. For example, a 1% increase in the Indonesian direct tax ratio to GDP could decrease the Gini index by 0.0051 from 0.603 to 0.602. Therefore, the application of direct tax tended to reduce the level of income inequality and increase income distribution. The impact of reducing inequality should be substantial, as evidenced by the coefficient value. The result aligned with Mirrlees's (1971) theory, which stated that direct tax ensured more significant fiscal mobilization and was essential for implementing transfers. It also corresponded with Khan and Padda (2021), Martorano (2018), and Mourfou and Ouedraogo (2021).

Based on the estimation results in Table 4, indirect tax had a statistically insignificant correlation with income inequality. This result contradicted the initial hypothesis, as shown by Khan and Padda (2021) and Mourfou and Ouedraogo (2021). Moreover, the results did not align with Martorano (2018), which found a negative correlation, and Messy & Ndjokou (2021), reporting a positive correlation with income inequality.

This current study had limitations, as only indirect tax data were available, and specific taxes on the consumption of goods and services, such as VAT and sales taxes, were not included. Tax on the consumption of goods and services had an objective characteristic, showing that tax imposition did not consider the subject. Taxpayers could belong to various income groups, both rich and poor, making income redistribution for reducing income inequality ineffective. While some taxes were classified as indirect, targeting certain goods, such as a tax on the sale of luxury goods, and tax on international trade, such as import and excise duties, each had unique characteristics. Therefore, the effect of these tax attributes on income inequality was somewhat uniform.

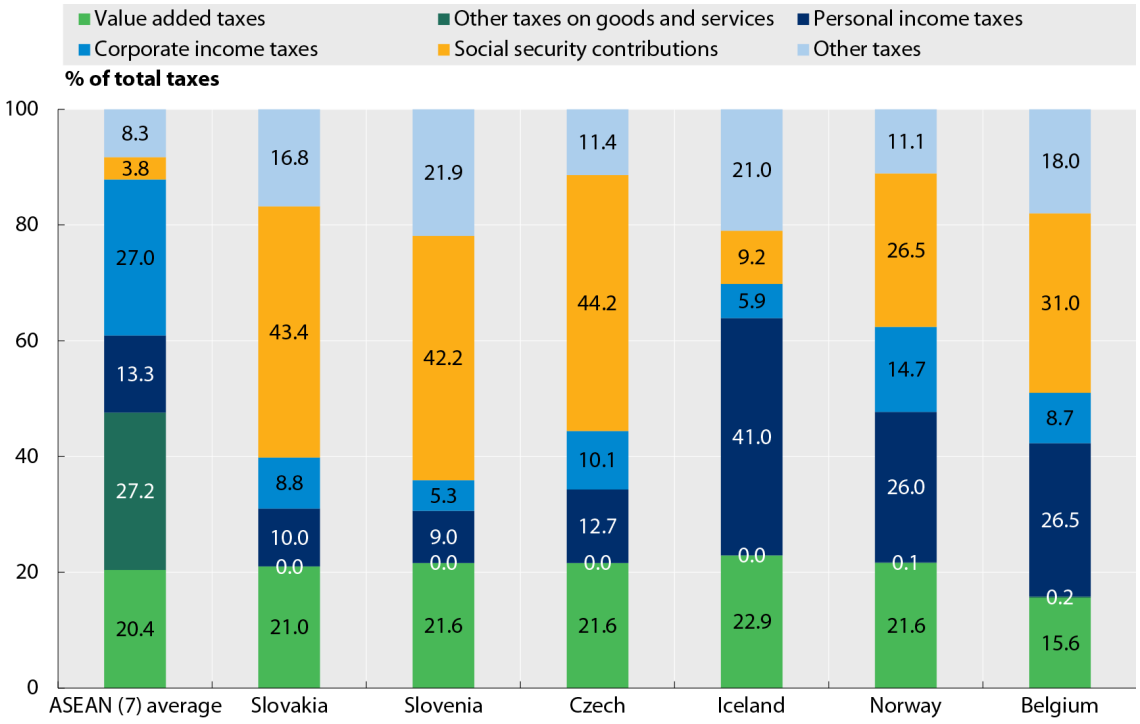
The estimation results in Table 4 showed that income tax negatively correlated with income inequality, as evidenced by the coefficient value of -0.504, statistically significant at a 5% level. Therefore, a 1% increase in government revenue from income tax on GDP decreased the Gini index by 0.00504. The result supported the initial hypothesis based on Mirrlees's (1971) theory, stating that income tax is negatively related to income inequality. It was also consistent with Caminada et al. (2019), Martorano (2018), and Parro (2024). The interpretation of the estimation results showed that the imposition of income tax on high-skilled individuals could impact income redistribution through government-provided transfers to low-skilled groups, thereby reducing income inequality.

However, the redistribution effect remained relatively small, at 0.00504 on a 0-1 scale of the Gini index.

A limitation of the data available in this study was the need for more distinction between income taxes levied on individuals and corporations. This result was essential because the redistributive effect of income tax was generally more significant for individuals than corporations. Akgun et al. (2017) explained that personal income tax was the most crucial instrument in redistributing income through the progressive design. Furthermore, the Gini index, which measured income inequality, was calculated based on the accumulated income of individuals rather than companies, comparing specific income groups on the Lorenz curve.

Further analysis could be conducted by comparing the composition of tax revenues between ASEAN and countries with low-income inequality, as shown in Figure 3. This comparison included six OECD countries with the lowest income inequality in 2020: Slovakia, Slovenia, Czech Republic, Iceland, Norway, and Belgium. The composition of income tax receipts from the countries showed that receipts from individual income tax exceeded corporate income tax, though with varying figures.

Figure 3. Tax Structure Comparison



Source: Compiled from OECD (2021)

In Slovakia, which had the lowest income inequality among OECD countries, individual income tax accounted for 10%, while corporate income tax comprised only 8.8%. Iceland, ranking fourth among OECD countries with a Gini index of 0.25, showed that the contribution of individual income tax was seven times greater than

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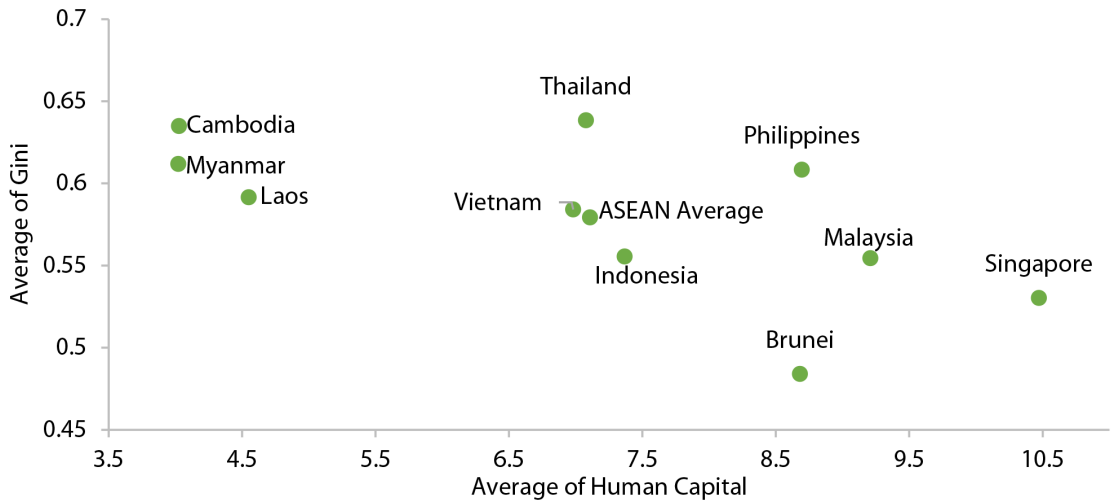
corporate income tax, at 41%. For ASEAN, the contribution of individual income tax was only 13%, while corporate income tax was double at 27%. This analysis showed that focusing on individual income tax could effectively improve income distribution and reduce income inequality. However, the effectiveness of personal income tax in reducing inequality tends to be more significant when all members of society contribute through tax.

The control variables that were statistically significant and corresponded with the hypothesis were human capital and population density, where human capital showed a negative correlation and population density was positively related. The results indicate that GDP per capita is negatively correlated with income inequality but only statistically significant in models (2), (3), and (4). Debt ratio and terms of trade were statistically significant in all models but did not correspond with the hypothesis. The debt ratio specifically showed a negative correlation, and terms of trade were positively related. The estimation results for FDI, social expenditure, and the inflation rate were insignificant in all models, while REER was only significant in model (2).

Figure 4. Income Inequality and Human Capital



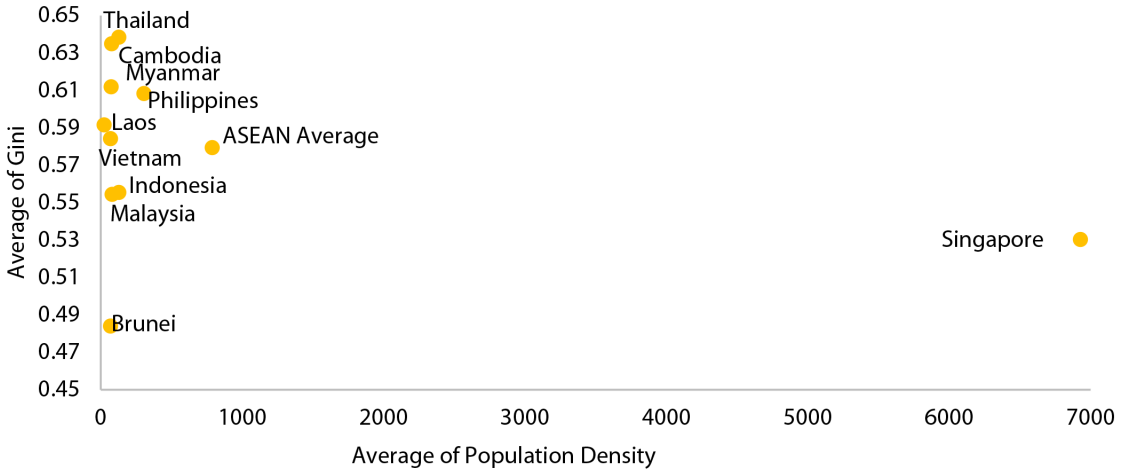
Source: Data processing

The results showed a significant relationship between human capital and population density variables, although the issue of labor and population was not the primary focus of this study. A country with a higher level of education tended to experience lower income inequality, while a country with higher population density tended to experience higher income inequality. ASEAN was classified based on the average years of schooling as an indicator of HC in Figure 4 and the average population density in Figure 5.

Singapore had the highest education in ASEAN, and the average inequality index was lower than the ASEAN average. Conversely, Laos, with education levels below

average, had higher inequality than the ASEAN average. Despite the high population density, Singapore ranked second lowest in income inequality due to the high-quality education system. Despite a low population density, Laos still struggled with above-average income inequality, as the average years of schooling were below the average ASEAN average. This result showed that population density was not a significant factor in determining income inequality in a country, provided the population had access to high-quality education.

Figure 5. Income Inequality and Population Density



Source: Data processing

The instrumental variables included the first lag of the endogenous variables in each model, namely the first lag of tax ratio, direct tax ratio, indirect tax ratio, and income tax ratio. The results from the first-stage testing showed that all the instrumental variables were statistically significant. Several tests were required to determine whether the variables were appropriate and correctly identified. The tests included under-identification, overidentification, weak identification, orthogonality conditions, and endogeneity. The results of the instrumental variable tests for all empirical models are shown in Table 5.

The underidentification test showed that all instrumental variables in the four study models were appropriately identified, as evidenced by the values of the Kleibergen-Paap rk LM statistic and the p-value. The overidentification test had similar results, observed through the p-value of the Hansen J statistic. The weak identification test, assessed by the Cragg-Donald Wald F statistic and Kleibergen-Paap rk Wald F statistic, showed that none of the variables were weak, as shown by values exceeding the critical values of the Stock-Yogo weak ID test.

The orthogonality conditions test examined whether instrumental variables correlated with endogenous variables while remaining uncorrelated with other independent variables. This result was assessed through the p-value of the Anderson-Rubin Wald test F statistic, Anderson-Rubin Wald test, and Stock-Wright LM S statistic. The results showed

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Table 5. First-Stage Result and Instrumental Variable Test

Variables	**(1)**	**(2)**	**(3)**	**(4)**
L1. *TaxRatio*	0.668***			
	[0.138]			
L1.*DirectTax*		0.757***		
		[0.065]		
L1.*IndirectTax*			0.718***	
			[0.063]	
L1.*IncomeTax*				0.724***
				[0.074]
GDP_perCapita	-0.000	-0.000	-0.000**	-0.000*
	[0.000]	[0.000]	[0.000]	[0.000]
REER	0.008	-0.003	0.000	0.001
	[0.017]	[0.004]	[0.006]	[0.005]
Debt_ratio	-0.031***	-0.003*	-0.003	-0.003*
	[0.011]	[0.002]	[0.002]	[0.002]
Terms_ofTrade	0.017**	-0.007	-0.007	-0.008
	[0.008]	[0.005]	[0.005]	[0.005]
FDI	-0.065	0.030	0.081***	0.034
	[0.062]	[0.025]	[0.022]	[0.024]
HC	-2.216***	0.127	0.271**	0.037
	[0.339]	[0.097]	[0.111]	[0.095]
Social_expenditure	-0.029	-0.037*	-0.053	-0.028
	[0.101]	[0.021]	[0.036]	[0.025]
Inflation	-0.003	0.005	0.002	0.005
	[0.016]	[0.003]	[0.004]	[0.004]
Popdensity	0.005**	0.000	0.001**	0.001*
	[0.002]	[0.000]	[0.000]	[0.000]
Constant	6.036***	2.143**	1.700**	2.428**
	[2.056]	[0.828]	[0.833]	[0.938]
Robust standard errors in brackets Significant at ***α=1%, **α=5%, *α=10%				
F-statistics	23.45	135.1	128.53	96.03
F-statistics - pvalue	0.0000	0.0000	0.0000	0.0000
Underidentification Test:				
Kleibergen-Paap rk LM statistic	17.71	43.37	42.22	36.60
Kleibergen-Paap rk LM statistic - p-value	0.0000	0.0000	0.0000	0.0000
Overidentification Test:				
Hansen J statistic - p-value	0.0000	0.0000	0.0000	0.0000
Weak Identification Test:				
Cragg-Donald Wald F statistic	165.51	266.10	220.54	232.74
Kleibergen-Paap Wald rk F statistic	23.45	135.10	128.53	96.03
Orthogonality Conditions Test:				
Anderson-Rubin Wald test, F – p-value	0.0511	0.0411	0.4407	0.0430
Anderson-Rubin Wald test, Chi-sq - value	0.0400	0.0310	0.4175	0.0325
Stock-Wright LM S statistic, Chi-sq – value	0.0118	0.0218	0.3666	0.0235
Endogeneity Test – p-value	0.0205	0.0261	0.3716	0.0477
Observations	230	207	207	207

Source: Data processing

significant correlations for models (1) and (2), with varying significances for model (4) and no correlation for model (3) due to orthogonal conditions. The endogeneity test examined whether instrumental variables were closely correlated with the endogenous variables.

CONCLUSION

This study showed the potential of tax policies in addressing income inequality in Southeast Asia, particularly tax ratio, direct tax, and income tax. However, the current impact of these measures requires reinforcement to address the issue effectively. ASEAN governments were recommended to prioritize increasing tax revenues, targeting a tax ratio of approximately 15.33% while also considering factors related to economic growth. To achieve significant reductions in income inequality, the derivation of tax revenue primarily from individual income taxes should be prioritized. Furthermore, careful consideration was required in setting optimal tax rates for the highest income bracket, as shown by the Indonesian recent implementation of a new income bracket at 35% in 2022.

The results showed the importance of education and workforce development in addressing income inequality, drawing insights from successful models in Singapore. It was also crucial to acknowledge the limitations of this study, including the need for additional values and more detailed tax-related data. Specifically, a deeper understanding of corporate and individual tax ratios in income tax was crucial for refining study methods, analysis methods, and subsequent discussions. This study offered valuable insights for ASEAN policymakers, providing guidance in crafting and implementing taxation policies to reduce income inequality and foster robust economic development in the region.

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Analyzing Economic Resilience of Rural Tourism in Indonesia Using Synthetic Composite Index

Nafiah Ariyani[1*], Akhmad Fauzi[2]
[1]Faculty of Economics and Business, Sahid University, Jakarta, Indonesia
[2]Department of Resources and Environmental Economics, Faculty of Economics and Management, IPB University, Bogor, Indonesia
E-mail: [1]arienafiah@gmail.com, [2]fauziakhmad@gmail.com
[*)]Corresponding Author

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Abstract

Research Originality: This study used a new method, namely the Adjusted Mazziotta-Pareto Index (AMPI) to measure and categorize economic resilience using clustering analysis. In addition, the innovative method had not been previously applied to tourism resilience in Indonesia, making this study the first to measure tourism village resilience.

Research Objectives: This study aimed to analyze economic resilience of tourism village destinations in Indonesia from 2019 to 2022 during the COVID-19 pandemic.

Research Methods: The procedures were carried out using a quantitative method to determine resilience index of tourism village in Indonesia during the COVID-19 pandemic. Data were obtained from form management documents as well as 24 tourism villages across Java, Bali, and West Nusa Tenggara Provinces.

Empirical Results: The results showed that the majority of villages were significantly impacted in the initial year of COVID-19, but were able to recover, demonstrating strong capacity and performance in recovering from the pandemic shock. In addition, economic aspects of capacity and performance showed high adaptability after the pandemic, indicating relative resilience to the shock.

Implications: The results of this study could inform policies to enhance tourism village resilience in Indonesia.

Keywords:

adjusted mazziotta-pareto index (AMPI); economic resilience; rural development; rural tourism

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INTRODUCTION

Rural tourism, also known as tourism village, is a series of activities that have been proven to be an essential dimension of rural development (Liu et al., 2023; Shi et al., 2022; Huang et al., 2023; Jamini & Dehghani, 2022; Bayrak, 2022; Stepanova et al., 2023). These activities are also considered innovative for overcoming various problems in rural areas and facilitating sustainable development (Lv et al., 2021). Several studies reported that tourism villages had developed into a new element and kinetic energy for revitalization and development (Neumeier & Pollermann, 2014). Despite believing in its vital role, some parties argue that tourism is vulnerable to various pressures and disruptions (C. Huang et al., 2021; Qin & Chen, 2022; Gallego & Font, 2019). These include financial crises (Chan, 2011), social disruption (Kılıçlar et al., 2018), natural disasters (Rosselló et al., 2020), political conflicts (Zhou et al., 2021), and pandemics (Altuntas & Gok, 2021). The sector vulnerability is closely related to the structure and function of the system, which is easily damaged due to the inability to adapt quickly to disturbances originating from in and outside the system (Qin & Chen, 2022).

According to previous studies, the COVID-19 outbreak from 2020 to 2022 has exerted immense pressure on global tourism (Gössling et al., 2020), leading to an unprecedented crisis (Marco-Lajara et al., 2022). UNWTO recognized 2020 as the worst year in the industry due to a disturbing crisis with significant impacts (Mazilu et al., 2023). The pandemic mainly affected tourism compared to other industries (Henseler et al., 2022) and was the last sector to recover (OECD, 2020). In addition, it was among the first sectors to experience the flagrant consequences of the COVID-19 crisis (Lamhour et al., 2023), with varying levels of impact (Jamini & Dehghani, 2022). The pandemic also raised awareness about the importance of paying particular attention to resilience in facing various external tensions and shocks (Higgins-Desbiolles, 2020; Feng et al., 2021; Hu et al., 2021; Ohe, 2022; Ibanescu et al., 2022). Resilience is an important variable in facilitating the sector's recovery (Pocinho et al., 2022) and maintaining the sustainability of rural tourism (Yu et al., 2023). In addition, it indicates a system's ability to cope and adapt positively to future social and ecological changes (Heslinga et al., 2020) and return to normal conditions after an event that disrupts its state (Hosseini et al., 2016). Several studies also showed that resilience was related to events that caused risks and shocks to a system. Risks are the possibility of adverse events and negative consequences, while shocks occur when risks become a reality (OECD, 2014). Resilience also provides a valuable framework for building bridges between emergencies, contingencies, competitiveness, and sustainable development (Béné et al., 2014).

Since the 21st century, resilience has increasingly become accepted as a framework for understanding world systems, including tourism. Studies exploring this framework in the context of tourism have also experienced growth in complexity and comprehensiveness (Ibanescu et al., 2020). These studies consistently focused on tourism resilience to climate change (Dogru et al., 2019), community resilience, and the importance of involving community leaders with local knowledge to build destination resilience (Kwok et al., 2016), tourism resilience and recovery from COVID-19 (McCartney et al., 2021),

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resilience and welfare of households that base the livelihoods on tourism (Munanura et al., 2021), communities in tourism village (Lew et al., 2016), the impact of COVID-19 on rural resilience (Yu et al., 2023), and tourism village in Japan during the new normal (Ohe, 2022).

Despite the availability of studies on tourism resilience, there still needs to be gaps in assessing resilience and accounting for temporal fluctuations in tourism shocks (Lamhour et al., 2023). Several reports, such as those conducted by Gaki and Koufodontis (2022), used the resistance index to measure regional tourism resilience using statistical data. Cirer Costa (2024) and (Manner-Baldeon et al., 2024) also focused on community resilience. Therefore, this study measures tourism villages at the destination scale by integrating temporal variations of resilience indicators. A novel method, the Adjusted Maziotta-Pareto Index (AMPI), was introduced to evaluate tourism village resilience based on temporal changes. This research is the first study in Indonesia to address the gap in tourism resilience measurement in the context of tourism villages.

As a nation with abundant potential for rural tourism, the proliferation of tourism villages in Indonesia is anticipated to bolster rural tourism's contribution to enhancing economic growth, fostering community welfare, and conserving nature and rural heritage (Ariyani & Fauzi, 2023). Consequently, the results hold the potential to serve as a guiding framework for fortifying tourism village resilience in Indonesia when confronting various shocks and risks. The results can also be extrapolated to regions sharing similar characteristics to facilitate broader applications beyond Indonesian borders.

METHODS

This study used a quantitative method that focused on tourism villages as participants. It aimed to analyze the economic resilience of tourism villages in Indonesia during the COVID-19 pandemic over different periods and whether there were discernible patterns in village resilience. Economic resilience in this study was defined as the tourism village's ability to maintain and improve performance while facing COVID-19. The parameters to measure the resilience index consisted of the capacity and performance dimensions, which were proxies for the phenomenon of tourism village. These parameters were determined based on focused group discussions with tourism village managers. The capacity dimension was related to resources that were part of the tourism village system, and the performance dimension was related to the results of the work of the tourism village during and after the disturbance occurred. Indicators of capacity and performance dimension are presented in Table 1.

The data used in this study was obtained from tourism village management documents. Twenty-four tourism villages scattered in Java, Bali, and West Nusa Tenggara Provinces were analyzed. The selection process employed a purposive sampling method based on the following criteria: availability of data, presumably impacted by the COVID-19 shock, considered to have an economic and social impact on rural economics, and represented tourism destinations in the three main islands of tourism in Indonesia.

A composite index was used to measure tourism village resilience. This method was appropriated for measuring concepts that one indicator could not capture (Scaccabarozzi et al., 2022), such as tourism. Mazziotta and Pareto (2013) stated that several socio-economic phenomena, including tourism, could not be measured with a single descriptive indicator but must be represented through several dimensions or a combination of different dimensions, with varying degrees, which must be robust. Composite indexes were a valid method for measuring multidimensional phenomena because they allowed the reduction and consideration of different dimensions of a phenomenon (Mazziotta & Pareto, 2017a; Mazziotta & Pareto, 2017b).

Table 1. Resilience Economic Indicators of Tourism Village

Parameters	
Capacity	**Performance**
• Capacity building: number of training conducted in a year (times)	• Tourist: number of tourists during the year (person)
• Employee: number of employees in a year (person)	• Income: total income for a year (IDR)
• Village Development Index (VDI): index to maintain villages' potential and ability to achieve sustainable development and prosper village life covering social, economic, and ecological aspects (district)	• Cost: total cost for a year (IDR)

In this study, tourism village resilience was measured using a synthetic indicator known as AMPI, developed by Mazziotta and Pareto (2016). This index was carried out with a spatiotemporal method, which had additional benefits over purely spatial or time-series analyses because it allowed the investigator to simultaneously study the persistence of patterns over time and illuminate any unusual patterns. Including space-time interaction terms could also detect data clustering that could indicate emerging environmental hazards or persistent errors in the data recording process.

AMPI was a variant of the Maziotta-Pareto Index (MPI), developed by Mazziotta and Pareto (2013). MPI was a formative composite index summarizing a series of indicators that were considered irreplaceable; all components must be balanced (de Muro et al., 2011). In addition, it was based on a non-linear function starting from the arithmetic mean, introducing a penalty for units with unbalanced indicator values. The index was designed to meet the following characteristics: (1) normalization of indicators with special criteria that removed units of measurement and effects of variability, (2) independent synthesis of ideal units, since the set of optimal values was arbitrary, non-univocal and could vary over time, (3) easy calculation, and (4) easy interpretation (Mazziotta & Pareto, 2016)..

AMPI was a non-compensatory composite index that allowed comparability of the data across units and over time. The method started with normalizing data or indicators using the following formula:

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$$r_{ij} = \left[\frac{(x_{ij} - Minx_j)}{Maxx_j - Minx_j}\right] * 60 + 70$$

In this study, x_{ij} represented a matrix of n rows which contained unit analysis, and m columns containing indicators. max_{xj} and Min_{xj} were the goalspots for indicator j. Such a normalization was a refinement of MPI designed to appreciate absolute changes over time (Mazziotta & Pareto, 2104). The range of normalization was varied between 70 and 130. When M_{ri} and S_{ri} were denoted as mean and standard deviation of normalized value of unit i, respectively, the generalized form of AMPI was given by the following equation:

$$AMPI_i^{+/-} = M_{ri} \pm S_{ri}cv_i$$

In the equation, $cv_i = S_{ri}/M_{ri}$ represented the coefficient of variation of the unit *i*. The sign $\pm$ indicated whether the phenomenon to be measured was maximized (the higher, the better) or minimized (the lower, the better).

As previously mentioned, AMPI needed a "goalspot" to facilitate interpretation of the results. The reference point of 100, which was the average indicator in a given year, was employed. The higher or lower AMPI value than this reference point indicated whether the unit being analyzed was progressing or regressing. In this case, whether the units were more resilient or vice versa, the procedure to set the goalspot included the following:

$$Ref_{x_j \pm \Delta} \text{ where } \Delta = \frac{(Sup_{x_j} - Inf x_j)}{x}$$

Sup_{xj} and Inf_{xj} represented the maximum and the minimum of indicator j across all periods and the reference value of indicator j (Mazziotta & Pareto, 2017a).

In addition to AMPI, this study used the traditional MPI to compare resilience level of tourism village without using "goalspot" years, such as those used in AMPI. Therefore, MPI measured the level of resilience independent of time (year), indicating that MPI score was calculated for every year from 2019 to 2022.

In AMPI, the calculation of MPI also involved normalizing the data through the z-score method. The formula for normalizing the matrix was in the form of:

$$z_{ij} = 100 + \frac{(x_{ij} - M_{xj})}{S_{xj}} 10$$

Where:
x_{ij} = original matrix value
M_{xj} = average value of the indicator (individual column)
S_{xj} = standard deviation of the indicator (individual column)

Once the normalized values had been calculated, the next step of MPI was to find the aggregation of the index using the following formula:

$$MPI^{+/-} = M_{zi} \pm S_{zi}cv_i$$

Where:
M_{zi} = mean value of the standardized values (horizontally)
S_{zi} = standard deviation of the standardized value (horizontally)
cv_i = coefficient of variation of the standardized

The plus or minus signs in the formula were due to the polarity of the indicators concerning one of the phenomena under study.

In order to capture resilience from COVID-19 shock, the data were collected from 2019 (pre-COVID-19) to 2022 (during and after COVID-19). The original data for all indicators during 2019-2022 from 24 tourism villages, which were the basis for calculating AMPI/MPI, were presented in Appendix A to D.

RESULTS AND DISCUSSION

Before the onset of the COVID-19 pandemic, tourism villages in Indonesia were experiencing promising growth. This growth was evidenced by the emergence of numerous new tourism destinations and the expansion of tourism villages as operators in various regions. Indonesian tourism villages reached 1,831 before the COVID-19 pandemic (Ariyani et al., 2023). However, following the government's official declaration in March 2020 that Indonesia was impacted by the pandemic and the subsequent implementation of large-scale social restrictions, tourism destinations in Indonesia witnessed a significant decrease in visitors and income (Sasongko et al., 2022). Despite these challenges, some tourism villages managed to recover, as indicated by the results of this study.

Table 2 illustrates that one year after the pandemic, all tourism villages experienced a decline in performance, as indicated by a decrease in AMPI scores. The delta (Δ) score from 2019-2020 reflected the changes in the resilience index of 24 tourism villages during this period, which was the most critical for the tourism village sector. Villages examined experienced a decrease in resilience index (negative delta AMPI). However, the impact varied among villages, with some experiencing a minor decrease in resilience scores while others were significantly affected.

From 2019 to 2020, Pentingsari Tourism Village experienced the most significant decline in the resilience index compared to all villages. The government's travel ban policy led to a substantial decrease in tourism arrivals. As a result, villages known for rural and agricultural cultural attractions decided to suspend the services to avoid incurring costs that outweighed the income. Despite abruptly declining visitor numbers and revenue, several other tourism villages were selected to remain open. Some villages continued the operations to uphold tourism village status, engaging in activities like staff training and facility maintenance.

When comparing the 2019-2022 and 2021-2022, significant differences were observed in the tourism resilience index. In 2020-2021, following the COVID-19 pandemic, nearly all villages, except for Tambaksari Village, displayed a notable recovery as evidenced by positive changes in AMPI scores (positive delta AMPI). The result suggested that during this time frame, tourism village successfully adjusted to the challenges posed by the pandemic. The overall increase in the resilience index could be attributed to the implementation of health protocols in the tourism sector (CHSE Protocol), service-related training during the new normal, and adapting tourism destinations into digital formats through travel packages. Digital tourism was introduced to cater to visitors who could

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not physically visit or were concerned about COVID-19 transmission. Furthermore, government policy's gradual reopening of tourism activities further supported the recovery, leading to a gradual rise in visitor numbers.

According to Table 2, the largest rise in the resilience index was observed in Karangrejo Village between 2020 and 2021. Karangrejo was known for its community-based tourism offerings, focusing on rural and agricultural cultural experiences. With strong community backing, particularly in providing accommodation and adherence to CHSE protocol for visitor health safety, this village had effectively increased visitor numbers, improving other resilience metrics.

Table 2. Comparison of Tourism Village Resilience Index Pre to During the COVID-19 Pandemic

Tourism Village	AMPI					
	2019	2020	Δ_1	2020	2021	Δ_2
Pentingsari	107,543	92,728	-14.815	92,728	99,363	6.635
Karangrejo	103,401	94,608	-8.793	94,608	108,836	14.228
Wanurejo	99,358	96,037	-3.321	96,037	99,233	3.196
Bleberan	103,293	102,091	-1.202	102,091	101,050	1.041
Tinalah	98,628	92,423	-6.205	92,423	101,606	9.183
Gunung Gajah	96,659	95,469	-1.19	95,469	96,610	1.368
Pulau Cemara	97,094	95,242	-1.852	95,242	98,471	3.229
Mandiraja	96,557	95,666	-0.891	95,666	95,744	0.078
Wana Wisata	99,879	97,276	-2.603	97,276	102,027	4.751
Tlogoweru	99,090	94,181	-4.909	94,181	95,247	1.066
Wonosari	96,174	95,931	-0.243	95,931	99,775	3.844
Tlogowero	98,003	95,103	-2.9	95,103	97,693	2.59
Bilebante	104,705	94,876	-9.829	94,876	100,928	6.052
Tambaksari	98,129	96,477	-1.652	96,477	96,436	-0.041
Pampang	96,381	94,768	-1.613	94,768	97,326	2.558
Bendolawang	97,041	94,443	-2.598	94,443	95,986	1.543
Malangjiwan	101,882	97,627	-4.255	97,627	107,394	9.767
Beji	99,838	96,154	-3.684	96,154	96,206	0.052
Tetebatu	104,052	98,319	-5.733	98,319	107,203	8.884
Sade	100,603	96,692	-3.911	96,692	101,590	4.898
Bonjeruk	99,790	95,858	-3.932	95,858	102,940	7.082
Hanjeli	97,321	96,095	-1.226	96,095	95,607	0.488
Tepus	96,584	94,218	-2.366	94,218	98,353	4.135
Cibuntu	97,597	93,544	-4.053	93,544	98,162	4.618

Source: AMPI Analysis

Table 3 compared AMPI scores representing resilience levels before, during, and after the COVID-19 pandemic, spanning from 2019 to 2022, using 2022 as a reference point. Analysis from Table 7 revealed a notable overall increase in AMPI scores leading up to 2022, which signaled a robust recovery trend post-shock. This trend indicated

that tourism villages had effectively adapted to the challenges posed by COVID-19 and could be considered fully recovered. Among these villages, Karangrejo stood out for its exceptional resilience, as evidenced by the significant positive change in Delta values. The success of Karangrejo could be attributed to the strategic partnerships, particularly with State-Owned Enterprises, which established the Village Economic Center (Balkondes).

Furthermore, the Tourism Awareness Group (Pokdarwis) played a pivotal role in enhancing resilience to the pandemic. The synergy between these entities fostered creativity, driving increased visitor arrivals. The village's strong community engagement in offering homestays and other amenities aligned with health protocols further boosted visitor numbers and revenue performance. These achievements underscored the effective implementation of community-based tourism, successfully navigating external disruptions. Karangrejo's accomplishments had been recognized by the Indonesian government, earning it an award as a sustainable tourism village.

Table 3. Comparison of Tourism Village Resilience Index Post the COVID-19 Pandemic

Tourism Village	AMPI								
	2019	2022	Δ_1	2020	2022	Δ_2	2021	2022	Δ_3
Pentingsari	107,543	118,566	11.023	92,728	118,566	25.838	99,363	118,566	19.203
Karangrejo	103,401	130,491	27.09	94,608	130,491	35.883	108,836	130,491	21.655
Wanurejo	99,358	112,524	1.166	96,037	112,52	16.487	99,233	112,524	13.291
Bleberan	103,293	114,805	11.512	102,091	114,805	12.714	101,050	114,805	13.755
Tinalah	98,628	120,395	21.767	92,423	120,395	27.972	101,606	120,395	18.789
Gunung Gajah	96,659	109,813	13.154	95,469	109,813	14.344	96,610	109,813	13.203
Pulau Cemara	97,094	112,095	15.001	95,242	112,095	16.853	98,471	112,095	13.624
Mandiraja	96,557	109,006	12.449	95,666	109,006	13.34	95,744	109,006	13.262
Wana Wisata	99,879	115,969	16.09	97,276	115,969	18.693	102,027	115,969	13.942
Tlogoweru	99,090	110,458	11.368	94,181	110,458	16.277	95,247	110,458	15.211
Wonosari	96,174	113,914	17.74	95,931	113,914	17.983	99,775	113,914	14.139
Tlogowero	98,003	110,091	12.455	95,103	110,091	14.988	97,693	110,091	12.398
Bilebante	104,705	120,750	16.045	94,876	120,750	25.874	100,928	120,750	19.822
Tambaksari	98,129	111,619	13.49	96,477	111,619	15.142	96,436	111,619	15.183
Pampang	96,381	112,194	15.813	94,768	112,194	17.426	97,326	112,194	14.868
Bendolawang	97,041	109,545	12.504	94,443	109,545	15.102	95,986	109,545	13.559
Malangjiwan	101,882	124,144	22.262	97,627	124,144	26.517	107,394	124,144	16.75
Beji	99,838	109,628	9.79	96,154	109,628	13.474	96,206	109,628	13.422
Tetebatu	104,052	120,301	16.249	98,319	120,301	21.982	107,203	120,301	13.098
Sade	100,603	118,571	17.968	96,692	118,571	21.879	101,590	118,571	16.981
Bonjeruk	99,790	124,534	24.744	95,858	124,534	28.676	102,940	124,534	21.594
Hanjeli	97,321	109,075	11.754	96,095	109,075	12.98	95,607	109,075	13.468
Tepus	96,584	113,240	16.656	94,218	113,240	19.022	98,353	113,240	14.887
Cibuntu	97,597	111,961	14.364	93,544	111,961	18.417	98,162	111,961	13.799

Source: AMPI Analysis

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Table 4 displays the resilience index calculated through the traditional MPI method. Unlike AMPI, MPI evaluated the resilience of individual units (tourism villages) for each year without setting a specific target year like 2022. As illustrated in Table 4, Pentingsari Village achieved the highest MPI score, while Wonosari Village scored the lowest. The high resilience index of Pentingsari could be attributed to the relatively high income than other tourism villages. In 2019, Pentingsari was a popular tourism spot known for the environmentally friendly theme tourism, which was in high demand before the COVID-19 pandemic. However, in 2020, Pentingsari had to cease operations based on a decrease in visitor numbers caused by the rapid spread of COVID-19 and government-imposed restrictions on outdoor activities, as detailed in the preceding section.

Table 4 illustrates that the effects of COVID-19 were experienced diversely among villages, as evidenced by the fluctuation in MPI rankings from 2019 to 2022. The shift in MPI scores rankings was linked to how villages responded to COVID-19 policies, including restricted mobility and stringent travel protocols. Therefore, tourism village resilience was shaped by the capacity to adapt, innovate, and cooperate with partners, influencing public trust in engaging in tourism activities during a pandemic.

Table 4. Resilience Index 2019-2022 Use MPI Method

Tourism Village	MPI							
	2019	Rank	2020	Rank	2021	Rank	2022	Rank
Pentingsari	116	1	96	19	101	10	99	3
Karangrejo	104	5	104	4	110	1	97	4
Wanurejo	99	10	100	7	99	12	94	8
Bleberan	106	2	111	2	103	5	94	9
Tinalah	99	12	103	5	102	6	96	5
Gunung Gajah	96	18	98	15	95	20	92	16
Pulau Cemara	94	23	97	17	96	17	89	21
Mandiraja	95	22	95	20	93	22	92	15
Wana Wisata	99	9	97	16	101	8	92	18
Tlogoweru	95	19	92	24	92	24	87	24
Wonosari	93	24	98	14	97	15	88	23
Tlogowero	98	13	98	13	98	14	92	19
Bilebante	106	3	100	6	101	9	100	2
Tambaksari	97	15	98	11	96	19	94	7
Pampang	95	20	98	12	97	16	93	14
Bendolawang	95	21	93	23	95	21	92	17
Malangjiwan	102	6	112	1	109	2	95	6
Beji	101	7	100	9	96	18	89	22
Tetebatu	105	4	108	3	108	3	93	13
Sade	100	8	100	8	101	7	93	11
Bonjeruk	99	11	99	10	103	4	103	1
Hanjeli	96	17	94	22	93	23	89	20
Tepus	97	16	96	18	99	11	93	12
Cibuntu	97	14	95	21	98	13	93	10

Source: MPI Analysis

Although Pentingsari performed well in 2019, the village faced significant challenges when COVID-19 emerged, which led to an abrupt decline in its MPI score from initial place in 2019 to 19th place in 2020. The same year, Malangjiwan emerged as a tourism village with the highest MPI score. The primary attraction of Malangjiwan was the natural spring water therapy, which included elevated pH and oxygen levels (reaching pH 7.5), set amidst picturesque views of rice fields near Mount Merapi, known as Umbul Brintik. Approximately 90% of visitors did not seek only pure water tourism but also a relaxing health retreat. The alignment of this product and the health-focused pandemic context has made Malangjiwan a highly appealing destination. The substantial visitor numbers and revenue generation drove the village's strong resilience index.

In 2021, Karangrejo tourism village stood out as a destination with the highest resilience index. Managed by Balkondes and Pokdarwis, the village actively promoted tour packages showcasing local life and attractions that captivated tourists. Government policies supported the implementation of the CHSE protocol for tourism sites and contributed to its success. Village's commitment to cleanliness and environmental preservation was noteworthy, which led to its designation as a model clean village, a community-wide effort. Additionally, Karangrejo offered meeting rooms, culinary experiences, and hotel and homestay accommodations for out-of-town visitors.

In 2022, Bonjeruk secured the top rank in the resilience index. This village exemplified how the efficiency of financing, alongside income, played a crucial role in determining the resilience of a tourism destination. Bonjeruk Village offered cultural and historical tourism experiences, showcasing rural landscapes, unique culinary delights, and a serene environment that allowed visitors to unwind amidst nature and rich traditions. Following the relaxation of tourism restrictions by the government and the gradual decline of the pandemic, this destination has emerged as a popular choice for tourists locally and internationally. As a result, visitor numbers in the village have surged by up to 300% while maintaining operational efficiency in staffing and costs.

The outcomes of AMPI analysis could be used to categorize tourism villages based on four key characteristics. These included (1) tourism village with a high resilience index (≥100) that experienced a decline during the COVID-19 pandemic (quadrant 1), (2) tourism village with a high and consistent resilience index during the COVID-19 pandemic (Quadrant 2), (3) tourism village with a low level of resilience heavily affected by the COVID-19 pandemic (Cluster 3 - C3), and (4) tourism village with a high level of resilience significantly impacted by the COVID-19 pandemic (Quadrant 4). The classification process was conducted using a X-Y diagram, as depicted in Figure 1.

According to Figure 1, there were 3 villages in Quadrant 1, 7 villages in Quadrant 2, 14 villages in Quadrant 3, and none in Quadrant 4. Tourism villages in Quadrant 2 were characterized by being well-established, having sufficient human resources, high motivation, and creativity. These villages also engaged in adequate capacity development and were situated in a district/subdistrict with a developing village index in the independent and advanced village category. In Quadrant 1, although the capacity was less stable than in Quadrant 2, the determination and creativity of

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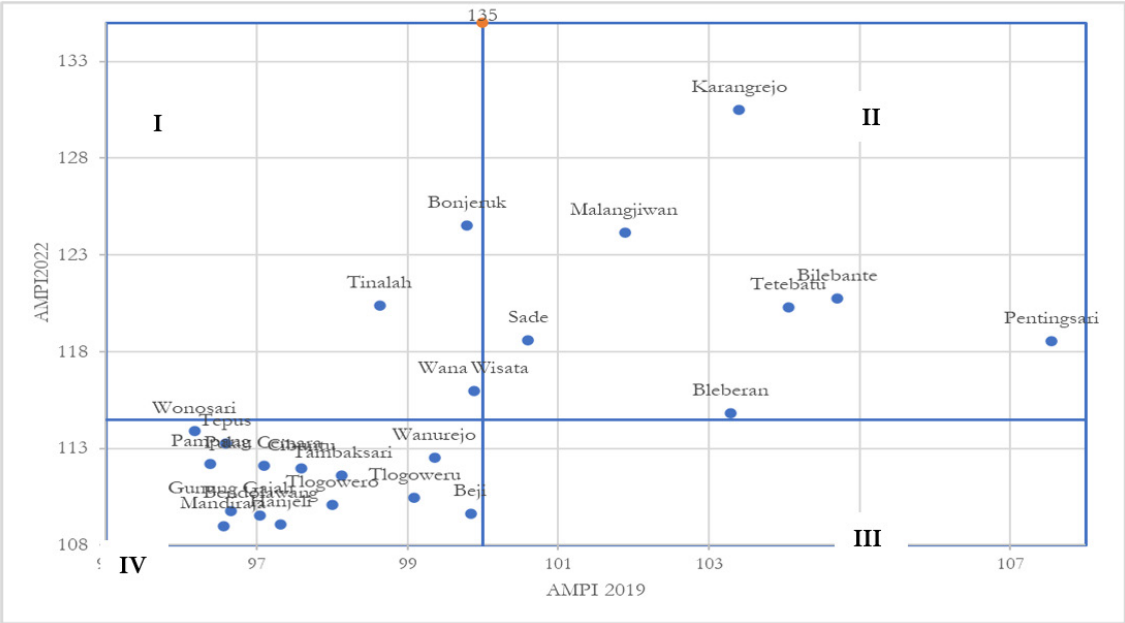
the managers led these villages to possess a high level of resilience. These tourism villages have implemented various strategies to address the challenges posed by the COVID-19 pandemic, particularly by embracing digital technology for promotion and development, which had emerged as a popular tool for capacity enhancement. These initiatives had successfully instilled public trust in visiting rural areas, as evidenced by the rising number of visitors.

Figure 1. Tourism Village Typology Based on Resilience Category



This study provided insight into two things from resilience analysis results using AMPI and the quadrant methods. First, understanding tourism village resilience could be presented more comprehensively through temporal variations before and after COVID-19. Temporal variations through synthetic indicators could describe the dynamics that occurred in performance indicators and the capacity of tourism villages to face shocks. Synthetic indicators were a way to combine multiple individual measurements into a single score that reflected the overall resilience of a tourism destination. These results help policymakers and tourism stakeholders understand a destination's strengths and weaknesses when dealing with disruptions. The individual indicators were then statistically combined into a single score. Using synthetic indicators had benefits in terms of providing a quick and easy way to compare the resilience of different destinations. It could also be used to track changes in resilience over time.

Second, quadrant mapping allowed the study to visualize the relative standing of each tourism village compared to the others. This comparative analysis was crucial for evaluating the current state of villages and the potential trajectories after absorbing the shock. Recognizing this perspective was essential for addressing identified weaknesses and gaining insights from the resilience demonstrated by other tourism villages during

challenging times. The quadrant mapping conducted in this study not only aids in enhancing the management of tourism villages but also serves as a valuable tool for local and national decision-makers to assess and enhance the resilience and sustainability of tourism village.

CONCLUSION

This study aimed to assess tourism village resilience in facing the external shock of COVID-19 in different periods and analyze resilience patterns of tourism villages facing the COVID-19 pandemic. The synthetic composite index was selected as an easy-to-use tool to assess resilience, making it easy for policymakers to understand and allowing comparisons across regions and periods. This method was selected to evaluate tourism village resilience in developing countries such as Indonesia. Applying typology analysis through quadrant mapping could unveil resilience patterns across villages. This information served as a valuable foundation for tackling challenges in tourism villages. Quadrant mapping visually represented each village's relative position compared to others. In addition, it was a powerful tool for assessing the current state and the dynamic changes (temporal variations) that each village experiences. This analysis empowered policymakers to identify benchmarks – villages demonstrating relative resilience towards external shocks.

The results revealed that external shocks, such as the COVID-19 pandemic in the early years, significantly impacted most rural tourism destinations. However, creative village managers were able to recover relatively quickly. The results demonstrated that the tourism village was developing innovative ideas to adapt to the new normal. These included developing virtual travel packages using digital technology, human resources training about the pandemic and creative ways to deal with it, and improving infrastructure by focusing on health, cleanliness, safety, and environmental sustainability protocols.

These results implied that resilience was essential for future success in rural tourism management. Understanding the composite index and the indicators could help implement appropriate policy measures for rural tourism. The synthetic resilience indicators obtained from this study could be used to assess village-level tourism resilience and design more effective policy measures to increase resilience. Though it had advantages, this study showed several limitations, specifically in selecting capacity and performance component variables. Including more variables in both components could provide a more comprehensive understanding of the level of resilience and the components. Likewise, broadening the unit of analysis could allow better comparisons in assessing the resilience of rural tourism.

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Appendix

Appendix A. Original Indicator 2019

Tourism Village	Capacity Building	Employee	VDI	Tourist	Income (IDR 000)	Cost (IDR 000)
Pentingsari	7	42	0.784	21.263	22.353.430	1.609.445
Karangrejo	10	11	0.702	7.694	1.891.371	862.902
Wanurejo	4	9	0.702	1.200	655.586	398.852
Bleberan	1	101	0.744	64.943	350.973	951.042
Tinalah	2	39	0.709	11.157	427.421	169.812
Gunung Gajah	1	6	0.682	20.655	56.700	67.500
Pulau Cemara	2	17	0.611	37.563	197.537	104.705
Mandiraja	1	15	0.660	12.000	40.000	55.000
Wana Wisata	1	7	0.649	93.231	753.428	963.610
Tlogoweru	10	6	0.599	500	12.000	15.000
Wonosari	0	17	0.610	47.395	664.956	103.309
Tlogowero	1	11	0.746	27.740	82.125	217.800
Bilebante	5	150	0.689	22.638	1.079.000	679.140
Tambaksari	4	16	0.666	6.291	85.740	72.400
Pampang	0	30	0.689	60	4.428	228
Bendolawang	2	26	0.657	418	2.150	3.500
Malangjiwan	0	19	0.661	20.608	1.610.249	615.133
Beji	5	25	0.752	6.500	32.000	112.000
Tetebatu	5	178	0.681	3.638	960.000	480.000
Sade	6	11	0.671	94.132	390.000	256.000
Bonjeruk	7	27	0.674	2.300	1.548.800	80.500
Hanjeli	2	25	0.657	1.400	65.000	85.000
Tepus	0	15	0.749	106	210.000	20.000
Cibuntu	1	10	0.709	28.964	354.295	201.879

Appendix B. Original Indicator 2020

Tourism Village	Capacity Building	Employee	VDI	Tourist	Income (IDR 000)	Cost (IDR 000)
Pentingsari	0	0	0.799	0	0	0
Karangrejo	0	11	0.720	5.930	757.500	812.053
Wanurejo	0	11	0.720	7.000	486.200	355.858
Bleberan	2	96	0.756	35.939	724.360	434.616
Tinalah	11	31	0.745	2.503	43.589	34.871
Gunung Gajah	0	9	0.706	31.671	98.190	95.703
Pulau Cemara	0	30	0.632	39.288	106.517	141.498
Mandiraja	0	20	0.665	15.000	75.000	60.000
Wana Wisata	2	7	0.662	19.004	175.600	155.314
Tlogoweru	1	6	0.607	50	2.000	1.500
Wonosari	1	17	0.623	36.045	440.582	102.408
Tlogowero	0	5	0.771	11.315	101.835	99.000
Bilebante	6	50	0.707	975	53.625	26.812
Tambaksari	2	16	0.738	6.459	76.120	66.000
Pampang	4	30	0.717	1.765	5.295	420
Bendolawang	0	17	0.660	65	650	800
Malangjiwan	0	19	0.701	132.832	1.062.658	985.251
Beji	2	25	0.793	3.800	76.000	68.000
Tetebatu	5	156	0.681	3.337	656.685	320.000
Sade	4	20	0.686	41.150	100.000	70.000
Bonjeruk	4	29	0.714	1.200	70.250	55.000
Hanjeli	1	15	0.647	950	70.000	50.000
Tepus	0	15	0.749	106	25.000	20.000
Cibuntu	0	10	0.730	0	0	0

Appendix C. Original Indicator 2021

Tourism Village	Capacity Building	Employee	VDI	Tourist	Income (IDR 000)	Cost (IDR 000)
Pentingsari	4	45	0.812	1.100	82.500	61.874
Karangrejo	11	12	0.724	6.192	1.048.052	927.398
Wanurejo	0	12	0.724	6.000	424.414	300.004
Bleberan	0	96	0.767	16.293	306.199	183.719
Tinalah	13	44	0.759	3.395	67.850	54.280
Gunung Gajah	0	5	0.709	19.505	61.798	61.107
Pulau Cemara	1	34	0.636	40.030	120.005	117.113
Mandiraja	0	10	0.665	10.000	50.000	45.000
Wana Wisata	2	8	0.669	46.813	561.860	335.82
Tlogoweru	2	6	0.638	100	4.000	6.000
Wonosari	1	17	0.627	48.153	488.063	83.321
Tlogowero	2	4	0.772	9.125	82.125	79.200
Bilebante	7	70	0.709	2.700	202.500	101.250
Tambaksari	0	16	0.740	4.202	51.100	62.000
Pampang	4	30	0.719	323	969	324.000
Bendolawang	1	17	0.729	128	1.500	1.280
Malangjiwan	0	21	0.724	107.060	856.528	684.963
Beji	0	12	0.793	760	15.000	14.860
Tetebatu	4	197	0.692	4.115	884.575	416.000
Sade	6	20	0.695	71.323	113.000	79.000
Bonjeruk	6	41	0.714	14.000	588.400	220.000
Hanjeli	1	15	0.655	500	40.000	33.000
Tepus	5	15	0.795	155	38.800	30.000
Cibuntu	1	10	0.754	17.181	146.905	112.500

Appendix D. Original Indicator 2022

Tourism Village	Capacity Building	Employee	VDI	Tourist	Income (IDR 000)	Cost (IDR 000)
Pentingsari	6	45	0.821	10.219	719.572	546.874
Karangrejo	15	18	0.749	12.006	2.8911	2.197.875
Wanurejo	0	9	0.749	20.000	655	333.008
Bleberan	0	84	0.796	18.524	350.973	210.583
Tinalah	15	44	0.802	9.009	427.421	406.049
Gunung Gajah	1	5	0.715	15.760	56.700	65.540
Pulau Cemara	2	30	0.658	29.091	197.537	107.910
Mandiraja	0	10	0.724	8.000	40.000	40.000
Wana Wisata	2	9	0.690	73.482	753.428	365.426
Tlogoweru	6	6	0.659	300	12.000	9.000
Wonosari	1	17	0.652	68.119	664.956	103.906
Tlogowero	1	4	0.772	9.125	82.125	79.200
Bilebante	5	100	0.796	13.000	1.079.000	431.600
Tambaksari	3	22	0.744	7.824	85.740	81.000
Pampang	5	30	0.760	1.476	4.428.	396
Bendolawang	1	17	0.758	215	2.150	2.000
Malangjiwan	1	20	0.735	145.955	1.610.249	1.175.856
Beji	0	12	0.820	1.600	32.000	28.000
Tetebatu	2	176	0.770	6.257	960.000	448.000
Sade	5	20	0.722	110.540	390.000	273.000
Bonjeruk	9	62	0.758	32.000	1.548.800	816.600
Hanjeli	1	18	0.672	800	65.00	47.000
Tepus	4	24	0.817	909	210.000	168.000
Cibuntu	1	10	0.790	13.137	354.295	201.879

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The Importance Level of Islamic Tourism Attributes: Will Religiosity Distinguish?

Afred Suci[1*], Rita Wiyati[2], Inova Fitri Siregar[3], Satria Tri Nanda[4]
[1,2,3]**Universitas Lancang Kuning, Pekanbaru, Indonesia**
[4]**Universiti Teknologi MARA, Selangor, Malaysia**
E-mail: [1]afredsuci@unilak.ac.id, [2]ritawiyati@unilak.ac.id, [3]inova@unilak.ac.id, [4]2021254038@student.uitm.edu.my
[*)]**Corresponding Author**

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Abstract

Research Originality: How Islamic attribute fulfilment may influence Muslim tourists' preferences has been widely known. Yet, the way the model is examined the other way around is relatively scarce in halal tourism literature. The originality of this research lies in the model use in testing the effect of companion type and destination choice, moderated by different levels of religiosity, on Muslim tourists' assessment of the importance of Islamic attributes in halal tourism.

Research Objectives: This study aims to examine the effect of Muslim tourists' preferences in terms of companion type and destination choice, moderated by their level of religiosity, on their assessment of the importance of Islamic attributes in halal tourism.

Research Methods: Friedman and Cochran's Q non-parametric tests were conducted on 189 data collected online to examine the direct effects of companion type, destination choice, and religiosity on Muslim tourists' assessment of the importance of Islamic attributes. Model 1 of the Hayes Process Macro with binary logistic was employed to examine the moderating effect of religiosity.

Empirical Results: The results showed that companion type, religiosity, and destination choice significantly affected Indonesian Muslim travellers' assessment of the importance of Islamic attributes. However, the moderating role of religiosity was not observed.

Implications: The findings have implications for Muslim travellers' decision-making literature and may offer better strategies for tourism businesses to attract and retain more Muslim tourists.

Keywords:
halal tourism; Islamic attributes; religiosity; tourist preference

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INTRODUCTION

The global halal market, including halal tourism, is worth USD 580 billion annually (Olya & Al-Ansi, 2018). The fact that Muslim tourists' demand for services and facilities differs from the demands of conventional tourists explains the exponential increase in halal tourism (Yousaf & Xiucheng, 2018). Halal tourism *per se*—despite the debate surrounding the term Islamic tourism or Muslim-friendly tourism (Suci et al., 2021)—is a concept of tourism that implements some Islamic values in its operation with the aim of providing for Muslims' needs during traveling (Wibawa et al., 2021). It has become a flourishing trend and shown a solid improvement in the tourism and hospitality industry, leading to a global recognition that this sector has a great impact on the global travel market, including in non-Muslim countries (e.g., Yousaf & Xiucheng, 2018; Aji et al., 2021; Suci et al., 2021).

Halal tourism is considered a niche market with feature needs due to varied tourists' religiosity and preferences (Liberato et al., 2020). Thus, it is essential to involve tourists' decision-making when discussing their preferences for halal tourism. In that vein, decades ago, Wahab et al. (1976) introduced the travel decision-making theory, stating that the traveler's decision-making process is based on decision-making rationality. In its further development, Gilbert (1991) proposed that when reviewing the decision-making process, the emphasis of various considerations is based on the behavior of each individual. These earlier theories of tourist decision-making have been further developed in lengthy discussions of recent tourism studies (e.g., Aydin & Karamehmet, 2017; Bowen, 2022). In halal tourism, travelers across religions and cultures differ in behavior patterns, travel arrangements, leisure activities, motivations, destination choices (Aji et al., 2021), and travel preferences (Hassani & Moghavvemi, 2020). In short, travelers' destination preferences depend on their respective beliefs (Sudigdo & Khalifa, 2020).

Tourist preferences are tourists' perceptions and opinions after an actual visitation (Sun et al., 2017). Thus far, little halal tourism literature examines the relationship between Islamic/sharia attributes and travel preferences (Moghavvemi & Musa, 2018). Few past studies have examined the impact of fulfilling Islamic attributes on Muslim travelers' preferences (e.g., Hakimi et al., 2018; Moghavvemi & Musa, 2018; Rahmiati & Fajarsari, 2020). Critical attributes, such as halal food and beverages and praying facilities, significantly influence Muslim tourists' decision-making when choosing a particular tourist destination (e.g., Sudigdo & Khalifa, 2020; Sulaiman et al., 2022). For example, in the Muslim-majority region of Southeast Asia, Battour and Ismail (2014) found an effect of Islamic attributes on Muslim tourists' destination preferences in Kuala Lumpur. Similarly, Rahman (2014) concluded that the ability to fulfill various Islamic features could motivate the preferences of Malaysian Muslim tourists. In Indonesia, Rahmiati & Fajarsari (2020) found that fulfilling physical Islamic attributes impacted tourists' preferences, and so did fulfilling non-physical attributes, although the impact was insignificant in the latter case.

However, such common knowledge may raise interesting critical questions: *"Is it a one-way relationship? Is the relationship possible to work in the opposite direction or even in reciprocal?*" Thus, whether a tourist's preferences influence their assessment of the

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importance of Islamic attributes is a reflective question worth addressing to gain new insight into halal tourism literature. For example, will the importance level of one or more specific Islamic attributes be similar between solo- and family-oriented travelers? Or do tourists who prefer to travel to Muslim-majority countries or regions perceive the same level of Islamic attribute importance as those who like to travel to Muslim-minority destinations? Answers to these questions remain unclear.

Hence, the current study intends to test the opposite of such common knowledge, that Muslim tourists' travel preferences will possibly have the potential to determine the importance level of various Islamic attributes in halal tourism. To the furthest of our knowledge, this model has never been tested before, resulting in novel knowledge in the context of halal tourism. Tourist preferences determining the importance of Islamic attributes in halal tourism has a logical rationale. For example, a traveler's preference in choosing a companion to travel with (companion type) will influence their assessment of how important an Islamic attribute is to be satisfied in tourism products and services. Regarding companion type, Muslim tourists usually prefer the company of family members, friends, tour groups, and their own (Tang et al., 2020). Halal tourism per *se* is often linked with the concept of family-friendly tourism (e.g., Rehman, 2020; Junaidi et al., 2020; Suci et al., 2021), where a tourist environment free of alcohol, pornography, porn/adultery, and drugs is perceived as safe and ideal for families, especially children traveling with their parents.

Meanwhile, tourists, especially the younger generation who prefer to travel alone (solo travelers) or with peers, will likely have different assessments in perceiving the importance of Islamic tourism attributes. The global acculturation process of cultures and beliefs has shaped secular lifestyles among young people (Van Kligeren & Spierings, 2020). As a result, young people's religiosity, especially in Indonesia, is fading from time to time, creating a greater degree of permissiveness of alcohol use, sexual exposure, *awrah*-exposing fashion, and lifestyles that are contrary to Islamic values (e.g., Francis et al., 2019; Suhandi & Jaafar, 2020).

Another example in the context of tourist preferences is destination choice. Moghavvemi and Musa (2018) stated that fulfilling Islamic attributes is integral to tourists' destination choice. Muslim tourists likely decide to travel to an area/country that can provide, at least, their basic needs to carry out the obligations that they must observe as Muslims while traveling. The same thing has been proposed by Hassani and Moghavvemi (2020), suggesting that tourists with religious motivations tend to choose tourist destinations with Islamic attributes. Conversely, those not motivated by religious motives tend to avoid Islamic/sharia-oriented tourist destinations.

Furthermore, one aspect that should be embedded when discussing Muslims' travel behavior is religiosity—the extent to which religious knowledge, beliefs, and rituals are applied in individual activities (Eid & El-Gohary, 2015). Religious motivation is an integral part of the design of halal tourism (Haque & Momen, 2017; Moghavvemi & Musa, 2018; Abror et al., 2019), on the grounds of which tourism operators should meet various sharia attributes when offering their services to Muslim tourists. Travelers with

religious motives tend to choose destinations that satisfy their demand for maximum quantity and quality of Islamic attributes (Hassani & Moghavvemi, 2020; Abror et al., 2021; Suci et al., 2021). Many previous studies support the claim, indicating that religiosity is crucial in determining Muslim tourists' consumption patterns and behavior (e.g., Arli & Pekerti, 2017; Abror et al., 2019; Aji et al., 2021; Sulaiman et al., 2022).

Religiosity *per se* has been extensively studied by halal tourism researchers, particularly in its moderating role in the relationship between predictors and relevant response variables (e.g., Hakimi et al., 2018; Abror et al., 2021; Hassani & Moghavvemi, 2020; Rahmiati & Fajarsari, 2020). For example, Patwary et al. (2018) examined the association of halal awareness and subjective norms with the interest in choosing a halal hotel moderated by religiosity. Islamic attributes moderated by religiosity were once scrutinized by Hakimi et al. (2018) in determining Muslim travelers' satisfaction. Other previous studies have tested the effect of religiosity as a moderating variable within the relationship between Islamic attributes and service quality to Muslim travelers' loyalty (Riyanto et al., 2022), the relationship between involvement and Muslim travelers' satisfaction (Abror et al., 2021), and the relationship between perceived value and Muslim travelers' satisfaction (Preko et al., 2020). The results, in general, demonstrated a significant moderation effect of religiosity.

A critical question that has not yet been widely discussed is: *"Would the perceived importance level of Islamic attributes be the same among Muslim tourists with different levels of religiosity?"* This crucial question is worth discussing given that the religiosity level of Muslims varies, possibly resulting in differences in how they understand and classify the level of importance of Islamic attributes in tourism (e.g., Eid & El Gohary, 2015; Junaidi et al., 2020; Hassani & Moghavvemi, 2020). It is especially the case for members of generations Y and Z, who are perceived as experiencing a "shock" to religious values in today's era of technology and openness (e.g., Van Klingeren & Spierings, 2020; Francis et al., 2019), including in Indonesia (Suhandi & Jaafar, 2020). Their perspectives on alcohol, inter-gender relations, clothing trends, and other lifestyles differ from those of previous generations. An answer to this question can, thus, expand our insight into the role of religiosity level in Muslim tourists' travel preferences.

From the abovementioned description, existing studies offer two significant research gaps to be addressed. First, unlike previous studies that mainly examined the effect of Islamic attributes on travel preference (e.g., Rahman, 2014; Battour & Ismail, 2014; Hakimi et al., 2018; Moghavvemi & Musa, 2018; Rahmiati & Fajarsari, 2020; Sudigdo & Khalifa, 2020; Sulaiman et al., 2022), the current study aims to test the effect inversely. That is, how Muslim tourists' travel preferences, consisting of travel companion type and destination choice, will possibly have the potential to determine the importance level (more versus less important) of various Islamic attributes in halal tourism is still relatively unclear. Second, how the different levels of religiosity (higher, moderate, lower) may moderate the effect of Muslim tourists' travel preferences on the importance level of various Islamic attributes in halal tourism has yet to be examined.

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Therefore, the current study aims to investigate the effect of Muslim tourists' preferences, moderated by their level of religiosity, on their assessment of the importance of halal tourism attributes. This study's findings can offer a novel insight into Muslim travelers' decision-making process by investigating the role of companion type, destination choice, and religiosity level in assessing and classifying the importance level of various Islamic attributes in halal tourism. Moreover, the current study attempts to balance the common method of classifying the importance level of Islamic attributes in halal tourism, which has been predominated by government bodies and religious scholars, by employing the perspectives of Muslims as parties who will pay for halal tourism services. From the managerial perspective, understanding Muslim tourists' travel decision-making process could help tourism businesses offer better services that align with their target market's preferences and religiosity level..

METHODS

The current study employed a quantitative method, using online questionnaires to collect data from the Indonesian Muslim population. There were no specific criteria for respondent selection except for the minimum age requirement of 18 years—this random selection aimed to reach respondents with different religiosity levels, socio-economic backgrounds, and travel preferences. More than 250 Google questionnaires were distributed through social media (WhatsApp, Facebook, and Instagram), 198 (79.2%) were responded to, and 189 were valid for subsequent processing (95.5%). The respondents were 56.1% men and 43.9% women. They were aged 37.6 years on average, with the youngest being 19 and the oldest 59 years. Fourteen-eight percent were respondents with no income (e.g., students, unemployed, homemakers), and the remaining 85.2% came from various professions. Most respondents spent IDR 4 to 7 million a year (29.6%) on self-booked (74.6%) traveling, mostly 2–4 times a year (52.4%), with family (58.7%), to Muslim-majority tourist destinations (78.8%). They preferred starred hotels for accommodation (42.9%). Nature was the most preferred destination choice for the respondents (67.2%).

Tourist preference was the independent variable in this study, encompassing companion type and destination choice. Companion type, which is the preference of tourists in choosing a travel companion, was measured by three dichotomous values: solo (coded 1), with friends or with a tour group (coded 2), and with family (coded 3) (Tang et al., 2020). Destination choice was measured by two dichotomous values: Muslim-majority countries or regions (coded 1) and Muslim-minority countries/regions (coded 2) (Moghavvemi & Musa, 2018; Hassani & Moghavvemi, 2020).

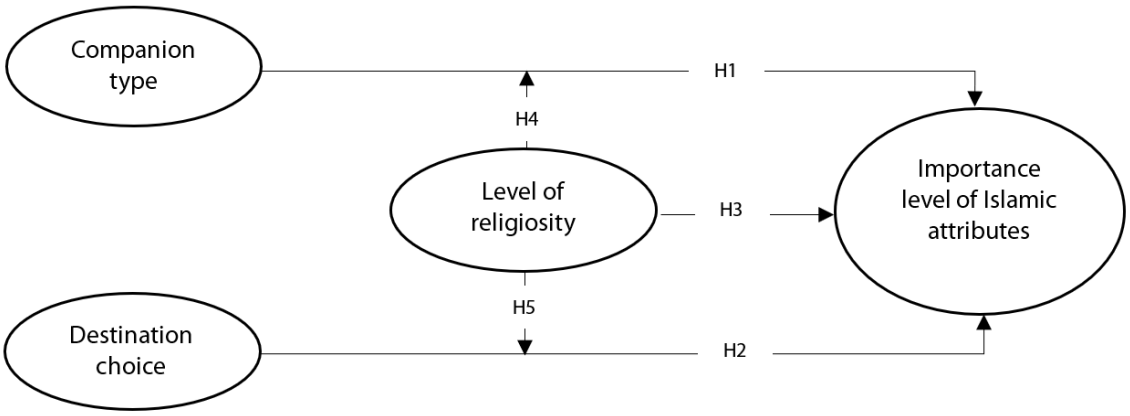
The dependent variable was the importance level of Islamic attributes (α = .93), which refer to the symbols or elements of sharia attached to a halal tourist destination (Battour & Ismail, 2014; Riyanto et al., 2022). Previous studies (e.g., Eid & El-Gohary, 2015; Suci et al., 2021; Sulaiman et al., 2022) have suggested a number of Islamic attributes in the context of halal tourism, namely halal food and beverages (α = .93), halal certificates (α = .92), prayer rooms/mosques with separated sections for men and

women (α = .92), prayer equipment (α = .92), separated ablution spaces for men and women (α = .92), locations with the concept of gender segregation of tourists (α = .92), tourist facilities with the concept of gender segregation (α = .92), elimination of non-sharia entertainment (α = .92), prohibition of alcohol and drugs (α = .92), restriction of access for unauthorized couples (α = .92), a covered dressing code for tourists (α = .92) and employees (α = .92), gender matching between tourists and service employees (α = .93), restriction of living-creature-like decoration (α = .93), and sharia payment transactions (α = .93). The measurement scale used was semantic differential with ten response ranges, where one represented "very unimportant" and ten represented "very important."

The moderating variable was the level of religiosity. Modifying the measurements from Hassani & Moghavvemi (2020), we measured it by four dichotomous values: practicing Islam strictly (coded 1), practicing Islam moderately (coded 2), practicing Islam limited to mandatory worship (coded 3), and not religious (coded 4).

As described in the previous section, all variables and their relationships are shown in Figure 1. A non-parametric method using Friedman and Cochran's Q tests was conducted to examine the effects of companion type, religious level, and destination choice on respondents' assessment of the importance level of Islamic attributes (H1, H2, and H3). Meanwhile, Model 1 of the Hayes Process Macro with binary logistic was employed to examine the moderating effect of religiosity on the impact of companion type and destination choice on the importance level of Islamic attributes (H4 and H5).

Figure 1. Research Model



RESULTS AND DISCUSSION

Before examining the effect of tourists' preferences on their assessment of the importance level of Islamic attributes, we initiated a descriptive analysis by determining the mean scores of such attributes, totally and individually. Table 1 shows that on a scale of ten, the importance level of Islamic attributes in halal tourism for Muslim tourists was relatively high. The next step was to determine which attributes could be grouped as more and less critical attributes for Muslim tourists by recoding them into a new

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dichotomous variable called the "importance level of Islamic attributes." Using the total mean score as the cut-point, we grouped those attributes into more important attributes ($M > 8.01$) and less critical attributes ($M < 8.01$). The results show that seven attributes were more critical, while respondents perceived the other eight as less important Islamic attributes in halal tourism.

Table 1. Categories of Islamic Attributes

Attributes	*N*	*M*	*SD*
All	189	8.01	1.73
More important (> 8.01)			
Halal food		9.41	1.49
Halal certificate		8.99	1.85
Praying room with separation of male and female prayers		8.95	1.85
Prayer equipment (*qibla* direction, mat, sarong/*muqna'ah*)		8.78	1.85
Ablution space with separation of male and female prayers		9.01	2.01
Alcohol prohibition		8.49	2.42
Access restriction for unmarried couples		8.50	2.49
Less important (< 8.01)			
Male and female tourist segregation		6.61	2.89
Facilities with separation of male and female tourists		7.25	2.84
No facilities prohibited by Islamic norms		7.70	2.95
Covered dressing code for tourists		7.98	2.54
Covered dressing code for employees		7.89	2.48
Gender matching between tourist and service employee		7.32	2.75
No living creature decoration (statues, paintings, etc)		6.92	2.82
Transaction using sharia account		6.29	2.91

Source: Data processing

Table 2 demonstrates that the difference in companion type generally determined the respondents' assessment of the importance level of Islamic attributes, thus supporting H1. Of the three types, group-oriented and family-oriented travelers were more concerned with more important Islamic attributes than solo-oriented ones. These results indicated that people who preferred traveling in groups and with family members were more concerned about how tourism operators would provide some basic needs of Muslim tourists, such as halal food and beverages, praying rooms, equipment, and ablution spaces with a gender segregation policy. The restriction on alcohol, drugs, and adultery was also the primary concern of this kind of tourists. Family-oriented tourists were most concerned with fulfilling Islamic elements in halal tourism. It was contrary to solo travelers, who might not see the urgency to differentiate the level of importance of these attributes in tourism services. This finding is logical because most family-oriented tourists were married and had children. In such a case, their norms and values were more conservative than solo travelers, mostly young (under their 30s) and single, who saw the world more open-mindedly. On the other hand, parents must protect their family members, especially the children, from indecent exposures, such as alcohol consumption, adult nightlife, and sensuality. Not surprisingly, the term *family-friendly* is also classified as *Muslim-friendly* in the contestation of World Halal Travel (Junaidi et al., 2020; Suci et al., 2021).

Table 2. Tourist's preference on the importance level of Islamic attributes

Model	*N*	X^2	[a]*Asymp. Sig.*
Companion type → Importance level of Islamic attributes	189	85.48	.00***
Solo (less important|more important)	20|15	.71	.40
Group (less important|more important)	13|30	6.72	.01***
Family (less important|more important)	41|70	7.58	.01***
Religious level → Importance level of Islamic attributes	189	19.96	.00***
Higher (less important|more important)	23|30	.93	.34
Moderate (less important|more important)	31|60	9.24	.00***
Lower (less important|more important)	11|18	1.69	.19
Not religious (less important|more important)	9|7	.25	.62
Destination choice → Importance level of Islamic attributes	189	[b]54.61	.00***
Muslim-majority (less important|more important)	60|89	5.64	.02**
Non-Muslim-majority (less important|more important)	14|26	3.60	.06

[a] **p < .05; ***p < .01

[b] *Cochran's Q*

In fact, for many non-Muslim tourist destinations, such as Bali and North Sumatra, it is the preference of hoteliers to use the term *family-friendly hotel* instead of *halal hotel*, *sharia hotel*, or *Muslim-friendly hotel* because the latter three sound doctrinal and are not very well-accepted by the residents (Suci et al., 2021). Non-Muslim tourists and tourism businesses, in some cases, might misunderstand the concept of halal tourism, assuming that there will be a fundamental switch of hospitality services to Islamic business (Suci et al., 2021). The same fact is also found in Egypt (Khan & Callahan, 2017), showing that this country is reluctant to use specific religious terms and has settled on using *family tourism* instead. Such a term can embrace all types of tourists seeking more family-friendly tourism experiences regardless of their religious affiliations. Especially when the women in the family arrange the traveling plans, they will likely choose children-friendly attractions and amenities, safe and clean environments, and healthy food (Liberato et al., 2020). Besides, it is also relevant to the stages of human life, where older people, especially married ones, become more religious than younger ones (e.g., Nguyen, 2020; Kurttekin, 2020). This result matches the demographics of the respondents of the current study, who were married and aged 37.6 years on average.

Table 2 also shows that the difference in religiosity level, in general, determined how the respondents perceived the importance level of Islamic attributes, hence confirming H3. Today, religious nuance is not limited to sacred worship but also implies more pleasant Muslim activities like tourism (Lutfiyah, 2017). Thus, involving religiosity in examining the relationship between Muslim tourist preference and Islamic attributes in halal tourism might benefit in explaining Muslims' travel decision-making. Moreover, religiosity, in general, has been proven to be a determining factor in Muslim consumers' halal lifestyle and intentional behavior (e.g., Maulani et al., 2022; Salsabila & Ihsan, 2023). In support, Hopkins et al. (2014) suggested that religious people are more conservative and more concerned about moral standards, which in turn, could shape their behavior (e.g., Abror et al., 2019; Wang et al., 2020; Sulaiman et al., 2022). Thus, specifically

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in halal tourism studies, religiosity plays a vital role in Muslim tourists' decision-making (e.g., Abror et al., 2019; Sudigdo & Khalifa, 2020; Aji et al., 2021).

Nevertheless, only those with moderate religiosity were significantly more concerned with more important Islamic attributes than less important ones, while respondents with higher and lower religiosity and those who were not religious perceived no meaningful difference between more important Islamic attributes and less ones in halal tourism. This finding aligns with Suci et al. (2021), suggesting that Islamic attributes should not be applied rigidly. Instead, they must be used flexibly by considering tourism businesses' policies and business models and, of course, considering tourist acceptance of these attributes. This result is relevant to Elseidi's finding (2018), which suggests that Muslims' behavior varies and depends on how deep their commitment to the religion is. For example, in the concept of faith-based needs of Muslim travelers (COMCEC, 2016), it is said that about 60% of Muslim tourists are moderate, only 20% are devout, and 20% are not religious. This concept also categorizes food and prayer as the most critical attributes in halal tourism, while others are considered less important. Notably, the halal tourism program can be accepted and run successfully only by tolerating business interests and differences in tourist preferences and religiosity by applying Islamic values in the tourism business model (Suci et al., 2021).

Respondents who preferred Muslim-majority destinations placed more importance on Islamic attributes than those who chose Muslim-minority destinations. As such, this difference in destination choice determined the importance level of Islamic attributes, supporting H2. Here, we demonstrate that only when choosing Muslim-majority destinations did Muslim tourists consider separating Islamic attributes by the level of importance, especially those perceived as more critical, such as halal food and beverages, halal certification, prayer facilities and equipment, and restrictions on alcohol and adultery. It is relevant to other studies revealing the importance of destination attributes in choosing a country to visit (e.g., Sudigdo & Khalifa, 2020). Physical attributes, such as halal food and worship facilities, and non-physical attributes, such as any tourism services, are considered Islamic values of tourism destinations that can drive Muslim travelers' decision-making (e.g., Eid & El-Gohary, 2015; Rodrigo & Turnbull, 2019).

On the contrary, for Muslim tourists who chose Muslim-minority destinations, the difference in the importance level of these attributes was insignificant. This condition is likely because getting appropriate facilities for Muslim tourists in non-Muslim countries to carry out religious rituals is somewhat challenging; thus, they cannot be too selective. It may be due to the lack of knowledge of these non-Muslim countries of the needs of Muslim tourists (Wibawa et al., 2021), causing inconveniences to Muslim tourists when traveling to non-Muslim countries (Al Ansi et al., 2021). This condition could also explain why this study did not find any significant moderating role of religiosity level in the influence of destination choice on the importance of Islamic attributes. Moreover, many non-Muslim countries applying halal tourism realize that such kind of tourism is not "really Islamic tourism." Instead, they understand that it is merely a marketing strategy to meet Muslim tourists' needs so that they can attract more Muslim tourists

to visit (Aji et al., 2021). Still, these non-Muslim countries encounter severe problems in following and properly implementing "Islamic tourism" (El-Gohary, 2016), especially with the fact that there is a lack of halal operation standards in their countries (Suci et al., 2021).

Table 3. Moderation effects

Model	Coeff.	SE	z	p
Companion type*religiosity → Importance level of Islamic attributes	.12	.20	.58	.56
Destination choice*religiosity → Importance level of Islamic attributes	-.53	.48	-1.10	.27

Source: Data processing

The results in Table 3 revealed that no moderating effects were observed, thus causing H4 to be rejected. Figure 2 validates this finding that the most significant importance of Islamic attributes across all levels of religiosity was perceived by family-oriented tourists, followed by in-group tourists in the second, and those who preferred solo traveling in the rearmost. Similarly, religiosity did not moderate the effect of destination choice on the importance level of Islamic attributes; thus, H5 was not supported. Figure 3 shows that a nearly flat line occurred at almost all levels of religiosity in the context of Muslim-majority destination choices. However, in the case of Muslim-minority destinations, respondents with higher levels of religiosity showed a great deal of consideration for Islamic attributes of greater importance, followed by moderately religious respondents. Those with the most minor religiosity level showcased the most minor consideration.

This result is possibly explained by the highest importance placed by family-oriented tourists at all levels of religiosity on Islamic attributes. This result indicates that Muslim tourists strongly consider family interests when traveling (e.g., Oktadiana et al., 2020; Liberato et al., 2020), even those less religious. The implication is that many Islamic attributes beyond worship rituals, such as prayers, should align with the norms and interests of Muslim families. For example, the prohibition on alcohol and drugs consumption, access restrictions for non-*mahram* couples, an environment free from pornography and porn, and of course, the availability of healthy, clean, and safe processed food on which attention is focused in halal food certification in Indonesia not only reflect religious values but also represent an ideal condition expected by tourists, especially those traveling with family members, both religious and non-religious, Muslim and non-Muslim. That is why many non-Muslim tourists enjoy the new cultural experience of halal tourism. They can feel safer and more comfortable with several Islamic rules in tourist attractions (e.g., Battour et al., 2018; Rahman et al., 2020). It further confirms that Islam is *rahmatan lil'alameen*; many practices in Islamic teachings bring virtue to all humanity. As such, when discussing these virtues, religiosity might no longer be relevant (Suci & Hardi, 2020), indicating that Islamic teachings can be rational instead of merely emotionally religious.

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Figure 2. The Effect of Companion Type Moderated by Religiosity Level on the Importance Level of Islamic Attributes

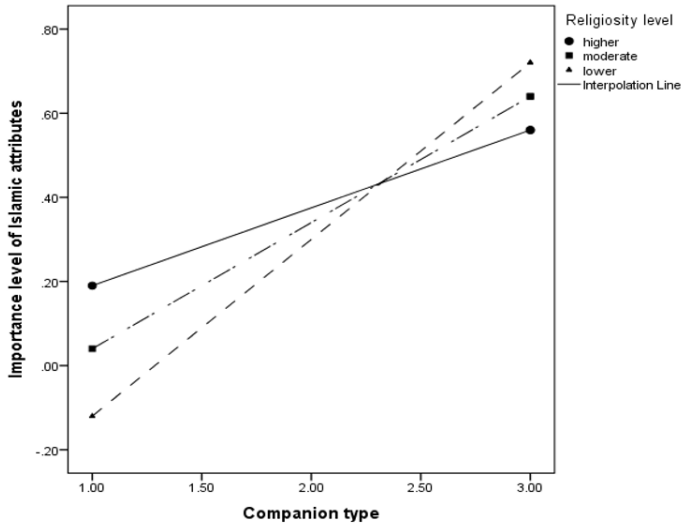
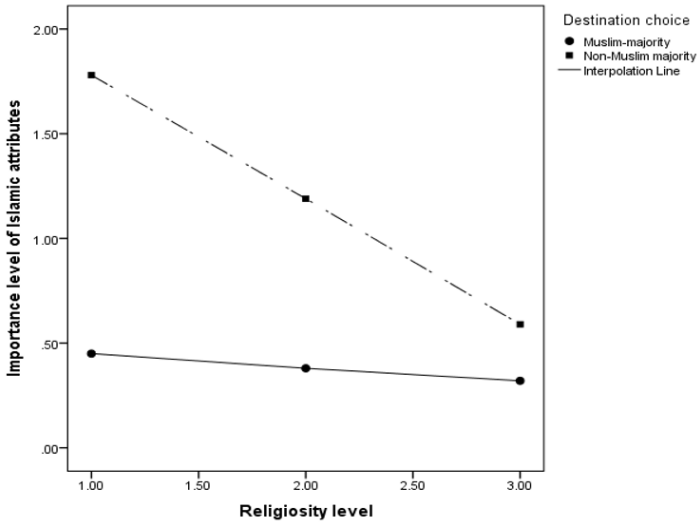


Figure 3. The Effect of Destination Choice Moderated by Religiosity Level on the Importance Level of Islamic Attributes



CONCLUSION

This study found that how Muslim tourists considered the importance level of Islamic attributes in halal tourism would depend on whom they liked to travel with, how religious they were, and where they preferred to travel. In other words, companion type, religiosity, and destination choice were crucial predictors for Indonesian Muslim tourists in determining which Islamic attributes were more or less essential to be embedded in a halal tourism package. These findings, thus, expand the literature on Muslims' travel decision-making by showing that Islamic attributes should differ by their level of importance; these are considered more and less important according to Muslim tourists' preferences in companion type and destination choice and their religiosity level. Here,

we demonstrate that family-oriented tourists were most concerned with fulfilling Islamic elements in halal tourism. It was contrary to solo travelers, who might not see the urgency to differentiate the level of importance of these attributes in tourism services. Another theoretical contribution to the Muslims' travel decision-making literature is the empirical findings showing that only when choosing Muslim-majority destinations did Muslim tourists consider separating the level of importance of Islamic attributes, especially those perceived as more critical, such as halal food and beverages, halal certification, prayer facilities and equipment, and restrictions on alcohol and adultery.

Meanwhile, for Muslim tourists who chose Muslim-minority destinations, the difference in the importance level of these attributes was insignificant. Additionally, the empirical results revealed that only moderately religious tourists chose more important Islamic attributes. In contrast, tourists with higher and lower religiosity and those who were not religious did not see the urgency in differing the importance level of those attributes, which might offer a novel insight into how religiosity may affect Muslim tourists' perception of the importance level of Islamic attributes.

This study practically contributes a broader perspective on the tourism business that will be useful in setting products and services by understanding what attributes are really and less critical for Muslim tourists with different preferences. Tourism businesses can selectively and adaptively incorporate those attributes in their operational programs in appropriate conditions, such as offering more halal attributes to family-oriented and in-group tourists but less to solo travelers. Accordingly, the policy recommendation of the current study is that the government should raise the attractiveness of halal tourism by promoting the flexible practices and benefits of halal tourism to a more prominent tourist base—not only to Muslim tourists but also to non-Muslims. As such, the digital realm may be leveraged to promote such a global campaign. In addition, the government should ease procedures and offer financial incentives for small and micro-tourism businesses to obtain halal certification.

Despite its contribution to expanding the knowledge on Muslims' travel decision-making regarding tourists' preferences, religiosity, and importance level of Islamic attributes, which are limited in literature, this study has few limitations. The respondents were only Muslims of Indonesian origin; thus, the findings might not be generalizable to other countries. Nevertheless, the average practice of Islam in Indonesia is moderate, similar to that in other Muslim-majority countries, thus opening up more significant opportunities for generalizing these results. However, the cultural aspects of certain nations can cause their Islamic practice to be distinctive. Thus, it is highly recommended that future researchers recruit Muslim respondents from different cultures, such as Central Asia, Turkey, Africa, or the Middle East.

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The Path to Guest Satisfaction: Leveraging Personalized Services and Islamic Principles in Shariah Hospitality

Andhi Sukma[1*], Maria Rochelle G. Divinagracia[2], Louie A. Divinagracia[3]
[1]Widyatama University, Indonesia
[2]University of the Philippines System, Philippines
[3]University of the East, Philippines
E-mail: [1]andhi.sukma@widyatama.ac.id, [2]mgdivinagracia2@up.edu.ph, [3]louie.divinagracia@ue.edu.ph
[*)]Corresponding Author

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Abstract

Research Originality: This research highlights the importance of personalized services, organizational image, and effective customer relationship management (CRM) strategies aligned with Islamic principles. The research aims to distinguish shariah hospitality and deepen understanding of customer behavior in this cultural and religious context.

Research Objectives: This study examines how personalized services, company image (CI) and customer perceived value (CPV) affect guest satisfaction and loyalty in Shariah-based hotels, providing insights into customer behavior.

Research Methods: The review analyzed customer relationship management, organization picture, and perceived value as independent factors, with loyalty as the dependent variable and satisfaction as the mediator. Data came from 220 guests at Shariah hotels in Indonesia.

Empirical Results: The study found strong links between personalized services, a positive organization picture, and perceived value with guest satisfaction and loyalty in Shariah-based hotels, emphasizing the need for effective CRM, a robust brand, and high-quality service.

Implications: This research advances customer relationship management (CRM) and Customer Perceived Value (CPV) theories in Shariah hotels through personalized services, effective communication, and strong branding, guiding hotels to prioritize these strategies for customer loyalty in hospitality.

Keywords:

customer relationship management; company image; customer perceived value; customer satisfaction; customer loyalty

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INTRODUCTION

The accommodation establishment plays a crucial role in tourism, requiring managers to collaborate with stakeholders to attract guests (Attila, 2016). Sharia-based hotels, a recent addition to the industry, are often mistaken for conventional hotels (Rodríguez et al., 2020). Yang et al. (2020) examined client-provider relationships in web-based platforms, emphasizing customer identification, data gathering, and perception formation. Long-term relationships enhance loyalty and provide competitive advantages (Tabrani et al., 2018). In a competitive environment, the hospitality industry must continually improve services to attract and retain clients (Amoako et al., 2019; Habineza et al., 2022; S. Li, 2020). Success depends on the quality of guest interactions (Baehaqi et al., 2023). Maintaining current customers proves more economically advantageous than acquiring new ones (Banyte et al., 2016). Indonesian hotel guests, predominantly Muslims, increasingly prefer Sharia-compliant hotels, reflecting a rise in religious awareness and preferences (Barton & Yilmaz, 2021).

The study conducted by Haryandika and Santra (2021) and Trini and Salim (2018) revealed that customer experience management (CEM) significantly influences customer loyalty within the hospitality industry. Understanding and managing customer perceptions and experiences are pivotal in enhancing loyalty. Furthermore, the research emphasized that customer relationship management (CRM) is not merely a technological innovation but a critical business and process issue, necessitating a comprehensive approach to CRM implementation that extends beyond technological aspects. Sri Gunawan's (2019) study focused on the role of brand image in influencing repurchase intentions mediated by customer satisfaction. This study offered insights into the determinants affecting guest satisfaction and loyalty, which are crucial for guests in Sharia-compliant hotels in Indonesia. Maintaining a positive corporate image across diverse social groups requires sustained investment in promotional activities over specific periods (Sajtos et al., 2015).

Juliana et al. (2023) identified key determinants of consumer loyalty in the Islamic financial sector, including trust, quality of service, and religiosity, which are also relevant to Shariah hotels. Rahimi and Kozak (2017) emphasized that hotel entrepreneurs must leverage CRM strategies to ensure business continuity amid intense competition. Research indicates that CRM applications and Shariah compliance significantly impact consumer loyalty. Rahimi and Kozak (2017) found that hotel CRM enhances customer value and satisfaction. Emaluta and Soewarno (2019) highlighted the positive effect of Shariah-compliant traits on Muslim travelers' satisfaction. Ahmed et al. (2022) and Saputra (2019) Highlighted the significance of consumer trust in Islamic financial services. Khan et al. (2015) examined the connection between CRM and consumer loyalty, with customer trust as a mediator in the hospitality sector. Alam et al. (2021) underscored CRM's role in boosting revenue and fostering loyalty. Mang'unyi et al. (2018) analyzed the effect of electronic CRM (e-CRM) on consumer loyalty. Bhat et al. (2018) emphasized the importance of CRM in banking for building loyalty and trust. Munandar et al. (2022) addressed CRM's strategic role in nurturing profitable customer relationships in conventional and Islamic banking contexts.

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Understanding the factors driving customer satisfaction is crucial in the hospitality industry (Christanto & Santoso, 2022). Corporate image significantly impacts consumer loyalty (Cheng & Rashid, 2014). Shariah-compliant attributes influence Muslim travelers' revisit intentions (Sulaiman et al., 2022)—administration quality and corporate image shape satisfaction and loyalty (Yu et al., 2017). Green practices enhance customer satisfaction (Han et al., 2022). Corporate social responsibility (CSR) and service quality affect trust and satisfaction (Latif et al., 2020). Confidence in a green image boosts loyalty (Sarmiento Guede et al., 2021). Improving a hotel's image fosters consumer loyalty (Gultom et al., 2021). Brand image affects satisfaction and loyalty (Winarko & Husna, 2020). Company image positively influences loyalty (Setia et al., 2021). Increased competitiveness drives efforts to maintain customer satisfaction and loyalty (Iraldo et al., 2017).

The hotel industry, including Shariah-compliant hotels in Indonesia, relies on understanding customer satisfaction (Sulaiman et al., 2022). Perceived value drives satisfaction in various industries (Marcos & Coelho, 2022) and Islamic banking (Ismail et al., 2017). Administration quality is crucial in hospitality, especially in Shariah-compliant hotels. Technological innovation boosts brand image (Hussein et al., 2023), and brand personality influences satisfaction in Islamic banking (Jan & Shafiq, 2021). Hotel loyalty depends on satisfaction (Fernando, 2019). Revisit intentions are vital for success (Abdel et al., 2023), shaped by perceived value (Juliana et al., 2022). Administration quality, perceived value, satisfaction, and loyalty are interconnected (Sri Gunawan, 2019). Responsiveness influences satisfaction and loyalty, while assurance, tangibles, and empathy do not (Waluyo & Waluyo, 2020). Service quality dimensions affect satisfaction but complexly affect loyalty (Winata, 2023). Various pathways connect administration quality, perceived value, satisfaction, and loyalty (F. Li et al., 2023).

A critical research gap in this study explores customer relationships, company image, and perceived value within Shariah-based hotels in Indonesia, an area with limited prior study. By investigating these factors' influence on guest satisfaction and loyalty, the study provides crucial insights into this market segment's unique preferences and needs. The uniqueness of this research lies in examining the interactions among customer relationship management, corporate image, and perceived value in Shariah-based hotels. This study offers a fresh perspective on hospitality management literature, highlighting the distinct characteristics of guests in this niche market. The research's contributions demonstrate how customer relationship management, corporate image, and perceived value enhance guest satisfaction and foster loyalty within Shariah hotels. The study offers practical implications for hotel managers to improve customer experiences, nurture enduring relationships, and achieve business success in the competitive Shariah-compliant hospitality industry.

METHODS

This research employs a non-probability purposive sampling technique assert that accurately assessing the quality of a sample becomes challenging when the sample size is too large. They recommend a minimum of 5 to 10 observations per parameter estimated.

Given the broad scope of this study, the higher end of this range, ten observations per parameter, was utilized. Consequently, the initial 22 statements in the survey were multiplied by 10, resulting in a targeted sample size of 220 respondents. This approach aims to achieve a margin of error of 10% with a confidence level of 90% (Hair et al., 2017).

Table 1. Functional Definition of Variables

Variable	Functional Definition	Indicator	Reference
Customer Relationship Management	a center business technique that coordinates the cycles and elements of the web and outer organizations to make and convey worth to designated clients at a benefit.	Customer empowerment Complaint resolution Customer orientation Customer engagement Customer knowledge management	(Guerola-Navarro et al., 2021)
Company Image	The impression an individual feels about an article, thing, or association in general will then be permanently etched in the shopper's memory.	Personality Reputation Value Corporate Identity	(Fraj-Andrés et al., 2012)
Customer Perceived Value	Customer perceived value is the emotional relationship between customers and sellers, which can take the form of economic interest, functional interest, or psychological interest.	Close to home Estimation Social Worth Execution Worth Value Worth image value	(Nguyen et al., 2019)
Customer Satisfaction	the feeling of Joy or dissatisfaction that an individual gets from looking at the apparent presentation (or consequences) of an item and their assumptions	Expectation confirmation Repurchase intent Intention to recommend Consumer dissatisfaction Overall customer satisfaction	(Fu & Juan, 2017)
Customer Loyalty	a company-customer relationship in which satisfaction is created to provide a reasonable basis for repurchasing the same item and forming a word-of-mouth recommendation	Say positive things Recommend friend Continue purchasing	(Tseng et al., 2018)

Source: Author's Compilations

This study employs a source-based approach for data collection, utilizing two categories of data sources: primary and secondary. Primary data are gathered directly from the sources by data collectors; in this case, surveys were distributed to guests who

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stayed at Shariah-based hotels in Indonesia. Secondary data are acquired from sources where researchers do not interact directly with data contributors, such as through literature or documents authored by others. The authors of this study gathered the required information by reviewing books, journals, articles, and previous research theses.

The study utilized smartPLS-SEM software for data analysis, utilizing Partial Least Squares - Structural Equation Modeling (PLS-SEM). PLS-SEM is adept at elucidating relationships among variables and conducting comprehensive analyses within a single framework. Its primary goal is to validate theories and ascertain the presence of relationships among latent variables. Hair et al. (2019) state that the PLS approach can define latent variables that are not directly observable using indicators. The researcher opted for Partial Least Squares due to the latent variable nature of the study, allowing for precise and extensive analyses based on its indicator-measured constructs.

This research utilizes surveys as the primary method for data collection, emphasizing a quantitative approach. The primary data concerning guests who stayed at Shariah-based hotels in Indonesia is gathered through questionnaires. These questionnaires are primarily distributed via email, although some are administered directly by the authors. Respondents receive the questionnaire and an introductory letter detailing the research objectives and ensuring confidentiality.

RESULTS AND DISCUSSION

Result

An outer loading value exceeding 0.70 is necessary for a survey To fulfill the construct validity and reliability requirements. This includes convergent validity with an AVE value composite reliability surpassing 0.60, with factor loadings exceeding 0.50, and Cronbach's alpha surpassing 0.70. These benchmarks indicate robustness in measurement (Hair et al., 2019). The evaluation of the outcomes of the external model is presented in Table 1, showing that Cronbach's alpha exceeds 0.70, composite reliability surpasses 0.60, and AVE values exceed 0.50. These findings indicate excellent construct validity and reliability across all elements.

The test results of the internal model evaluate how well the underlying model aligns with the study. Table 2 presents the coefficients of determination (R^2). CRM, customer satisfaction, perception of value, and company image collectively explained 79.9% of the variance in customer loyalty ratings. Conversely, external factors not covered in the study accounted for 20.1% of the variance. Similarly, customer loyalty can be understood through customer relationship management, corporate image, and perceived customer value, with an R^2 of 74.5%. Factors that were not included in the study explained the remaining 25.5%. The coefficient of determination (R^2) values for Customer Loyalty and Customer Satisfaction indicate the extent of variability in these dependent variables, CRM, CI, and CPV explain. A higher R2 value signifies a more significant proportion of variance in customer loyalty or satisfaction attributed to the independent variables. Analyzing these R^2 values provides insights into the predictive and explanatory power

of the independent variables concerning customer loyalty and satisfaction within Shariah hotels in Indonesia. Understanding these determination coefficients aids in evaluating the overall explanatory capability of the model. It offers practical implications for enhancing guest satisfaction and loyalty in the Shariah hospitality sector in Indonesia.

Table 1. Analyses of the External Model

Construct / Item	Loadings	Alpha	CR	AVE
Customer Relationship Management		0.929	0.946	0.780
CRM1	0.926			
CRM2	0.911			
CRM3	0.906			
CRM4	0.852			
CRM5	0.815			
Company Image		0.837	0.891	0.673
CI1	0.763			
CI2	0.814			
CI3	0.853			
CI4	0.848			
Customer Perceived Value		0.964	0.972	0.875
CPV1	0.947			
CVP2	0.945			
CPV3	0.947			
CPV4	0.925			
CPV5	0.914			
Customer Satisfaction		0.866	0.903	0.651
CS1	0.794			
CS2	0.803			
CS3	0.812			
CS4	0.797			
CS5	0.827			
Customer Loyalty		0.937	0.960	0.889
CL1	0.943			
CL2	0.935			
CL3	0.950			

Source: Author's Calculation Results.

Table 2. Determination Coefficient (R^2)

Variable	R^2	Adjusted R^2
Customer Loyalty	0.799	0.796
Customer Satisfaction	0.745	0.742

Source: Author's Calculation Results.

Table 3 presents the F-square values, which assess the influence of each exogenous variable on the endogenous variables of CL and CS. The effects of CRM and CI on

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CL are minimal, with F-square values of 0.003 and 0.004, respectively. In contrast, perceived customer value significantly impacts customer loyalty and satisfaction, with F-square values of 0.383 & 0.464, in that order. The F-square (Effect Size) values for CL and CS concerning CI, CPV, and CRM indicate The impact of each independent variable on the dependent variables of CL and CS. A higher F-square value signifies a more substantial impact of the independent variable on the corresponding dependent variable. For instance, a higher F-square value for CPV suggests a more significant influence on CL than CI or CRM. Understanding these effect sizes elucidates the pivotal factors driving CL and CSn in Shariah-based hotels in Indonesia. The analysis of F-square values provides a valuable understanding of the relative relevance of CI, CPV, and CRM in shaping guest experiences and loyalty within Shariah accommodations in Indonesia.

Table 3. F-Square (Effect Size)

Variable	Customer Loyalty	Customer Satisfaction
Company Image	0.004	0.020
Customer Perceived Value	0.383	0.464
Customer Relationship Management	0.003	0.121
Customer Satisfaction	2.039	

Source: Author's Calculation Results

Table 4 summarizes the Q-square predictive relevance test. The impact of variables such as CRM, CI, CPV, and CS on CL is evaluated through predictive relevance (Q^2 = 0.700). Additionally, customer loyalty achieves a Q^2 value of 0.484. Both values exceed 0, indicating predictive solid relevance. The Q-square (Q^2) values assess the predictive relevance of CI, CL, CPV, CRM, and CS. These values gauge the model's ability to predict Customer Loyalty and Satisfaction based on CI, CPV, and CRM. A Q^2 value of 1 signifies robust predictive relevance, underscoring the model's efficacy in predicting customer loyalty and satisfaction in Shariah hotels in Indonesia. Analyzing these Q-square values offers insights into the model's predictive capacity for capturing guest experiences and fostering loyalty in Shariah accommodations. Understanding predictive significance informs hotel management strategies to enhance guest experiences and loyalty within Indonesia's hospitality sector, particularly in Shariah-based establishments.

Table 4. Relevance Predictive of the Q-Square (Q^2)

Variable	SSO	SSE	Q^2 (=1-SSE/SSO)
Company Image	920,000	920,000	
Customer Loyalty	690,000	207,017	0.700
Customer Perceived Value	1150,000	1150,000	
Customer Relationship Management	1150,000	1150,000	
Customer Satisfaction	1150,000	592,922	0.484

Source: Author's Calculation Results

Hypotheses are tested by examining the p-value and t-statistic. Figure 2 presents the bootstrapping results using the SmartPLS 3.0 method. The diagram illustrates the influence of external factors on the 22 indicators.

Figure 2. Bootstrapping Results

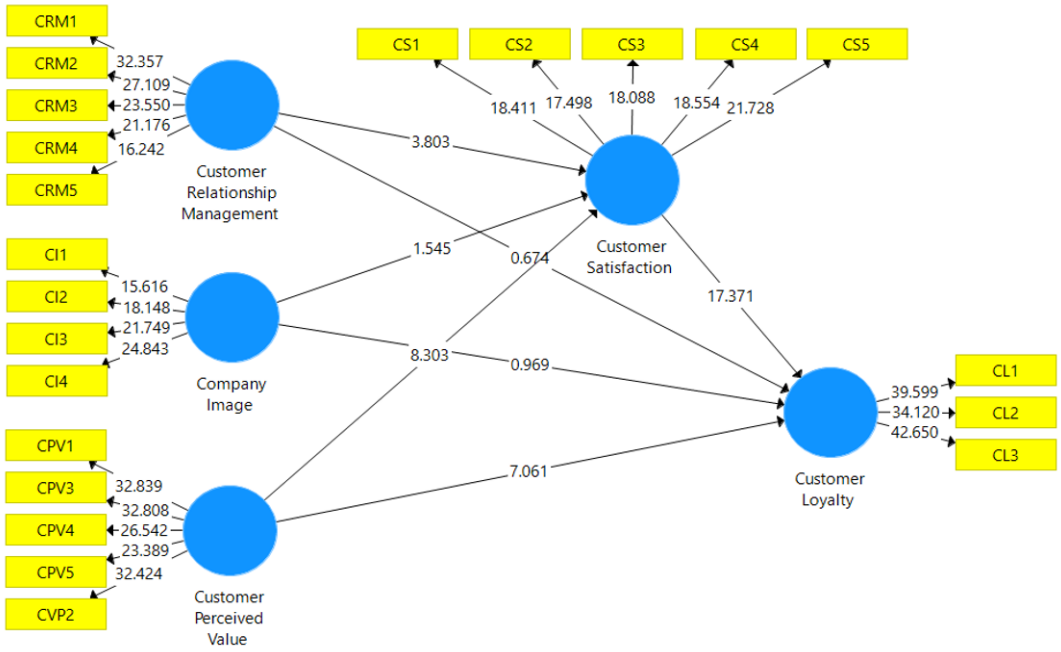

Table 5. Bootstrapping Effect Results

Variable	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
CRM -> CS	0.285	3.608	0.000 *
CRM -> CL	0.043	0.660	0.509
CI -> CS	0.153	1.697	0.090
CI -> CL	-0.060	0.918	0.359
CPV -> CS	0.536	8.671	0.000 *
CPV -> CL	-0.523	7.295	0.000 *
CS -> CL	1.268	16.731	0.000 *

* means significant at 5%

Bootstrapping tests on the hypotheses are presented in Table 5. CRM significantly influences CS indicators, as demonstrated by a p-value of 0.000. Conversely, ratings of customer relationship indicators have an insignificant impact on CL indicators, with a p-value of 0.509. Ratings of CI indicators show no significant effect on CL and commitment indicators, with p-values of 0.090 and 0.359, respectively. CPV significantly CL & commitment indicators, with p-values of 0.000 each. CL indicators positively influence customer commitment indicators, with a p-value of 0.000.

The bootstrapping effect analyzes the relationships among CRM, CI, CPV, CS, and CL in Shariah hotels in Indonesia. The findings underscore that CRM and CPV

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significantly influence customer satisfaction, highlighting the importance of personalized services and perceived value in enhancing guest experiences. Moreover, perceived value is critical in influencing loyalty, underscoring the importance of aligning services with Islamic principles to foster guest loyalty. Tailored services, effective communication strategies, and customized marketing efforts can strengthen guest relationships and enhance their experiences. To maintain competitiveness, continuous improvement initiatives, ongoing staff training, and innovation are essential for Shariah-compliant accommodations. The study guides enhancing guest loyalty in Shariah hotels, particularly within the Indonesian context, by elucidating the bootstrapping impact results and offering practical implications for tailored strategies in Shariah hospitality.

Table 6. Explicit Aberrant Impacts

Construct	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
CRM -> CS -> CL	0.362	3.773	0.000 *
CI -> CS -> CL	0.194	1.680	0.094
CPV-> CS -> CL	0.680	6.828	0.000 *

* means significant at 5%

The study focuses on CRM, CI, CPV, CS, and CL in Shariah hotels in Indonesia. It reveals that CL mediates the relationships between CRM, CI, CPV, and CL. The analysis indicates that CL significantly mediates the association between CL and CRM, demonstrated by a t-value of 3.773 and a p-value of 0.000. However, a t-value of 1.680 and a p-value of 0.094 suggest that CS indicates insignificant mediate the association between CL and CI. CS also substantially influences the relationship between CL and CPV, with a t-value of 6.828 and a p-value of 0.000.

These findings emphasize the factors influencing CL and satisfaction in Shariah hotels in Indonesia. CRM directly affects CS, which impacts CL, underscoring the critical role of effective CRM practices in enhancing guest satisfaction and loyalty. However, the study suggests that CI may influence CL less in Shariah hotels than other factors. The significant impact of CPV on satisfaction and loyalty highlights the significance of providing exceptional experiences and adhering to Islamic principles in Shariah hospitality. Utilizing customer-perceived value effectively can enhance satisfaction and foster loyalty in Shariah accommodations, which is essential for maintaining competitiveness. Continuous improvement initiatives, staff training, and customer-centric approaches are crucial for meeting evolving guest expectations and sustaining a competitive edge. The study provides practical insights for enhancing guest satisfaction and loyalty in Shariah hotels in Indonesia.

DISCUSSION

Examining the influence of CRM, CI, and CPV on CS and CL among Shariah-based hotel guests in Indonesia offers invaluable insights into the elements impacting customer behavior within the hospitality sector. Prior research has underscored the

significance of CS and CL across various sectors, including Islamic banking and conventional hotels. For example, research by Juliana et al. (2022) emphasizes trust, service quality, and religiosity as pivotal in customer loyalty, equally relevant in Shariah-based hotels. Additionally, studies by Sulaiman et al. (2022) and Yusup (2019) emphasize the importance of customer satisfaction, service quality, and perceived value in the service and accommodation sector, especially within Islamic contexts. These findings are consistent with current research, identifying perceived value as a crucial driver of satisfaction and loyalty among occupants of Shariah-based hotels. Furthermore, the focus by Hussein et al. (2023) on technological innovation in enhancing satisfaction and loyalty in hotels supports the notion that improving the customer experience through innovative strategies can positively influence customer behavior.

The research by Yu et al. (2017) underscored the essential function of client experience management in promoting customer loyalty within the hotel industry. This discovery aligns with previous research that emphasizes the impact of customer experience on loyalty. Additionally, Fu and Juan (2017) highlighted the pivotal role of factors affecting revisit intentions, such as perceived value, in shaping hotel success, reinforcing that perceived value directly influences satisfaction and loyalty. In hospitality, particularly within Shariah-based hotels in Indonesia, comprehending customer dynamics is crucial for ensuring guest satisfaction and loyalty. Prior studies have investigated factors influencing guest satisfaction and loyalty within the service and accommodation sector, emphasizing the importance of CRM, CPV, and CI (Trini & Salim, 2018). These studies have underscored the significance of personalized services, organizational image, and perceived value in shaping guest satisfaction and loyalty, underscoring the necessity for customized approaches to meet customer expectations in Shariah-compliant hotels.

Moreover, research has scrutinized the influence of shariah-compliant characteristics on the satisfaction of Muslim travelers, emphasizing the mediating function of customer trust in Islamic financial services. This result highlights the importance of aligning hotel offerings with the values and preferences of the target market to ensure guest satisfaction and loyalty. Furthermore, the study highlighted the critical impact of brand image on consumer satisfaction and loyalty, suggesting that a positive brand perception can elevate guest experiences and foster loyalty (Juliana et al., 2022). In Indonesia, where many hotel guests prioritize Shariah compliance, understanding and catering to their needs are crucial for hotel success. Offering services and amenities that adhere to Shariah principles can meet the expectations of this demographic, differentiate hotels in the market, and attract and retain loyal customers. Furthermore, implementing Customer Relationship Management (CRM) systems in Shariah-based hotels has demonstrated the ability to enhance customer lifetime value, satisfaction, and profitability. By leveraging customer data and insights through CRM, hotels can personalize services, improve customer experiences, and cultivate loyalty, highlighting the transformative influence

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of technology in improving guest satisfaction and loyalty within the hospitality sector (S. Li, 2020; Tabrani et al., 2018).

By integrating established theoretical frameworks in CRM, CS, and CL, the researcher can provide a deeper theoretical analysis of the empirical findings, enhancing the understanding of the underlying mechanisms driving guest satisfaction and loyalty in Shariah-compliant facilities. Examining insights from studies in related industries or sectors focusing on the Impact on CS and CL can offer a broader perspective on factors influencing guest experiences and loyalty, facilitating a more comprehensive discussion of implications for Shariah hotels in Indonesia. Furthermore, incorporating qualitative data or insights from interviews with hotel guests or industry experts can enrich the analysis by providing nuanced perspectives on the factors affecting guest satisfaction and loyalty in Shariah hotels.

CONCLUSION

This research highlights the pivotal function of CRM and CPV in cultivating visitor loyalty in Shariah-based hotels in Indonesia. It underscores personalized services, effective communication channels, and tailored marketing strategies as drivers of guest satisfaction and loyalty. Furthermore, the research emphasizes the unique role of Islamic principles in delivering exceptional services, thereby enhancing guest experiences and loyalty. Based on empirical findings, recommendations suggest that Shariah hotels prioritize effective CRM strategies, cultivate a positive company image, and enhance perceived value to build enduring customer loyalty in the competitive hospitality industry. Continuous improvement initiatives, including staff training and innovation, are essential for Shariah hotels to meet evolving customer expectations and maintain their competitive edge. Focusing on customer-centric approaches, soliciting guest feedback, and maintaining high service standards are crucial for achieving customer satisfaction, retention, and business success in Shariah accommodations.

Theoretical implications of this study advance CRM theory by emphasizing the transformative impact of personalized services, efficient communication, and tailored marketing on guest loyalty in Shariah hotels. It also contributes to company image theory by acknowledging the role of brand differentiation despite its minimal influence on guest satisfaction. Additionally, the study enhances customer perceived value theory by highlighting the transformative importance of continuous improvement and customer feedback in improving guest experiences. These insights provide a transformative framework for understanding guest behavior in Shariah hotels, guiding strategic management of customer relationships, company image, and services to foster loyalty in the hospitality sector. From a managerial perspective, Indonesian Shariah hotels can prioritize effective CRM, personalize guest interactions, uphold Islamic principles, and invest in brand image and unique value propositions to transform guest satisfaction and achieve long-term success in the competitive hospitality sector.

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Exploring a Consumption Value Model for Halal Cosmetics

Ana Toni Roby Candra Yudha[1*], Rizka Rahmatillah Zidna[2], Novi Febriyanti[3]
[1,2]State Islamic University Sunan Ampel Surabaya, Indonesia
[3]Alma Ata University Yogyakarta, Indonesia
E-mail: [1]anatoniroby@uinsa.ac.id, [2]rrizkarahmatillah@gmail.com, [3]novifebriyanti@almaata.ac.id
[*)]Corresponding Author

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Abstract

Research Originality: Halal cosmetics segmentation requires detailed analysis to enable stakeholders from the industry sector to optimize marketing and sales. The findings of this study are interesting, the market opportunity specifically for women is not only in consumption volume but also production, especially with market segmentation among millennials and Gen Z.

Research Objectives: This research aims to determine the simultaneous and partial effects of halal labeling, product quality, religiosity, and online consumer reviews on purchasing decisions regarding halal cosmetic products among female and male consumers.

Research Methods: This research employed an online survey method with 203 respondents. It also employed the SEM-PLS to evaluate models and validate hypotheses, and Multi-Group Analysis (MGA), which is employed to determine the gender effect's position on the hypotheses.

Empirical Results: The results with the SEM-PLS method show that product quality, online consumer reviews, and religiosity satisfactorily influence purchasing decisions, this is not the case with the halal label. It seems that online consumer reviews are more suitable for male consumers. Appearance and persuasive factors are more important for male consumers who value rational factors compared to female consumers.

Implications: The findings of this research are significant due to the comparison drawn between male and female consumers. Such a comparison aids practitioners and business professionals in effectively delineating market demands and preferences. When developing halal cosmetic products, manufacturers must consider not only the product's sales potential but also its efficacy and potential side effects upon usage.

Keywords:

halal cosmetics; multi group analysis; gender; purchase decision; gen-Z

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INTRODUCTION

There has been an increase in the purchasing of cosmetics during the post-COVID pandemic among the public (Salsabila & Ihsan, 2023), especially among Gen Z. Consumers of cosmetics are not merely female but also male (Juliana et al., 2022). The market share for body care and cosmetics in the halal industry is one area with promising prospects for encouraging the halal economy. Indonesia is second with the largest consumption of halal cosmetics, followed by India. By 2023, the cosmetics market share will increase by 6.9 percent to USD 90 billion (DinarStandart, 2021). This data demonstrates the huge potential of halal cosmetics to meet global consumer demand. Just as halal food is widely accepted, the same is valid for cosmetics.

Several big brands are continuing to experience increased sales. Data from the Ministry of Trade indicates that the growth of the domestic body care and cosmetics industry is due to high demand from both domestic and export markets. This trend aligns with society's increasing consideration of body care products as a primary need, particularly among teenage female consumers who constitute the main target demographic for the body care and cosmetics industry.

According to changes in purchasing patterns in the beauty market due to the post-COVID pandemic, while the focus has been on face-to-face services with testers and in-store samples, the COVID pandemic has forced the industry to offer a range of contactless services, either by delivery or online (Kim et al., 2022). Products in the cosmetics category have outperformed e-commerce sales transactions by 46.8 percent at the beginning of 2021. Then, the transaction value of this category in the online market exceeded IDR 40 billion in the same period.

The large sales of these products cannot be separated from the role of digital media (Rangel-Pérez et al., 2023). In today's digital era, social media can be said to have a strong influence so that consumers feel interested in buying a product promoted on social media (Tazlia et al., 2023). This condition is due to the ease of access to social media. Indeed, it can be accessed anywhere and at any time. Similarly, when consumers intend to purchase skincare products, they typically seek information by initially perusing reviews on social media platforms. This assertion supports survey findings regarding social media usage, encompassing platforms such as YouTube, Instagram, Facebook, and other similar social media.

Information about a product is a crucial factor that influences consumers' decisions (Nurfadilah & Samidi, 2021). Online consumer reviews are information presented in pictures, videos, or written content on the internet, providing feedback on a product from individuals who have utilized it (Nurcahyo & Hudrasyah, 2017). This reason is why the product is subject to unique market segmentation.

The segmentation of the Gen Z market for cosmetic products, which is the focus of this study, their level of awareness of halal cosmetics is remarkably high. Gen Z has a common characteristic of being accustomed to searching for themselves and experimenting to acquire information about cosmetics (Shakirah & Sapir, 2021). Since Indonesia has

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already been facilitated by a Halal label issued by the Indonesian Ulema Council (MUI) printed on the packaging of cosmetic products, some of them will be significantly helped by finding cosmetic products that are guaranteed Halal just by looking at the Halal label on the cosmetic packaging. Thus, this phenomenon is considered worthy of research on this exciting ground. Not many will care about the halal label (Amalia, 2020). However, others will assume that their body care and cosmetic products are considered halal, with a one-sided statement that does not require a halal label and the ingredients in their body care and cosmetic products.

Regarding labels, consumers need to obtain correct, clear, and complete information concerning the quantity, content, quality, and other relevant details regarding products circulating on the market. Information on product labels is crucial so that consumers can make informed choices before purchasing (Ivantri et al., 2024; Salsabila & Ihsan, 2023). Providing halal labels on products reduces consumers' doubts about the halal status of the products they purchase to some extent (Salman et al., 2019). Few will care about the halal label (Amalia, 2020). However, others will assume that their body care and cosmetic products are considered halal, with a unilateral statement that does not require a halal label and the ingredients in their body care and cosmetic products. Halal labels, product quality, and online consumer ratings are part of Islamic consumer behavior (Indrawan & Wahyuningsih, 2019). Then, academics still widely discussed religiosity in the quantification and measurement stages (Irfany et al., 2024).

It is interesting to see this phenomenon, where there is an increase in purchases and repeat purchases of cosmetic brands labelled with halal and starring influencers in Muslim clothing (Jalil et al., 2021). For some consumers, this exterior side represents religiosity (Ishak et al., 2020). This condition is confirmed by studies which state that the level of religious belief or consumers' religiosity influences interest in cosmetic products (Gunawan & Gaffar, 2021), but not purchasing decisions (Ahyar, 2020). However, studies indicate that halal labels and influencer credibility can influence religiosity (Venciute et al., 2023), before ultimately strengthening their choice to buy cosmetic products (Ashoer et al., 2019).

Trade among countries in exports and imports continues to fluctuate, especially concerning cosmetic products (Sugibayashi et al., 2019). Therefore, it is relevant to Indonesia's demographic conditions, as it is home to the world's largest Muslim population (Ratnasari, 2020). Naturally, the expectation is not solely to be a market destination but also to be actively involved as a player or producer (Yudha & Kafabih, 2021). Thus, all economic actors at various levels will gain the educational, social, and economic benefits being felt (Yudha et al., 2020).

In Indonesia, skin care has been constructed as a feminine beauty product. Unlike women, men tend to avoid all aspects that are feminine in order to maintain the value of their masculine identity, one of which is avoiding skin care products, even though it is common knowledge that cosmetics users are not only women but men as well (Juliana et al., 2022). Skincare products do not have a gender (Azuma, 2021), but it is common in the market for brands to release skincare products designed for men. However, over

time, men have begun to open up to trying new things, one of which is consuming skin care products but still trying to maintain masculinity within themselves. Thus, the emergence of cosmetic products for men also raises buying interest and ultimately increases sales of male cosmetic products. Specifically, this study is dominated by consumers of the Gen Z segment. This fact is an interesting finding of this research, from the study of planned behavior theory, which in previous studies only reviewed product purchase intention.

On this ground, this article contributes to providing some additional insights. *First*, it explores whether psychological values of consumption and religiosity play a role in influencing purchasing decisions. *Second*, this study incorporates gender as an additional factor in explaining differences in purchasing decision levels. *Third*, this study seeks to fill the research gap by examining the value of religiosity and gender in analytical studies.

Following the background explanation presented in the above section, this study is aimed at two objectives: *first,* to find out and analyze the presence or absence of psychological values of consumption and religiosity in the decision to purchase cosmetic products among Gen Z. *Second*, to examine the role of gender in influencing purchasing decisions. Based on the researcher's knowledge, the role of religiosity as a mediator and gender has not been explored in previous studies, most of which regarded religiosity as a general moderator.

METHOD

The research used a quantitative approach and purposive sampling technique. It used primary data from an online survey intended explicitly for Gen Z people. The sample of respondents was selected based on several criteria. *First*, they were aged 16-25 years at the time of the research. Second, they were required to know and use at least two halal-labeled cosmetic brands. Third, they needed to be familiar with and recognize at least two beauty vloggers on various social media platforms.

In addition, this study aims to explore the influence of halal label variables, product quality, religiosity and online consumer reviews on the purchase decision of halal cosmetics. The data for this study derived from primary data as mentioned earlier. We use SEM analysis to examine the relationship between latent variables (refer to Table 1). Furthermore, to see differences in hypotheses from a gender perspective, we use multi group analysis (MGA). Therefore, it can be emphasized that the analysis of hypotheses from the gender perspective constitutes a conceptual exploration in this study.

The characteristics of the samples from the population are unknown, making the samples of this study saturated. This means that the population cannot be calculated. Thus, the method for determining the sample size follows theoretical principles, which suggest that the sample size should be 5 - 10 times the number of research indicators. Then, after mentioning the research approach used, methods and respondent criteria, the following research instruments in the form of questionnaire items is also presented in Table 1.

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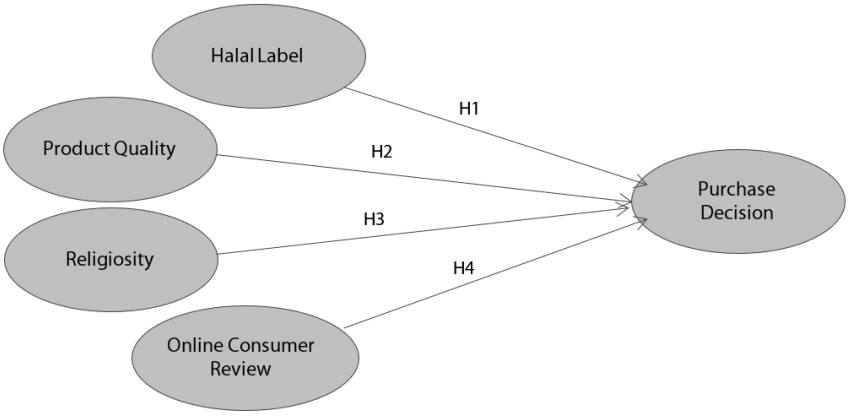
Table 1. Questionnaire Items

	Variable	Indicators	Sources
independent	Halal Label (HL)	1. The existence of the word "Halal" on the product or packaging helps me identify the product before purchasing halal cosmetic products; 2. I always pay attention to the halal image on the packaging before purchasing cosmetic products; 3. I clearly know the location of the "Halal" label on the packaging of cosmetic products, making it easier to provide information and confidence in the quality of the product; 4. I know that there is a combination of images and writings of the official "Halal Label" from Indonesian Ulema Council (MUI) so that I can consider choosing skin care and other cosmetic products before making a purchase.	(Ishak et al., 2016)
	Product Quality (PQ)	1. Halal cosmetic products have a variety of products that suit my skin care needs to stay healthy; 2. Halal cosmetic products are in accordance with what is offered through advertisements and product labels; 3. Halal cosmetic products do not cause problems on my skin so I feel safe; 4. Halal cosmetic products have durability in a certain period of time that is quite long; 5. The packaging design of halal cosmetic products is attractive and functional to keep the product inside.	(Ali et al., 2018), (Tazlia et al., 2023)
	Religiosity (R)	1. I find it very important to make a shopping list so as not to over-consume; 2. I feel in control of my spending on consumption, especially spending on cosmetics.	(Gunawan & Gaffar, 2021), (Irfany et al., 2024)
	Online Consumer Review (COR)	1. I see reviews from beauty vloggers that have a clear explanation of the advantages and disadvantages of the product.; 2. I trust the choice of halal cosmetic products that I will buy by first looking at the honest review of the beauty vlogger of my choice. 3. I choose halal cosmetic products to buy by looking at reviews from beauty vloggers with the same skin problems.	(Juliana et al., 2022), (Salsabila & Ihsan, 2023)
dependent	Purchase Decision (PD)	1. By recognizing the need for halal cosmetic products, you hope to buy the right skin care products; 2. Before buying halal cosmetic products, you feel the need to be active in finding information about the products offered.; 3. After getting information about halal cosmetic products, you evaluate and consider several options before making a decision. 4. You make a purchase of halal cosmetic products after evaluating product options; 5. I will recommend halal cosmetic products to others.	(Salsabila & Ihsan, 2023), (Jalil et al., 2021), (Hassan & Sengupta, 2019)

Figure 1. Hypothesis Framework



Source: Authors (2023)

This study relates to persistence and even increasing levels of cosmetics sales in the post-pandemic period. The approach adopted in several previous studies suggests that consumers' perceived value significantly influences their interest in purchasing cosmetics (Tazlia et al., 2023). There are also findings that brand ambassadors positively increase sales of halal cosmetics among Muslim millennials (Juliana et al., 2022). Additionally, religiosity influences consumers' purchasing psychology (Gunawan & Gaffar, 2021).

The concept they use does not include religiosity as an endogenous variable that is directly tested or gender as an analytical study. This study adopted the previously developed concept, which uses consumption theory to hypothesize that consumption, marketing, and psychological value influence purchasing decisions. Figure 1 is the complete hypothesis framework.

The method of choice for this study is PLS path modeling, a robust approach when the SEM contains both factors and composites. Testing on PLS enables us to develop a comprehensive model (Gotz et al., 2010), with variable categorization which is called multi-group analysis. Even in conditions that use respondents as primary data, we can still use a reference loading factor value in the range 03-0.4 as a valid value, ensuring the thoroughness of our methodology.

RESULTS AND DISCUSSION

Result

As explained in the data in the previous section, respondents for this research were selected with few screening items. The respondents in this study were predominantly female students, selected based on their familiarity with cosmetics, having used a minimum of 2 cosmetic products, and being acquainted with two beauty vloggers. The gender distribution of respondents indicates that 62 were male and 141 were female. Most participants fell within the age range of 21 to 24 years.

Figure 2 shows the loading factor analysis for each variable indicator. All measured indicators have values of more than 0.7. Thus, it can be concluded that they significantly

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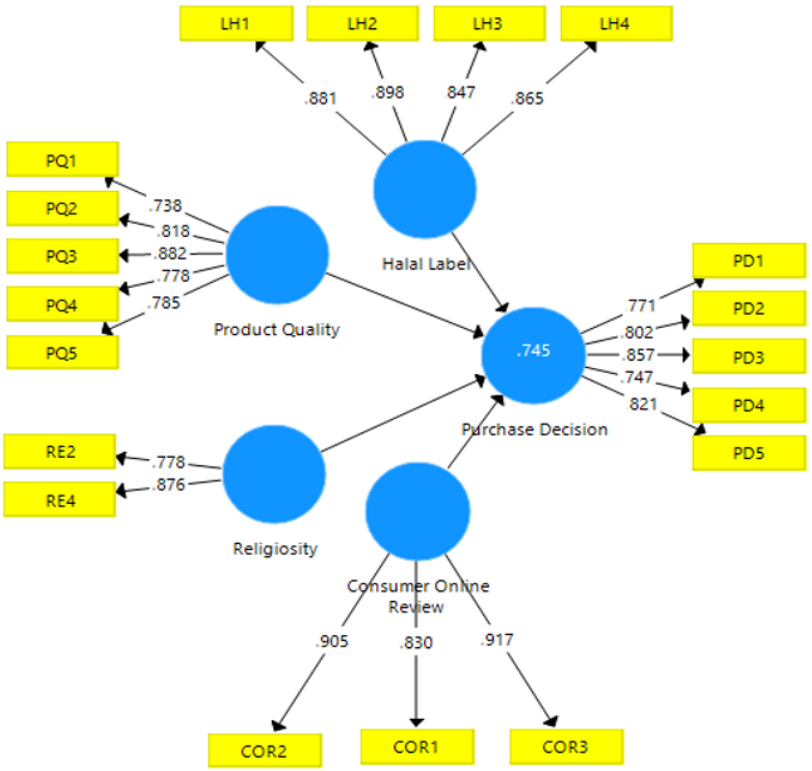
Figure 2. Outer Loading



explain each variable. The lowest value is 0.738 for the product quality 1 (PQ1) indicator, and the highest is 0.917 for the customer online review 3 (COR3) indicator. All measurable variables significantly influence purchase decisions.

All four indicators (LH1 – LH4) significantly explain the halal label, with the third indicator (LH3) having the lowest value. Then, the measured variables (PQ1-PQ5) significantly explain product quality, with PQ3 obtaining the highest loading factor value, 0.889. Purchasing decision indicator 3 (PD3) has the highest loading of 0.857 in the model, while purchasing decision indicator 4 (PD4) is the indicator with the lowest value, 0.747.

Table 2. Reliability and Validity Test

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Online Consumer Review	.861	.880	.915	.783
Halal Label	.896	.902	.928	.762
Product Quality	.860	.865	.900	.643
Purchase Decision	.859	.861	.899	.641
Religiosity	.549	.573	.813	.686

Based on Table 2, Cronbach's alpha and composite reliability values are greater than 0.7, which is considered good (Gotz et al., 2010). The average variance extraction (AVE) results are good, considering the value is above 0.5 (Henseler et al., 2016). Discriminant

validity testing ensures that each latent model concept is unique. The validity test determines the accuracy of a measuring instrument. SMART PLS can evaluate discriminant validity using Fornell-Larcker criteria and cross-loading. Table 2 shows the results of the discriminant validity test.

Table 3. Fornell-Cracker Criteria

	Online Consumer Review	Halal Label	Product Quality	Purchase Decision	Religiosity
Online Consumer Review	.885				
Halal Label	.711	.873			
Product Quality	.656	.755	.832		
Purchase Decision	.707	.709	.803	.810	
Religiosity	.076	.188	.153	.190	.828

Based on the results of the Fornell-Larcker criteria test in Table 3, the square root of the AVE for the Halal Label of 0.873 is greater than the correlation value of 0.711, which indicates that the discriminant validity requirements have been met. The square root of AVE for product quality (PQ) is 0.832, which is greater than the correlations with Halal Label (0.755) and Customer Online Review (0.656), thus indicating discriminant validity. The square root of the AVE purchase decision is (0.810) greater than the correlation with product quality of 0.803, Halal Label (0.709), and Online Consumer Review (0.707). The square root of AVE Religiosity is 0.828, higher than the correlation with purchasing decisions (0.190), product quality (0.153), Halal Label (0.188), and Customer Online Reviews (0.076). This value proves discriminant validity.

Table 4. VIF

Item	Value
COR1	1.883
COR2	2.412
COR3	2.683
LH1	2.428
LH2	3.517
LH3	2.228
LH4	2.966
PD1	1.833
PD2	2.018
PD3	2.409
PD4	1.681
PD5	2.024
PQ1	1.927
PQ2	2.294
PQ3	3.250
PQ4	2.429
PQ5	1.955
RE2	1.167
RE4	1.167

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Table 5. R^2

	R-square	R-square Adjusted
Purchase Decision	0,745	0,739

Based on Table 4, this study passed the multicollinearity test because the VIF value was less than 5. Table 5 shows that the perceived value has a good R-square value of 0.745. This result means that HL (halal label), PQ (product quality), R (religiosity), and COR (Online Consumer Review) explain 74.5% of the variance in purchasing decision values. Meanwhile, 27.8 percent of the variation in purchasing decisions is explained by variables not included in the research model.

Figure 2 outlines four hypotheses: The first hypothesis (H1) is that online consumer reviews influence purchase decisions. The second hypothesis (H2) is that halal Labels influence Purchase Decisions. The third hypothesis (H3) is that product Quality influences Purchase Decisions. The fourth hypothesis is that religiosity influences Purchase Decisions.

Based on Table 6a of the test results of 4 hypotheses, the results obtained are 1 hypothesis was rejected, and three other hypotheses were accepted. The accepted and rejected hypothesis results are based on the t-statistic value and p-value. The rejected hypothesis is the second hypothesis, which tests the halal label variable on purchase decisions because the t-statistic value is 3.183 (>1.96). The P value for this hypothesis is 0.001, which indicates that this hypothesis is correct. This study found that Online Consumer Review positively affects purchase decision.

As for the accepted hypotheses, there are 3, namely hypotheses 1, 3, and 4. The relationship between these variables is online consumer review on purchase decision, product quality on purchase decision, and religiosity on purchase decision, respectively. The third of this is the accepted hypothesis. Regarding the influence of consumer review variables on purchase decisions, consumers' views on products due to the assessment of beauty vloggers and their trust in released products significantly influence their confidence to purchase cosmetics. This study certainly provides a review that strengthens the previous empirical study from Juliana et al. (2022).

Table 6a. Hypothesis Testing

	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Result
Online Consumer Review -> Purchase Decision	.270	.085	3.183	.001	Acceptable
Halal Label -> Purchase Decision	.049	.100	.409	.341	Rejectable
Product Quality -> Purchase Decision	.607	.065	9.479	.000	Acceptable
Religiosity -> Purchase Decision	.070	.038	1.767	.039	Acceptable

Source: research finding

Table 6b. Hypothesis Testing on Male

	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Result
Online Consumer Review -> Purchase Decision	-.391	.241	1.501	.067	Rejected
Halal Label -> Purchase Decision	.386	.173	2.099	.019	Accepted
Product Quality -> Purchase Decision	.885	.287	3.068	.001	Accepted
Religiosity -> Purchase Decision	.100	.053	1.976	.040	Accepted

Source: research finding

Table 6c. Hypothesis Testing on Female

	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Result
Online Consumer Review -> Purchase Decision	.334	.098	3.370	.000	Accepted
Halal Label -> Purchase Decision	-.030	.113	.254	.400	Rejected
Product Quality -> Purchase Decision	.652	.055	11.809	.000	Accepted
Religiosity -> Purchase Decision	.038	.061	.660	.255	Rejected

Source: research finding

When it comes to the effect of product quality on purchasing decisions, this hypothesis stands out as the strongest. This is evident from the statistical value, which is the highest among all the hypotheses at 9.479. The logical relationship between these variables, as well as the alignment with business law, further strengthens this hypothesis. According to business law, product quality is directly proportional to consumer interest, which in turn influences their purchasing decisions. This logical connection makes the hypothesis compelling and worthy of further exploration.

Finally, the fourth hypothesis tests the religiosity variable on purchasing decisions. It can be seen in Table 6a and the hypothesis model in Figure 1, which concludes that this hypothesis is accepted. A sense of restraint not to consume excessively and being economical in shopping, especially in cosmetic products, still gives them savings to decide to buy halal cosmetics. This result aligns with studies conducted by Hakim et al. (2023) and Salsabila and Ihsan (2023).

Based on the multi-group analysis (MGA) test, there are differences in the hypothesis results between male and female consumers (see Tables 6b and 6c). In hypothesis testing for male respondents, 1 hypothesis was found, which had no significant effect. Namely, a hypothesis that measures the influence of Online Consumer Reviews on purchasing

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decisions. Meanwhile, in testing the hypothesis with female respondents, it was found that two hypotheses had no significant effect—namely, hypothesis 2, halal labels on purchasing decisions, and hypothesis 4, religiosity towards purchasing decisions. Meanwhile, the other two hypotheses (H1 and H3) were proven significant.

DISCUSSION

This study determined that online consumer reviews, religiosity, and product quality can positively influence purchasing decisions. However, a halal label does not negatively impact purchasing decisions. In practice, consumers selecting cosmetic items often note that beauty vloggers possess considerable expertise in reviewing beauty products (Handriana et al., 2020), and people who are followers consider the beauty vlogger to be competent. Moreover, post-pandemic, the government is still implementing social restrictions, albeit gradually. This condition benefits people in choosing beauty products by relying on beauty vlogger reviews rather than purchasing from offline stores (Sukoco et al., 2020). The presence of influencers, such as beauty vloggers, will undoubtedly offer diverse perspectives and references for potential consumers, allowing them to compare product reviews and quality across different sources. Naturally, beauty vloggers' extensive knowledge and insights, coupled with their heightened commitment, carry persuasive value in convincing consumers to purchase cosmetic products (Yudha & Basya, 2024).

Product quality is a primary consideration for consumers when choosing cosmetic products, alongside price. Consumers expect the products they receive to meet their standards, a fact supported by the quality of cosmetic products and skin care advertised and endorsed by user testimonials. This emphasis on product quality and the trust it fosters among consumers are key factors in the cosmetic industry.

Then, apart from product quality, online consumer reviews also play a significant role in decision-making. These reviews, particularly those from beauty vloggers perceived as clear, honest, and aligned with the product profile, ultimately foster consumer trust and influence purchasing decisions. Beyond product quality and online consumer reviews, another factor that influences purchasing decisions is religiosity. For Muslim consumers, it is essential to choose halal products that align with the beliefs and teachings of the Islamic religion.

However, among the four independent variables, the halal label does not significantly impact purchasing decisions. Statistically, its P-value is insignificant. However, random interviews conducted with several respondents revealed that they considered products bought and sold in Indonesia, where the majority of the population is Muslim, to be inherently halal. This perception diminishes the importance consumers place on the halal label. (Arieffiandi et al., 2016; Goranda et al., 2021). The basis for purchasing decisions is more due to product rationality, such as usefulness, price, and durability. However, further study observing the influence of endogenous variables on exogenous variables revealed several interesting things. One finding is that there are differences in

assessments and test results from a gender perspective. This result means that male and female respondents have different views on cosmetic purchasing decisions.

Following the background that reviews differences in gender views (men and women), the results of the hypothesis of the influence of halal labeling on purchasing decisions and the level of religiosity on purchasing decisions can be accepted in the view of male respondents. However, this is different for female respondents who refuse. In tracing through confirmation interviews with several respondents, this finding is logical and in line with the actual conditions in the field. Based on this, an assessment was obtained that for men, the cosmetics they use require spiritual factors such as religiosity and halal labels before they finally decide to use them. However, it is different with female consumers, who are more rational in purchasing decisions by only considering product quality and online consumer reviews.

Once again, these findings confirm differences in results from a gender perspective. The answers to the hypotheses for males and females were found to be unique. Male respondents who use cosmetic products strengthen the hypothesis that halal labels, product quality, and religion can influence decisions to purchase cosmetic products. Meanwhile, online consumer reviews do not increase their confidence in cosmetic products. This result is considered a market opportunity.

Then, for female consumers, different results were also found in proving the hypothesis. When deciding to purchase cosmetic products, female consumers prioritize online consumer reviews and product quality, with a psychological and rational background similar to the condition of females in general when deciding to purchase products. Meanwhile, female consumers need to fully consider the halal label and religious values in deciding to purchase cosmetics. This finding confirms that female consumers find it easier to follow trends and trendsetters of new things. The issue of halal cosmetics and the halal industry, in general, is attracting market share, predominantly female consumers of a particular age group, millennials, and Gen Z.

Thus, the difference in the results of this study when viewed with previous studies is the influence of related variables as compiled in the hypothesis model from a gender perspective. This review from a gender perspective is seen as interesting for several reasons. First, cosmetics are commonly associated with women but are unfamiliar to men. This study found that men and women have similar views and interests in cosmetics. Second, cosmetics are considered genderless among millennials and Gen Z. Thus, there has been a shift in interest and paradigm towards cosmetics from the previous to the current millennial era. Third, the findings of this study can be a strategic material and study in product mapping and segmentation for local cosmetic companies in particular. Where the position of Gen Z and millennials who view halal cosmetics, and mainly male Muslim consumers, is a potential segmentation to continue to be developed.

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CONCLUSION

This study shows that online consumer reviews, religiosity, and product quality positively impact purchasing decisions, while the halal label is not so significant. This condition is because some respondents tend to believe that cosmetic products in Indonesia, where the majority of the population is Muslim, are safe and automatically halal. An interesting finding from this study is that there are differences in gender perspectives regarding cosmetic purchasing decisions. Male consumers show greater attention to halal labeling, product quality, and religiosity. In contrast, female consumers prioritize online consumer reviews and product quality and place less emphasis on religiosity and halal labels when purchasing.

This result suggests different market opportunities for women in terms of consumption volume and production, especially with market segmentation among millennials. This research also found that differentiation from a gender perspective certainly offers benefits for stakeholders. This result presents a significant concern for male consumers indifferent to online reviews, particularly in the beauty industry. The industry can address this concern by continuing to provide education through advertising featuring beauty vloggers as influencers. Male consumers represent potential market segments that need to be fully optimized and strategically targeted. Conversely, this situation also catalyzes encouraging local entrepreneurs to enter the market by offering halal cosmetic products currently in high demand. This result aligns with the demand-supply theory; when there is a high demand, it presents an opportunity for producers to introduce their products to the market.

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Do Digital Competitiveness and Government Efficiency Affect Macroeconomic? An Evidence From Asia-Pacific Countries

Ernawati[1*], Muhammad Natsir[2], Mansyur Asri[3]
[1,2]Halu Oleo University, Kendari, Indonesia
[3]STMIK Catur Sakti, Kendari, Indonesia
E-mail: [1]ernawaty@uho.ac.id, [2]drnatsir64@gmail.com, [3]mansyur.asri12@gmail.com
[*)]Corresponding Author

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Abstract

Research Originality: This research divided the dimensions of digital competitiveness into knowledge, digital policy, and IT integration. The digital competitiveness variable was estimated simultaneously with government efficiency in influencing macroeconomic performance in Asia Pacific countries. This research proved the important role of responsive digital policies and government efficiency in driving the macroeconomy.

Research Objectives: This research aimed to determine the effect of digital competitiveness and government efficiency on macroeconomic performance.

Research Methods: Data was sourced from the International Institute for Management Development (IMD) publication from 2019 to 2022 for 13 Asia Pacific countries. The digital competitiveness considered in this research is knowledge, digital policy, and IT integration variables. Data was analyzed and processed using panel data regression.

Empirical Results: The result showed that digital policy variables reduced macroeconomic performance, while government efficiency positively affected macroeconomic performance. Furthermore, the digital knowledge and IT integration variables did not significantly affect macroeconomic performance.

Implications: This research has significant implications for the development of responsive digital policies that promote macroeconomic performance. It also underscores the importance of governance by the government in controlling the high-cost economy to encourage productivity and macroeconomic performance. These implications provide valuable insights for policymakers and professionals in the field of economics and digital policy.

Keywords:
digital; government; macroeconomic; governance; policy

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INTRODUCTION

The utilization of digitalization was significant during COVID-19 despite its existence before the pandemic. Moser-Plautz and Schmidthuber (2023) reported that the pandemic increased technological means and affected various aspects of the organization, such as employee attitudes. Organizations negatively affected by the pandemic have benefited from a greater degree of digital transformation. Consequently, the pandemic affected the spirit of innovation and increased the speed of digital transformation. According to Srisathan and Naruetharadhol (2022), individuals facing challenges adapting to the digital pandemic tended to engage more in digitalization. A macro-level report from ADB (2022) showed that the digital core share of countries in the Asia Pacific increased since 2018. The value during the COVID-19 period was an average of 5.47% but has yet to match the performance in 2017 of 5.5%. Furthermore, the digital economy share in several countries experienced a decline during the COVID-19 period with contraction, such as in Korea, Singapore, Japan, India, Thailand, Fiji, Cambodia, and Kazakhstan.

The Solow and Swan model reported that production factors and technological progress influenced economic growth. This research determined the level of technological progress by an exogenous factor. The neo-classical growth model introduced total factor productivity (TFP). TFP is the ratio of output that cannot be explained by several inputs used in production, with the exception of capital and labor. This ratio explains other factors influencing economic growth besides capital and labor by determining the effect of technological processes on economic growth. The Solow-Swan model also explained that technological advances increased labor efficiency in production activities, propelling the output produced. According to The Solow and Swan model, technological progress was an exogenous variable that did not depend on other economic forces. Digital technology, as an example of technological progress, has driven the economic progress of a country. Bhandari et al. (2023)examined a panel data set of 571 US manufacturing firms and found a sloping relationship between digitization and firm performance. This relationship had a negative or relatively flat slope at low levels of digitization and an increasingly positive slope at a relatively higher level.

Furthermore, Zhang et al. (2021)measured the digital economy development index of 30 cities from 2015 to 2019 in China from the three dimensions of digital infrastructure, industry, and integration. The result showed that the variables had a significant positive effect on the total factor productivity of the area. The coefficients of influence were 0.2452, 0.0773, and 0.3458, respectively. The mediating effect of technological progress was 0.1527, with 1.70%, 9.25%, 28.89%, and 21.22% in the eastern, north-eastern, central, and western regions, respectively.

Galina and Lapiņa (2023) found that a framework of interrelationships between digital transformation, open innovation, and sustainability was developed and confirmed. This report showed that digital transformation was a supporting factor and driving force for sustainability and open innovation. At the same time, digital transformation can negatively impact the environmental dimension of sustainability. Cheng et al. (2023) reported

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a positive nonlinear U-shaped relationship, showing that the TFP of real economic firms decreased in the early stages of digital transformation and then increased after exceeding a critical threshold value. During a crisis, supply chain digitization increased cost-effectiveness, improved information and communication efficiency, and promoted supply chain resilience to achieve better performance (Zhao et al., 2023).

Previous research examined the link between digitalization and economic performance at both micro and macro levels. Digitalization was measured from applied technology or integration at the micro level (Bhandari et al., 2023; Bui & Le, 2023; Peng & Tao, 2022). The results showed that digitalization had an impact on business performance (Xie & Wang, 2023; Zhao et al., 2023); financial inclusion (Al-Smadi, 2022), promoting labor market resilience (Oikonomou et al., 2023). According to Kusumawardhani et al. (2023), digitalization had no impact on women's labor market outcomes, but previous research reported an impact on sustainability and the environment. Digital transformation was driving the sustainability transition (Chatzistamoulou, 2023). Furthermore, Mutascu et al. (2023) reported that digitalization stimulated green preferences in clean environments with distorted green information. Research conducted by Santos et al. (2023), using country-level data for the European Union from 1995 to 2019, showed the average positive net effect of ICT investment on total employment. A €100,000 increase in ICT investment shares was associated with a rise of 3.3 jobs in the European Union. However, the magnitude of the impact was heterogeneous across countries.

Adaptation to digitalization can improve government governance through e-government, thereby boosting economic performance. Castro and Lopes (2022) reported that e-government development was a positive determinant for a country's sustainable development, represented by adjusted net savings, including a country's economy, social, and environmental development. However, other research, such as Sevinc et al. (2019) and Mroczek et al. (2019), placed governance, including government institutions, as an exogenous variable.

This study's research gap was related to the empirical gap with previous studies that estimated the impact of digitalization at the micro level, namely company performance, and at the macro level, which was limited to employment and environmental variables. This research carried out a cross-country macro-level estimation approach with dependent variables in macroeconomic performance. The research gap was also related to digitalization variables, which only refer to IT infrastructure, IT Integration, and human resources, while digital policy variables still needed to be minimally studied. The novelty of this research is measuring the dimensions of digital competitiveness with three variables, namely knowledge, digital policy, and IT integration at the macroeconomic level. This dimension was different from the previously used by Park & Choi (2019), namely technological innovation capability, human resources, and the environment; and Zhang et al. (2021) used three digital dimensions, namely digital infrastructure, industry, and integration, to drive economic development in China. The latest study by Zhang (2023) uses path analysis to examine the influence of digital policies on economic development mediated by urbanization. This study estimated the three dimensions of digital competitiveness

in a model for the cross-country level of Asia-Pacific countries. Estimates of digital dimensions differentiated into three variables clarified the economic strengthening needed to support macroeconomic competitiveness. Some of the contributions of this research are: (1) using digital policy variables as one of the independent variables that influence macroeconomic performance; (2) using government efficiency variables as a proxy for governance as a factor influencing economic performance; and (3) using panel data in cross-country studies in the Asia Pacific region by measuring economic variables at the macro level. This research aims to analyze the influence of digital knowledge, digital policy, IT integration, and government efficiency on macroeconomic performance in Asia-Pacific countries. This research will consider the country's digital framework and government efficiency to encourage macroeconomic performance.

METHODS

This research used secondary data published by the International Institute for Management Development (IMD) from 2019 to 2022. Based on IMD Digital Competitiveness data, fourteen countries are estimated to be included in the Asia-Pacific countries, excluding Oceania countries. However, in the study, only thirteen countries were included in the model based on data completeness considerations. These Asian-Pacific countries include Indonesia, Thailand, the Korean Republic, Japan, India, Singapore, the Philippines, Malaysia, China, Mongolia, Kazakhstan, Hong Kong SAR, and Taiwan. The digital competitiveness variables measured knowledge, policy, and IT integration. Digital policy variables encourage macroeconomics through capital allocation policies and developing an environment to support efficient and effective economic digitalization. The digital policy variable was proxied from the technological dimension, which IMD estimated with the indicators of the regulatory framework, capital, and technological framework.

In contrast, the IT integration variable was obtained from the future readiness dimension. Data on macroeconomic competitiveness and government efficiency was obtained from IMD's World Competitiveness Year Book publications. Data was analyzed using panel data regression. Equation 1 shows the research model from this study.

$$Y_{it} = \alpha + b_1X_{1it} + b_2X_{2it} + b_3X_{3it} + b_4X_{4it} + e_{jt} \quad (1)$$

Where:

Y : Macroeconomic competitiveness

X_1 : Knowledge

X_2 : Digital policy

X_3 : IT integration

X_4 : Government efficiency

Panel data regression was tested by selecting the best model between the common and the fixed effects based on the Chow test. When the probability of cross-section was < 0.05, a better model of the two was the fixed effects model. The best model between

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the random and fixed effects was selected based on the Hausman test. A probability of random cross-section < 0.05 showed that the fixed effects model was better than the random effects model. The Lagrange multiplier was carried out when the best random effect model was obtained based on the Hausman test. Estimated research data will be processed with random effects when the Breusch-Pagan cross-section and time probability are < 0.05. However, when the probability is > 0.05, panel data will be processed with common effects. Digital dimension data was obtained from the World Competitiveness publication and analyzed using panel regression.

Data on macroeconomic competitiveness and government efficiency was obtained from IMD's World Competitiveness Year Book publications. Classical assumption tests were carried out for CEM or FEM estimation (normality, multicollinearity, autocorrelation, and heteroscedasticity test) before interpreting the output of the panel data. However, the random effects model automatically addresses the problems of heteroscedasticity and autocorrelation.

RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics and analysis of the variables being studied. Changes in the digital policy and IT integration variables had a negative direction, suggesting a decrease in the variables for the estimated period. Based on the Std.Dev value, the difference in digital knowledge (X_1) between countries in the Asia Pacific was very high, including government efficiency (X_4) and macroeconomic performance (Y). The variables with slight variations were IT integration (X_3) and digital policy (X_2).

Table 1. Descriptive Statistics of Research Variables

	X_1	$d(X_2)$	$d(X_3)$	X_4	Y
Mean	64.514	0.210	-0.455	62.452	62.111
Median	67.640	-1.150	-1.289	59.404	62.790
Maximum	92.031	13.341	13.692	100.000	83.415
Minimum	35.158	-11.361	-12.149	28.730	30.050
Std. Dev.	17.665	6.514	5.983	17.852	12.763
Skewness	-0.189	0.195	0.223	0.549	-0.459
Kurtosis	1.691	1.965	2.316	2.416	2.825
Jarque-Bera	3.019	1.987	1.082	2.515	1.422
Probability	0.221	0.370	0.582	0.284	0.491
Sum	2516.051	8.178	-17.754	2435.645	2422.320
Sum Sq. Dev.	11858.120	1612.378	1360.413	12110.150	6189.786

Source: Data processing

The results of the correlation test between variables (Appendix 1) showed a high relationship (> 80) between digital policy and IT integration with other variables. Thus, the estimation of digital policy and IT Integration variables uses change values. By modifying this data, the correlation between research variables <0.80 (Appendix 2).

Table 2 shows the Chow test to determine the best model between CEM and FEM. The Chi-square cross-section probability value was 0.000, suggesting FEM is the best model. Subsequent tests were conducted to test the best model between FEM and REM. In Table 3, the random cross-section probability value was 0.246 > 0.05, showing that REM was the best model. The results of the Lagrange multiplier tests show the Breusch-Pagan probability value for both of 0.000 < 0.05. Therefore, the best model for estimating panel macroeconomic performance data was REM.

Table 2. Chow Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	16.151	(12,22)	0.000
Cross-section Chi-square	89.051	12	0.000

Source: Data processing

Table 3. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.431	4	0.246

Source: Data processing

Table 4. Lagrange Multiplier Tests

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	21.473	1.144	22.617
	(0.000)	(0.285)	(0.000)

Source: Data processing

Our main estimation results highlight the crucial role of digital policy in shaping macroeconomic performance. We found that the digital policy of digital competitiveness dimension significantly affects macroeconomic performance, while knowledge and IT integration have no significant effect. This underscores the importance of digital policy in the context of macroeconomic performance. Interestingly, the influence of digital policy on macroeconomic competitiveness had a negative direction, with a change in digital policy by one index point reducing macroeconomic competitiveness by 0.302 points. On the other hand, the government efficiency variable had a significant and positive influence on macroeconomic competitiveness. This result shows that an increase in government efficiency competitiveness by one index point will increase macroeconomic performance by 0.439. In summary, our findings emphasize the significant role of digital policy and government efficiency in shaping macroeconomic outcomes.

Knowledge and IT integration have no significant effect on macroeconomic performance, which contradicts previous research, where IT integration affected macroeconomic variables. Zhang et al. (2021) showed that digital integration positively and significantly affected total factor productivity in China. The estimation results of

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Jahan & Zhou (2023) showed that digital inclusion significantly impacted employment growth during the pandemic, where every one-unit increase in the digital inclusion index in the average value of confirmed COVID-19 cases increased employment growth by 0.078%. The positive impact was significant for both high- and low-income countries. According to Hui et al. (2023), the integration of digital technology in the financial sector only positively impacted regional innovation capacity. This impact was more significant for provinces with a higher share of the total GDP of the tertiary sector and a lower level of market development.

The digital and economic competitiveness index based on GDP per capita groupings for 2022, which is more or less $20,000, is shown in Figure 1. Countries with a GDP per capita of more than $20,000 are Korea, Japan, Singapore, Hong Kong SAR, and Taiwan. Based on the grouping, there are differences in digital power and competitiveness. Countries with a GDP per capita greater than $20,000 have higher digital competitiveness than other groups. This condition was followed by the country's competitiveness, which was also higher for all indices and indicators. The highest difference in digital competitiveness was found in the IT integration aspect.

Table 5. Estimating Results of Research Variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	24.9795	9.2794	2.6919	0.0109
X_1	0.1505	0.1299	1.1584	0.2548
$d(X_2)$	-0.3022	0.1512	-1.9992	0.0536
$d(X_3)$	-0.1257	0.1538	-0.8173	0.4194
X_4	0.4392	0.1207	3.6380	0.0009
Effects Specification				
			S.D.	Rho
Cross-section random			8.994363	0.8741
Idiosyncratic random			3.412749	0.1259
Weighted Statistics				
R-squared	0.6359	Mean dependent var		13.29113
Adjusted R-squared	0.5931	S.D. dependent var		5.4615
S.E. of regression	3.4838	Sum squared resid		412.6616
F-statistic	14.847	Durbin-Watson stat		2.0906
Prob(F-statistic)	0.0000			

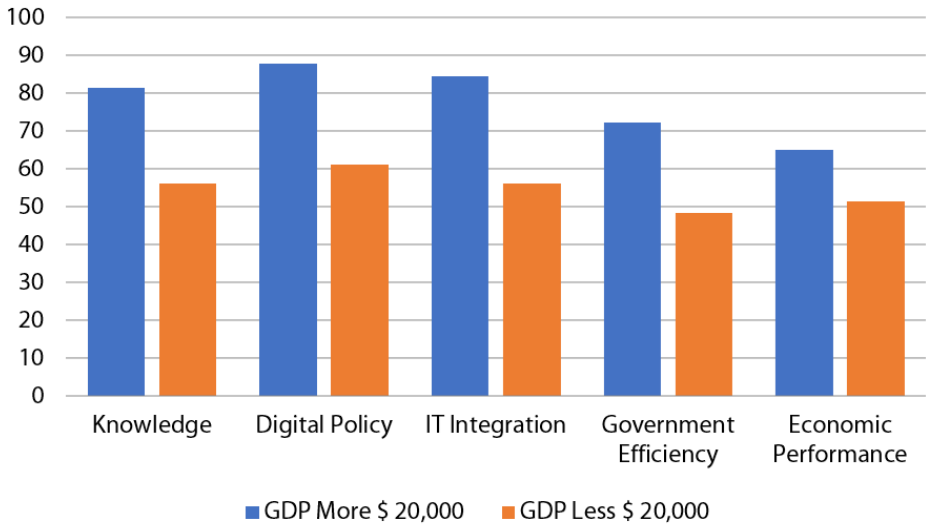
Source: Data processing

The results of this research, which showed the negative influence of digital policies on macroeconomic competitiveness, contradict Park & Choi (2019). The research showed that the regulatory and political environment had a positive and significant influence on economic growth. Meanwhile, the drivers and challenges of digital innovation in Africa were mainly caused by social, economic, political, and institutional factors (Arthur et al., 2024). Some previous research showed that government attention significantly promoted

the development of the digital economy (Zhang et al., 2024). This result implied that for every unit increase in the DT policy indicator, economic development increased by 49.7% (Zhao et al., 2023). Digital policy manifested as environmental factors that influenced the allocation of capital to digital development. When viewed from the aspect of capital directed toward digital development, the results also contradict previous research. Santos et al. (2023) showed an average positive net effect of ICT investment on total employment. The policies in this research had several indicators, namely technological, regulatory, and digital frameworks. These findings have significant implications for our understanding of the digital economy and its impact on economic development.

Based on Figures 2 and Figure 3, digital competitiveness has a positive relationship with macroeconomic performance. Digital competitiveness was above average in Singapore, Korea, Hong Kong SAR, Taiwan, China, Japan, and Malaysia. Meanwhile, only Singapore, Hong Kong, Taiwan, and China are above average in terms of economic competitiveness. Mongolia and the Philippines had the lowest competitiveness, both in terms of digital aspects and economic competitiveness. Based on the digital competitiveness variable, Thailand has a higher digital policy index but lower economic performance. In contrast, Japan, which has a low digital policy index, has better economic performance.

Figure 1. Digital Competitiveness Index, Government Efficiency, and Macroeconomic Performance Based on 2022 GDP per Capita Grouping Countries in the Asia Pacific



Figures 4, 5, 6, and 7 show the digital and economic competitiveness profiles. During the research period, all the variables exhibited fluctuations. The economic performance experienced high fluctuation, specifically in 2022, shown by a sharp decline compared to the previous period in all countries. The high decline was also experienced by government efficiency. Meanwhile, the index experienced the most increase among all variables in the technological aspect. The digital policy index increased, but there was a decrease in government efficiency and economic performance. Meanwhile, knowledge and IT Integration changes in the countries studied were relatively lower.

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Figure 2. The Digital Competitiveness Index of Countries in the Asia Pacific in 2022

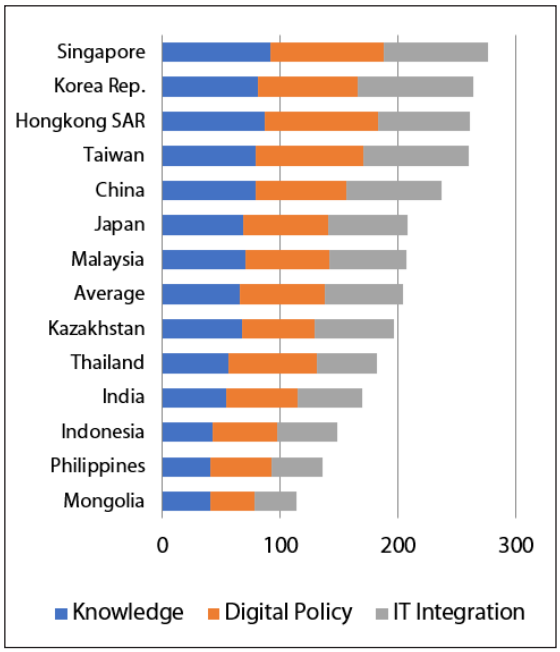


Figure 3. Economic Performance and Government Efficiency in the Asia Pacific Countries in 2022

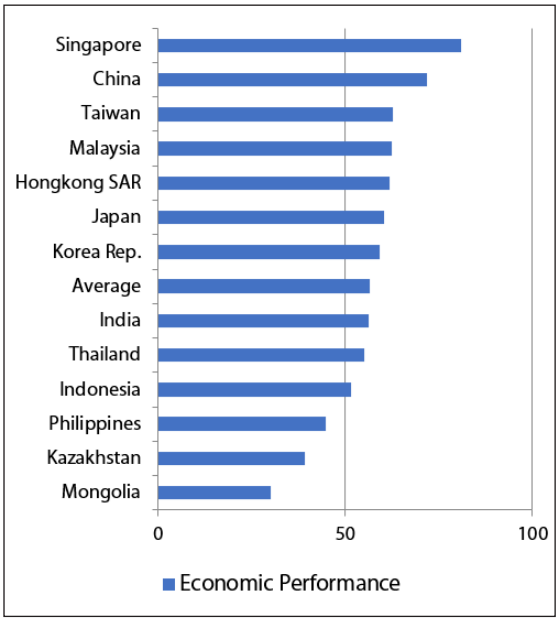


Figure 4. Index of Digital and Economic Competitiveness of Countries in Asia Pacific in 2019

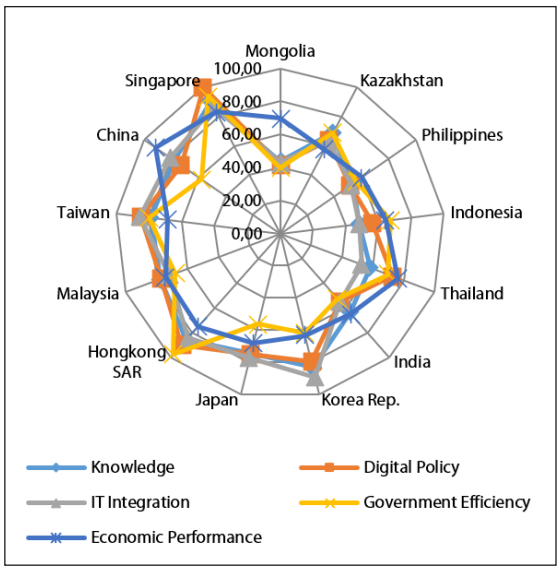
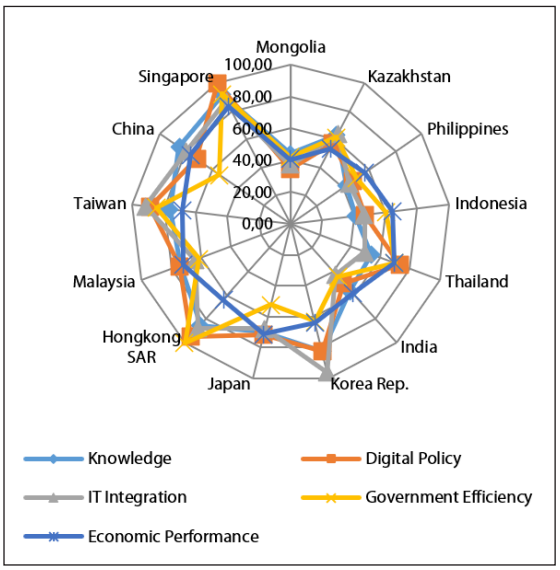


Figure 5. Index of Digital and Economic Competitiveness of Countries in Asia Pacific in 2020



The result of this research showed that the government efficiency variable had a significant and positive influence on macroeconomic competitiveness. Government efficiency was shaped by institutional (government) quality. Li and Maskin (2021) studied the influence of government quality on economic performance. In this case, government quality included government voice and accountability, political stability and absence of violence, effectiveness, regulatory quality, supremacy of quality law, and control of corruption. This is consistent with the report of Palei (2015) that the level of institutional

Figure 6. Index of Digital and Economic Competitiveness of Countries in Asia Pacific in 2021

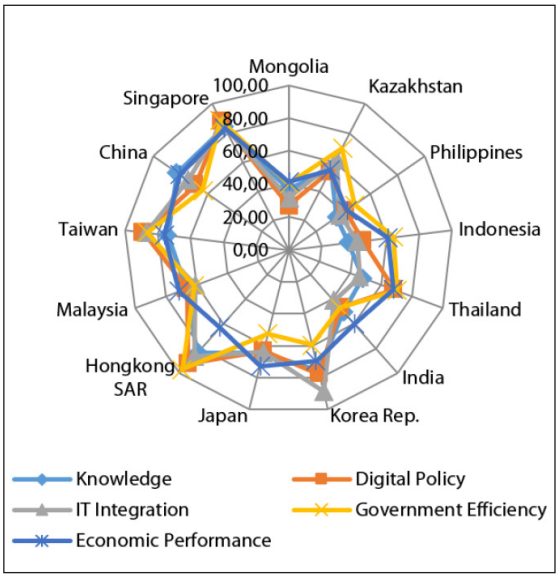
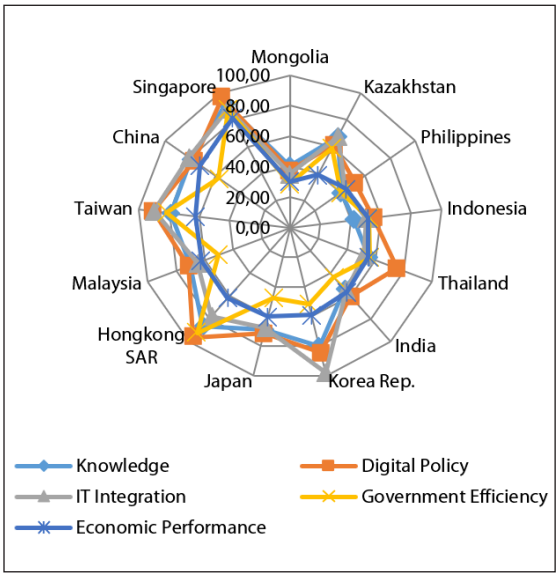


Figure 7. Index of Digital and Economic Competitiveness of Countries in Asia Pacific in 2022



development influences a nation's competitiveness. The role of institutional development in shaping a nation's competitiveness cannot be overstated. Non-feasible institutional conditions will negatively affect macroeconomic performance. Cigu et al. (2019) reported that corruption, the regulatory environment, and the shadow economy had a negative effect on economic growth**.** Li et al. (2020) tested the influence of institutional dimensions on economic growth using two variables, namely control of corruption and regulation, in 15 developing countries. The result showed that control of corruption reduced growth, but it is the quality of regulations led to an increase.

Meyer (2019) analyzed the impact of government activities on economic growth in Poland and the result showed a long-term and short-term relationship between government spending, size, effectiveness, and the level of corruption. Furthermore, the result showed that government variables caused economic growth changes. Khodapanah et al. (2022) found an inverted U relationship between GDP and corruption in Asian countries. In the early stages of economic development, activities expanded but there were no institutional changes. Therefore, a parallel increase in instances of corruption was observed alongside the progression of economic development. Further economic development was often accompanied by improvements in the quality of institutions in various areas of law, rules, and regulations. These institutions reduced corruption and increased production. In addition, a two-way relationship between corruption and economic growth was found in both developed and developing countries (Qureshi et al., 2021). The positive influence of digital competitiveness and government effectiveness showed the importance of these two variables in promoting macroeconomic competitiveness. Therefore, the urgent need to perfect digital economic policies and governance regulations is paramount for promoting development (Ma et al., 2024).

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CONCLUSION

In conclusion, a higher GDP increases countries' digital competitiveness by improving government efficiency and macroeconomic performance. Government efficiency, a manifestation of good institutions, improved macroeconomic performance. Therefore, quality government institutions produced a lower-cost economy, boosting productivity and the economy. The test result showed that only the digital policy variable was significant, while knowledge and digital integration did not significantly affect macroeconomic performance in Asia Pacific countries. Digital policy showed a negative influence on macroeconomic performance. This result showed that increased digital policy led to worse economic performance.

The negative impact of digital policy on the economy is shown in two ways: firstly, there is excessive policy intervention, thereby reducing digital competition and innovation—excessive digital intervention results in a less productive economy. Second, the digital policies of countries in the Asia Pacific are less effective in optimizing digital potential and driving economic output. Thus, this research recommends identifying and improving policy frameworks and digital support environments that damage the economy. The policy framework that is prepared must be able to provide optimal resources to support the country's productivity and competitiveness. Research findings showing the positive influence of government efficiency on macroeconomic performance imply the importance of governance in supporting efficient governance that can control a high-cost economy, thereby promoting productivity and macroeconomic performance.

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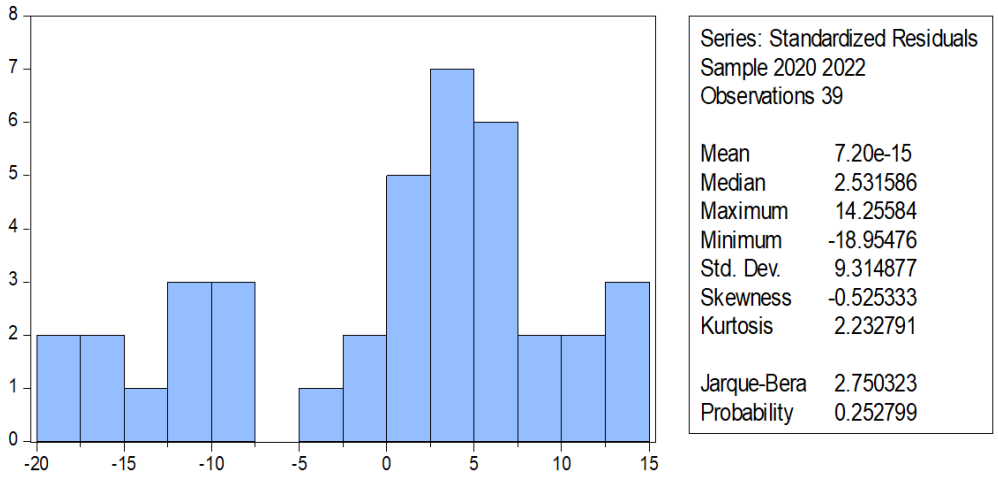
Appendix 1. Correlation Between Research Variables

	X_1	X_2	X_3	X_4	Y
X_1	1.000	0.898	0.932	0.664	0.649
X_2	0.898	1.000	0.890	0.805	0.648
X_3	0.932	0.890	1.000	0.654	0.577
X_4	0.664	0.805	0.654	1.000	0.542
Y	0.649	0.648	0.577	0.542	1.000

Appendix 2. Correlation Between Research Variables with changes in variables X_2 and X_3

	X_1	$D(X_2)$	$D(X_3)$	X_4	Y
X_1	1.000	0.125	0.126	0.658	0.690
$D(X_2)$	0.125	1.000	0.747	-0.084	-0.235
$D(X_3)$	0.126	0.747	1.000	-0.045	-0.159
X_4	0.658	-0.084	-0.045	1.000	0.591
Y	0.690	-0.235	-0.159	0.591	1.000

Appendix 3. Normality Test



Appendix 4. Research Data

Country	Year	Knowledge	Digital Policy	IT Integration	Economic Performance	Government Efficiency
Indonesia	2019	48.40	56.26	48.17	64.42	67.26
	2020	41.26	46.77	46.70	64.32	60.52
	2021	36.58	45.29	41.67	60.55	64.26
	2022	42.20	55.33	50.31	51.52	52.11
Thailand	2019	58.44	72.79	52.86	76.65	69.84
	2020	54.19	73.17	49.94	69.63	69.95
	2021	48.19	68.42	45.97	67.78	70.21
	2022	55.52	74.97	51.70	55.05	56.26
Malaysia	2019	77.61	76.84	71.51	74.21	67.81
	2020	73.64	74.77	64.05	72.20	61.60
	2021	66.46	66.01	60.50	71.38	61.13
	2022	70.08	71.45	65.33	62.34	50.46

Country	Year	Knowledge	Digital Policy	IT Integration	Economic Performance	Government Efficiency
Korea Rep.	2019	83.36	79.66	89.66	63.43	62.07
	2020	82.50	82.63	96.12	64.13	63.03
	2021	75.49	77.96	88.82	69.41	59.40
	2022	80.44	84.66	98.12	59.15	51.75
Japan	2019	74.69	75.08	77.35	68.43	56.40
	2020	70.09	71.77	67.93	71.16	52.21
	2021	64.76	63.18	64.20	72.67	52.39
	2022	68.83	71.35	67.95	60.31	47.30
India	2019	63.72	54.98	54.95	64.86	52.54
	2020	56.23	49.98	42.80	58.62	44.47
	2021	50.06	46.91	41.51	60.06	47.27
	2022	53.95	60.25	55.20	56.33	43.55
Kazakhstan	2019	68.97	64.09	63.60	57.50	68.94
	2020	62.94	57.29	63.84	53.17	61.81
	2021	55.31	53.78	62.21	54.54	69.85
	2022	67.64	61.56	67.51	39.12	59.05
China	2019	78.07	72.86	80.74	91.71	57.83
	2020	85.11	71.71	80.00	76.47	54.60
	2021	82.50	69.23	74.66	80.16	63.46
	2022	79.27	76.69	80.93	71.91	56.95
Taiwan	2019	78.89	84.93	85.56	68.64	79.97
	2020	76.34	88.68	91.81	68.31	84.82
	2021	73.91	88.71	87.20	76.32	86.60
	2022	79.23	90.70	89.99	62.79	81.65
Philippines	2019	53.54	51.47	52.09	60.14	55.71
	2020	42.56	47.25	44.79	56.45	50.39
	2021	35.16	41.74	37.69	42.79	48.36
	2022	40.51	51.58	43.95	44.74	40.49
Singapore	2019	90.50	100.00	86.41	83.07	93.84
	2020	92.03	99.50	87.12	83.42	92.33
	2021	84.13	88.14	86.23	83.35	89.16
	2022	91.44	96.43	88.19	81.09	87.63
Hongkong SAR	2019	85.82	89.80	84.23	75.11	97.39
	2020	85.38	94.60	87.87	63.99	100.00
	2021	83.84	92.66	86.33	63.15	97.14
	2022	86.53	96.19	77.97	61.91	92.32
Mongolia	2019	43.67	41.72	42.94	69.65	39.60
	2020	44.13	34.40	37.02	40.50	42.19
	2021	36.92	26.89	31.37	41.49	40.23
	2022	40.73	37.50	35.15	30.05	28.73

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Profitability of Manufacturing Firms in Indonesia Amidst the Pandemic

Sholikha Oktavi Khalifaturofi'ah[1*], Rahmat Setiawan[2]
[1,2]**Faculty of Economics and Business for Universitas Airlangga, Indonesia**
[1]**Faculty of Economics and Business for Universitas Hayam Wuruk Perbanas, Indonesia**
E-mail: [1]sholikha.oktavi.khalifaturofiah-2023@feb.unair.ac.id & sholikha@perbanas.ac.id,
[2]rahmatsetiawan@feb.unair.ac.id
[*)]**Corresponding Author**

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Abstract

Research Originality: In the realm of manufacturing firms, profitability remains a foremost concern. This paper distinguishes itself through its innovative approach, integrating key factors such as liquidity, leverage, activity, and the influence of the COVID-19 pandemic.

Research Objectives: This study is of utmost importance as it aims to evaluate the profitability of manufacturing firms in Indonesia. It specifically delves into the impact of liquidity, leverage, and activity measures on profitability while examining how the COVID-19 pandemic factors into this equation.

Research Methods: This study employs a quantitative approach. It utilizes panel data gathered from 134 manufacturing firms in Indonesia from 2018 to 2023. The analysis relies on a panel regression model to draw insights.

Empirical Results: The analysis yields significant findings. Notably, leverage demonstrates a negative and statistically significant influence on manufacturing firms' profitability, whereas firm activity shows a positive and statistically significant effect. Conversely, liquidity and the COVID-19 pandemic appear to have negligible impacts on profitability.

Implications: These findings have significant implications for policymakers and practitioners within Indonesia's manufacturing sector. To bolster the profitability of manufacturing firms, policymakers should prioritize reducing leverage and fostering increased company activity, possibly through amplified sales efforts. This practical advice will keep you informed and prepared for the future.

Keywords:

financial performance; liquidity; leverage; pandemic COVID-19; manufacturing firms

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INTRODUCTION

Profitability holds paramount significance in financial literature, particularly emphasized by Budagaga (2022), who reinforced the dividend irrelevance theory, asserting that a company's performance hinges solely on its ability to generate fundamental profits and navigate business risks. Numerous studies corroborate that profitability indeed dictates a company's performance (Agegnew & Gujral, 2022; Fujianti et al., 2022; Hossain, 2021; Pervan et al., 2019; Pratiwi et al., 2021; Susilo et al., 2020). Notably, the examination of manufacturing firms' profitability in Indonesia (Aryantini & Jumono, 2021; Fujianti et al., 2022; Susan et al., 2022; Susilo et al., 2020) has garnered considerable attention in recent years.

Manufacturing profitability in Indonesia has experienced a downward trajectory due to the COVID-19 pandemic (Fujianti et al., 2022). Amid the pandemic, the average profitability of manufacturing firms stood at 3.5 percent, marking a decline of 1.4 percent compared to the pre-pandemic figure of 4.9 percent. Despite the manufacturing sector contributing 76.49 percent to the total national exports in 2021, industrial utilities witnessed a decline from 76.3 percent to 61.1 percent by the end of 2020 (BPS, 2021), underscoring the adverse effects of the pandemic. According to data from the Central Statistics Agency (BPS), the Gross Domestic Product (GDP) growth rate of the manufacturing industry in Indonesia was -2.93 percent in 2020, 3.39 percent in 2021, and 4.89 percent in 2022, indicating a contraction during the COVID-19 outbreak, with gradual recovery seen in 2022.

The above explanation underscores the importance of profitability for manufacturing companies in Indonesia. Profitability refers to a company's ability to generate profit while managing its assets. The higher the profitability, the better the company's performance, as its value will increase (Halfiyyah & Suriawinata, 2019; Parlindungan & Dewi, 2022; Pratiwi et al., 2021; Soukotta et al., 2023; Sudiyatno et al., 2021; Tui et al., 2017). Profitability is influenced by liquidity, leverage, company activity, and COVID-19.

Liquidity is one of the factors affecting profitability. Generally, the greater the available liquidity, the higher the company's profitability (Sethi et al., 2023; Tailab, 2014). Higher corporate liquidity signals to investors that the company can meet its short-term obligations. However, excessively high liquidity indicates many unproductive assets, which can reduce the firm's profitability. While liquidity refers to the short-term obligations a company must meet, leverage pertains to long-term obligations. Leverage creates fixed costs for the company, meaning that the higher the company's leverage, the greater the interest expenses, which can suppress profitability (Agegnew & Gujral, 2022; Hossain, 2021; Pratiwi et al., 2021; Sethi et al., 2023; Tailab, 2014). However, according to the trade-off theory, increased debt up to a certain point can enhance profitability due to tax benefits outweighing bankruptcy costs (Alarussi & Gao, 2023; Aryantini & Jumono, 2021; Ifeduni & Charles, 2018).

Firm activity also affects profitability. This activity is measured by how often a firm generates sales from its total asset management. The faster the turnover, the higher the profitability (Aryantini & Jumono, 2021; Hossain, 2021; Pratiwi et al., 2021). The profitability of manufacturing firms declined during the pandemic (Fujianti et al., 2022). Several studies have investigated the pandemic's impact on profitability in various sectors,

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including finance and banking (Khalifaturofi'ah et al., 2023; Wahyuni et al., 2021), telecommunications (Homayoun et al., 2023), and healthcare (Malahayati et al., 2021).

Existing research predominantly examines the profitability of manufacturing firms (Aryantini & Jumono, 2021; Škuflić et al., 2016; Susan et al., 2022). Previous studies (Agegnew & Gujral, 2022; Pratiwi et al., 2021; Susilo et al., 2020) have highlighted factors such as company size, growth, liquidity, leverage, and business activity influencing profitability. However, these findings do not specifically address the impact of COVID-19 on the profitability of manufacturing firms in Indonesia. Earlier research (Aryantini & Jumono, 2021; Susan et al., 2022) focused on small samples of manufacturing firms, whereas the current study will examine 134 firms from the total population. Although previous studies have attempted to analyze the pandemic's impact on manufacturing firms, many have adopted different methodologies, examining only the differences before and during COVID-19 (Qadri et al., 2023; Wahyuni et al., 2021). Thus, this study aims to fill the research gap that previous studies have overlooked.

METHODS

This study examines a population of manufacturing firms listed on the Indonesian Stock Exchange (BEI). From the total of 193 manufacturing firms listed on the BEI, a sample of 134 firms was selected for the research period spanning from 2018 to 2023. The selection criteria encompass manufacturing firms listed on the stock exchange from 2018 to 2023, which have provided complete financial reports from 2018 to 2023, exhibit positive equity and have yet to be delisted. The sample encompasses three primary sectors: the basic and chemical industry, various industrial sectors, and the consumer goods industry. Financial statements were collected by observing and recording data obtained from the official website of Bursa Efek Indonesia.

For data analysis, panel regression with static panels was employed. The researchers conducted the LM test, the Chow test, and the Hausman test. These tests were conducted with the objective of determining the most suitable model for the static panel. The tests helped ascertain whether the common effect model, fixed effect model, or random effect model provided the best fit for the data. The significance of the independent variables concerning the dependent variable was analyzed using the t-test. The panel regression model utilized in this research is as follows:

$$ROA_{it}=\alpha+\beta_1 CR_{it}+ \beta_2 DER_{it}+ \beta_3 TATO_{it}+ \beta_4 DC+\varepsilon_{it} \quad (1)$$

Where:

ROA = represents Return on Asset
DC = denotes a dummy variable for COVID-19
CR = signifies Current Ratio
DER = stands for Debt To Equity ratio
TATO = denotes Total asset turnover.

The dependent variable in this study is profitability, measured using return on assets. We also consider four independent variables: liquidity, leverage, activity, and the dummy

variable for COVID-19. The dummy variable for COVID-19 is a key component of our research, as it distinguishes between the period during COVID-19 and the period before the pandemic. It takes the value of 1 during the COVID-19 period and 0 before the pandemic, helping us to isolate the specific impact of the pandemic on profitability.

The literature offers various approaches to measuring the impact of COVID-19, such as utilizing a dummy variable, examining specific cases affected by COVID-19, or analyzing the period during which the pandemic occurred. For this study, COVID-19 is measured using a dummy variable that distinguishes between the period during COVID-19 and before COVID-19.

RESULTS AND DISCUSSION

This study aims to analyze the influence of liquidity, leverage, activity, and COVID-19 on the profitability of manufacturing firms in Indonesia. The findings reveal that the COVID-19 pandemic did not significantly impact the profitability of Indonesian manufacturing firms between 2018 and 2023. Analyzing 134 manufacturing firms listed on the Indonesian Stock Exchange, the study shows that liquidity did not significantly influence profitability. However, leverage, measured by the debt-to-equity ratio, had a negative and significant effect, indicating that higher debt levels increased interest expenses, thus reducing profitability. Conversely, the activity ratio, measured by total asset turnover, positively and significantly impacted profitability, suggesting that higher asset utilization contributed to better financial performance. The analysis involves several stages, including both descriptive and inferential methods.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Maximum	Minimum
Profitability (ROA)	804	0.0462	0.0985	0.9210	-0.4014
Liquidity (CR)	804	3.1793	8.7217	206.8642	0.1295
Leverage (DER)	804	1.1520	1.4068	17.2106	0.0461
Activity (TATO)	804	1.0024	0.8296	12.6246	0.0031
COVID-19 (DC)	804	0.6667	0.4717	1.0000	0.0000

Source: Data processed, 2024

Table 1 presents the descriptive statistics of the research variables. The table indicates that, on average, manufacturing firms can generate profits of 4.62 percent from their assets. Meanwhile, the ability of manufacturing firms to meet short-term obligations stands at 3.1793. This result suggests that, on average, manufacturing firms have current assets exceeding their current liabilities. The average proportion of debt to equity is also higher at around 115.20 percent. On average, manufacturing firms have net sales proportions almost equivalent to their total assets. This result indicates good operational efficiency as sales still exceed total assets by 1.0024. The descriptive data indicate heterogeneous profitability, liquidity, and leverage variation, while activity and the COVID-19 dummy variable exhibit homogeneous data variation. The data variability of both independent

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and dependent variables appears adequate. The highest data fluctuation occurs in the liquidity variable, with a maximum value of 206.8642 and a minimum value of 0.1295, accompanied by a standard deviation of 8.7217.

Furthermore, Table 2 illustrates the matrix relationship between variables. It's reassuring to note that no value exceeds 0.8, indicating the absence of multicollinearity among the independent variables. This strengthens the reliability of our research. From Table 3, it is observed that ROA negatively correlates with COVID-19, liquidity, and leverage, while it positively correlates with activity.

Table 2. Correlation Matrix

	ROA	CR	DER	TATO	DC
ROA	1				
CR	-0.03534	1			
DER	-0.16291	-0.134885	1		
TATO	0.292588	-0.064152	0.070321	1	
DC	-0.03357	0.050854	-0.03256	-0.02988	1

Source: Data processed, 2024

The next step following descriptive statistics is inferential statistics. In the proposed panel regression model, $ROA_{it}=\alpha+\beta_1 CR_{it}+ \beta_2 DER_{it}+ \beta_3 TATO_{it}+ \beta_4 DC+\varepsilon_{it}$, a static panel regression test is conducted, encompassing three models: the common effect model, the fixed effect model, and the random effect model. Table 3 presents the results of the panel regression.

The panel regression model utilizing common effect, fixed effect, and random effect models yields adjusted R-squared values of 11.76 percent, 57.09 percent, and 16.48 percent, respectively. Based on the F-test, all three models exhibit a good fit as their p-values are less than 5 percent.

Table 3: Panel Regression Results

	Common effect model			Fixed effect model			Random effect model		
Variable	**Coef.**		**Std. Er.**	**Coef.**		**Std.Er.**	**Coef.**		**Std.Er.**
C	0.0310	***	0.0076	-0.0021		0.0078	0.0108		0.0090
CR	-0.0005		0.0004	-0.0004		0.0003	-0.0004		0.0003
DER	-0.0133	***	0.0023	-0.0090	***	0.0028	-0.0109	***	0.0025
TATO	0.0359	***	0.0040	0.0626	***	0.0053	0.0525	***	0.0045
DC	-0.0060		0.0069	-0.0042		0.0049	-0.0049		0.0048
R-squared	0.1219			0.6441			0.1690		
Adjusted R-squared	0.1176			0.5709			0.1648		
F-statistic	27.7419			8.7992			40.6096		
Prob(F-statistic)	0.0000			0.0000			0.0000		

Note : *p<0.1, **p<0.05, ***p<0.01, Coef=Coefficient regression, Std.Er.= Standar Error
Source: Data processed, 2024

After conducting the regression test, the next step involves selecting the best model to address the research question regarding profitability and the influence of independent

variables. Based on Table 4, the preferred model is the fixed effect model due to the Chow test (0.0000 < 0.0500) and the Hausman test (0.0074 < 0.0500) values being below the significance level of 0.05. According to the fixed effect model, the contribution of independent variables, namely liquidity, leverage, activity, and the COVID-19 dummy variable, in explaining the profitability of manufacturing firms, amounts to 57.09 percent. Variables outside the model influence the remaining 42.91 percent.

Table 4. The Best Model Selection Test

Test	Probability	Decision
Chow test	0.0000	Fixed Model
Hausman test	0.0074	Fixed Model
LM-test	0.0000	Random Model
The best Selected Model		***Fixed Model***

Source: Data processed, 2024

Before analyzing the influence of liquidity, leverage, activity, and the COVID-19 dummy variable, classical assumption tests are conducted to meet the assumption of Best Linear Unbiased Estimators (BLUE). Table 5 presents the results of the BLUE test.

Table 5. BLUE Test

Blue test	Multicollinearity	Heteroscedasticity	Autocorrelation
Collinearity	Value of collinearity < 0.8		
Glejser		Value of probability > 0.05	
Durbin watson			Value of DW 2.0771

Source: Data processed, 2024

Based on Table 5, the panel regression model has been cleared of multicollinearity, heteroskedasticity, and autocorrelation issues. Therefore, the analysis can proceed to the next stage, which involves examining the influence of independent variables, namely liquidity, leverage, activity, and the Covid-19 dummy variable, on the profitability of manufacturing firms in Indonesia. Table 6 presents the selected fixed effect model based on the results of the Chow test and the Hausman test.

In the fixed-effect model, the four independent variables—liquidity, leverage, activity, and COVID-19—collectively explain 57.09 percent of the variance in manufacturing firms' profitability. Interestingly, the study reveals that liquidity, as measured by the current ratio, does not significantly influence profitability during the research period. This result implies that liquidity is not a primary indicator of a manufacturing firm's profitability.

The absence of a substantial impact of liquidity, as measured by the current ratio, on manufacturing firms' profitability could stem from various factors. The current ratio assesses a company's ability to meet short-term liabilities using its current assets. While a higher current ratio signifies better liquidity and the prompt payment of short-term debts, this liquidity metric may not directly translate into profitability for manufacturing firms.

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Table 6. Fixed Effect Model

	Fixed effect model	
Variable	**Coef.**	**Std.Error**
C	-0.0021	0.0078
CR	-0.0004	0.0003
DER	-0.0090***	0.0028
TATO	0.0626***	0.0053
DC	-0.0042	0.0049
R-squared	0.6441	
Adjusted R-squared	0.5709	
F-statistic	8.7992	
Prob(F-statistic)	0.0000	

Note : *p<0.1, **p<0.05, ***p<0.01, Coef=Coefficient regression,
Source: Data processed, 2024

One potential explanation for this insignificance is that manufacturing firms may have adopted conservative financial strategies to maintain an adequate liquidity without compromising profitability. These firms likely strike a balance between ensuring they possess sufficient cash to meet short-term obligations and effectively utilizing their assets to generate profits. Moreover, Fujianti et al. (2022) suggest no discernible difference in liquidity among manufacturing firms before and during the COVID-19 pandemic.

Furthermore, industry-specific factors and prevailing economic conditions may influence the correlation between liquidity and profitability. For example, manufacturing firms operating in capital-intensive industries with lengthy production cycles may prioritize efficient asset management and production efficiency over maintaining excessively high liquidity levels. Conversely, firms in cash-intensive industries may prioritize liquidity due to the immediate need for cash flows to support their operations. In the banking sector, El-Chaarani et al. (2023) assert that liquidity creation, in conjunction with asset quality and bank size, enhances bank profitability, particularly during periods of substantial liquidity supply shocks like the COVID-19 crisis. This finding aligns with prior research (Pratiwi et al., 2021; Sulitiyani & Noor, 2022), indicating that liquidity does not significantly impact profitability.

Another piece of evidence that can elucidate why liquidity does not affect profitability is presented in Figure 1. Liquidity values during the research period exhibit the highest variability among the variables, indicating a considerable bias. From Figure 1, the average growth of liquidity in manufacturing firms peaked in 2020 at 4.7800. Upon closer examination of Figure 1, liquidity appears to fluctuate without corresponding fluctuations in profitability. This result raises the question: Why did liquidity in manufacturing firms increase during the COVID-19 period?

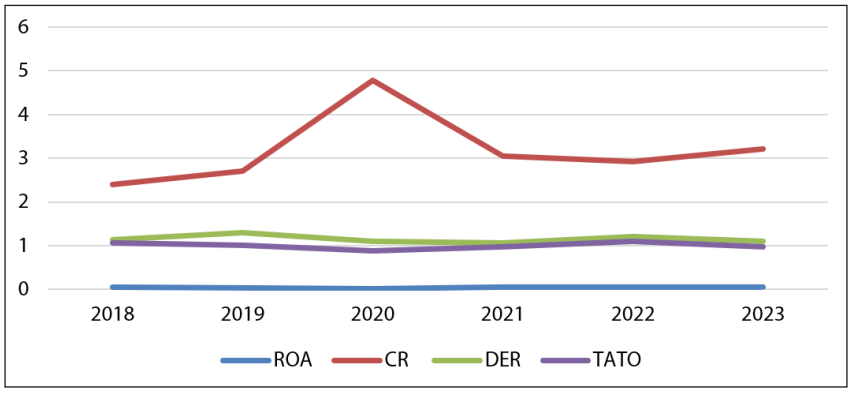
The high level of liquidity in manufacturing firms during the COVID-19 pandemic can be attributed to several factors. Firstly, the surge in demand for essential products, such as healthcare products, personal protective equipment (PPE), and food items, may have played a significant role. This increased demand could have led to a substantial growth in cash flow and liquidity for these firms, indicating a potential for growth even in challenging times.

Secondly, the implementation of cost-saving measures during periods of economic uncertainty, such as the pandemic, may have significantly contributed to the high liquidity levels. Many firms took significant steps to reduce operational expenses, cut capital expenditures, and postpone non-essential projects. These actions not only optimize the use of company funds but also enhance liquidity, providing a sense of financial stability even in turbulent times.

Thirdly, substantial government subsidies and assistance have maintained high liquidity levels. Governments worldwide provided various forms of aid to firms to help them weather the economic crisis caused by COVID-19. This assistance, ranging from direct cash grants to tax exemptions and low-interest loans, played a crucial role in bolstering company liquidity, providing a sense of support from the government.

Lastly, a focus on cash management emerged as a priority during the COVID-19 pandemic. Many firms intensified their cash and liquidity management efforts to navigate the economic uncertainty. This condition involved tightening inventory management, delaying payments, and optimizing revenue cycles. Such intensive focus on cash management could elevate company liquidity levels.

Figure 1. Average Research Variables



Source: Data processed, 2024

Conversely, leverage, as measured by the debt-to-equity ratio (DER), demonstrated a notable negative impact on profitability. This result suggests that elevated debt levels impose increased interest payments on manufacturing firms, diminishing profitability. The higher the leverage, the lower the profitability. The adverse and significant influence of the Debt-to-Equity Ratio (DER) on profitability can be explicated through several mechanisms.

A higher DER indicates more debt than equity, signifying heavy reliance on borrowed capital to fund operations. Consequently, this heightened debt load can escalate financial leverage and interest expenses, exerting pressure on the company's profitability. Elevated debt levels necessitate interest payments, eroding profits and diminishing overall profitability. As debt accumulates, so do interest payments, resulting in an adverse effect on profitability.

Moreover, a heightened DER implies heightened financial risk (Sulitiyani & Noor, 2022). Firms laden with significant debt may need help in meeting debt obligations, particularly during economic downturns or financial strain. This financial risk may

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dissuade potential investors and impact the company's creditworthiness, further impinging on profitability. Additionally, elevated debt levels can curtail financial maneuverability, compelling the allocation of a substantial portion of earnings toward debt repayment, thereby restricting investments in growth prospects or shareholder dividends. Such diminished financial flexibility may impede the company's adaptability to evolving market conditions or capitalization on new business opportunities.

Additionally, investors may interpret a high DER as a sign of financial distress or instability, potentially resulting in a company's stock price decline. Consequently, this could impact the company's market capitalization and shareholder wealth, extending the negative influence of DER on profitability beyond financial ramifications to affect overall market perception and the company's long-term prospects.

The theoretical framework of this study posits that leverage, as measured by DER, exerts a negative and significant influence on profitability in Indonesian manufacturing firms. This finding aligns with prior research investigating the relationship between leverage and profitability across different contexts. For instance, Tao et al. (2022) observed a negative correlation between leverage and profitability in Chinese firms during the pandemic, attributing it to heightened financial risk and reduced profitability due to increased leverage levels. Similarly, previous studies (Agegnew & Gujral, 2022; Hossain, 2021; Pratiwi et al., 2021; Sethi et al., 2023; Tailab, 2014) documented a negative impact of leverage on profitability, linking it to amplified financial constraints and elevated interest expenses amid economic challenges posed by the pandemic. These findings are consistent with earlier studies (Agegnew & Gujral, 2022; Hossain, 2021; Pratiwi et al., 2021), underscoring that heightened reliance on debt collateral diminishes profitability.

While this study's outcomes align with these consistent findings, it is crucial to acknowledge that not all studies have reported a negative correlation between leverage and profitability. Other studies (Alarussi & Gao, 2023; Aryantini & Jumono, 2021; Ifeduni & Charles, 2018) even identified a positive impact of leverage on profitability. Thus, the influence of DER on profitability may vary depending on specific company circumstances, industry dynamics, and economic conditions.

Furthermore, the study unveiled that the activity ratio, gauged by total asset turnover (TATO), wielded a positive and significant effect on manufacturing firms' profitability (Aryantini & Jumono, 2021; Hossain, 2021; Pratiwi et al., 2021). The higher the firm's activity, the higher the profitability of the manufacturing firms. Elevated activity ratios signify efficient asset utilization and, consequently, enhanced profitability. This discovery echoes the findings of research conducted by Arifiana and Khalifaturofi'ah (2022), reinforcing the notion that optimal activity ratios mitigate financial distress and bolster profit generation.

The favorable and substantial influence of the activity ratio, measured by total asset turnover (TATO), on the profitability of manufacturing firms stems from the effective utilization of assets to generate revenue. When a manufacturing firm efficiently employs its assets to drive sales, it signifies proficient operation and resource management, thereby fostering heightened profitability.

A high TATO signifies the company generating greater sales relative to its total assets. This result reflects efficient asset utilization in producing and selling goods or services, amplifying revenue. Effective asset management minimizes idle resources and enhances productivity, positively impacting profitability. Moreover, a higher TATO suggests that the company can bolster revenue without necessitating additional investments in fixed assets. This efficiency translates into enhanced profit margins, as the company can generate more revenue while minimizing operating costs.

Several prior studies have corroborated a positive correlation between activity and profitability across various industries and countries (Aryantini & Jumono, 2021; Hossain, 2021; Pratiwi et al., 2021). For instance, research by Taruli and Panggabean (2019) focusing on firms in Indonesia and Malaysia revealed a positive effect of TATO on profitability. Similarly, a study by Pratiwi et al. (2021) on Indonesian-listed firms highlighted the positive impact of TATO on profitability, particularly in the real estate sector in Indonesia. These findings support the notion that efficient asset turnover contributes to enhanced profitability in manufacturing firms. TATO's favorable and significant impact on manufacturing firms' profitability can be attributed to efficient asset utilization, resulting in increased sales revenue and reduced operating costs. These findings are consistent with numerous previous studies, indicating a recurring trend across diverse industries and countries.

The presence of COVID-19 did not significantly affect profitability, which means that the pandemic will not affect the profitability of manufacturing firms. The variability in profitability data ranged from 2.4 percent to 5.9 percent. The average profitability value before COVID-19 was 5.1 percent, while the average during COVID-19 was 4.4 percent. These findings contradict previous studies (Devi et al., 2020; Pratiwi et al., 2021), highlighting the adverse effects of COVID-19 on profitability, activity, and leverage in various sectors, including real estate and property.

COVID-19 did not impact profitability significantly due to the manufacturing firms' relatively robust financial performance, which is evident in the stability of profitability, leverage, and activity before and during COVID-19. Manufacturing firms were deemed sufficiently resilient to withstand the Covid-19 pandemic. Several reasons explain why COVID-19 did not significantly impact the profitability of manufacturing firms during this period. Many firms have responded proactively to the evolving situation since the onset of the COVID-19 pandemic. Manufacturing firms took anticipatory measures to mitigate its impact, such as securing alternative supply chains, adjusting production to meet changing demands, and reassessing financial policies.

Some manufacturing sectors experienced relatively stable or even increased demand during this period. For instance, demand for specific products such as healthcare supplies, sanitation equipment, and food and beverages may have remained high or even increased during the pandemic, supporting the profitability of manufacturing firms in these sectors.

Furthermore, many governments worldwide provided economic stimulus and financial assistance to firms to help them survive the pandemic. These measures helped manufacturing firms maintain profitability by providing access to additional resources and shielding them from adverse economic impacts. Manufacturing firms may have adopted

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innovations or adapted their business models to address the challenges faced during the pandemic. For example, firms may have improved operational efficiency, expanded their online presence, or adjusted their product portfolios to meet changing market demands. This result is consistent with Gaisani et al. (2021), which found that COVID-19 does not affect the profitability of manufacturing firms in Indonesia.

Profitability holds significant importance for manufacturing firms (Agegnew & Gujral, 2022; Aryantini & Jumono, 2021; Lambey, 2021; Škuflić et al., 2016), as it does for small businesses in the banking sector (Saady et al., 2020). Within the manufacturing sector, achieving high profitability depends on several internal variables examined in this research. Specifically, maintaining low corporate debt (Hossain, 2021), optimizing asset utilization (Ifeduni & Charles, 2018), and operating within a stable economic environment are key factors contributing to improved profitability (Yuen et al., 2022).

These findings underscore the significance of maximizing asset utilization and practicing prudent debt management to enhance profitability within the manufacturing sector. Such insights can be valuable for policymakers and stakeholders in formulating effective strategies to bolster the financial performance of manufacturing firms in Indonesia amidst evolving economic conditions.

CONCLUSION

This study delved into the financial performance and the impact of the COVID-19 pandemic on profitability in Indonesian manufacturing firms spanning from 2018 to 2023. The analysis encompassed 134 manufacturing firms listed on the Indonesian Stock Exchange. The findings unveiled that liquidity and COVID-19 had no significant impact on the profitability of manufacturing firms during the research period. Conversely, leverage, as gauged by the debt-to-equity ratio, exhibited a negative and substantial effect on profitability, suggesting that elevated debt levels translated to heightened interest expenses and diminished profitability. On the other hand, activity, assessed by total asset turnover, demonstrated a positive and notable influence on profitability, signifying that higher activity levels contributed to heightened profitability. This study offers valuable insights into the factors influencing profitability in Indonesian manufacturing firms. The results suggest that prudent financial management can bolster profitability in manufacturing firms.

The policy recommendations from this study are highly pertinent for policymakers and industry practitioners. Policymakers can leverage these findings to design targeted interventions and policies that support manufacturing firms during economic crises. For instance, policies that promote debt restructuring or provide interest relief during economic downturns can help mitigate the negative impact of high leverage on profitability. Furthermore, initiatives that encourage efficient asset utilization and technological upgrades can enhance the financial performance of manufacturing firms. For industry practitioners, the study's insights underscore the importance of maintaining prudent financial management practices. Manufacturing firms should keep leverage levels low to minimize interest expenses and financial risk. Additionally, increasing asset utilization efficiency is crucial, as evidenced by the positive impact of the activity ratio

on profitability. Firms can achieve this by investing in technology and processes that optimize production and inventory management.

It is imperative to acknowledge the limitations of this study. The research relied on panel data from a specific timeframe (2018-2023), and factors influencing profitability may evolve. Moreover, while this study covered a substantial proportion of the manufacturing population in Indonesia, further research could incorporate a broader sample or explore other economic sectors for a comprehensive analysis. In conclusion, this study sheds light on the critical aspects of financial performance and profitability in Indonesian manufacturing firms, particularly during the COVID-19 pandemic. The research provides valuable guidance for industry stakeholders and sets the stage for future research endeavors.

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How Does Nuclear Energy Affect Environmental Pollution? Evidence from the United States

Melike Atay Polat[1], Buket Savranlar[2], Ferhan Arslan[3*]
[1]Mardin Artuklu University, Turkey
[2]Nisantasi University, Turkey
[3]Tokat Gaziosmanpaşa University, Turkey
E-mail: [1]matay@artuklu.edu.tr, [2]buket.altinoz@nisantasi.edu.tr, [3]ferhan.arslan@gop.edu.tr
[*)]Corresponding Author

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Abstract

Research Originality: Nuclear power plant installation activities, which have gained momentum since the 1970s, have made nuclear energy widespread. The US ranks first in the world in nuclear energy use. This article contributes to the existing literature on environmental economics by incorporating environmental technologies and globalization into investigating the impact of nuclear energy on environmental pollution.

Research Objectives: This study aims to analyze the effects of nuclear energy consumption, environmental technologies, and globalization on environmental pollution in the US..

Research Methods: The paper use ARDL approach with the data of 1970-2018 period.

Empirical Results: According to the findings, nuclear energy consumption negatively affects environmental quality in the US both in the short and long run. On the contrary, environment-related technologies contribute positively to environmental quality, reducing carbon footprint in the long run. Also, globalization has an insignificant effect on the environment in both the short and long run.

Implications: Supporting environmental technologies and exchanging nuclear energy with renewable energy sources in the US is thought to improve environmental quality.

Keywords:

nuclear energy; ecological footprint; environmental technologies; ARDL approach

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INTRODUCTION

Economic growth, industrialization, urbanization, and population are key factors in increasing energy supply and demand. The energy that helps individuals carry out their daily activities also affects the socio-economic stability of a country (Sadiq et al., 2022b). On the other hand, environmental pollution is inevitable if increased energy consumption is welcomed by fossil energy sources such as coal, natural gas, and oil. Thus, environmental protection requires the widespread use of cleaner energy sources. One of these alternative sources is nuclear energy. Many studies in the literature have suggested that nuclear energy contributes to improving environmental quality in the fight against climate change (Hassan et al., 2020; Bandyopadhyay & Rej, 2021; Danish et al., 2021; Ali et al., 2022; Majeed et al., 2022; Ozgur et al., 2022; Sadiq et al., 2022a). For Pakistan, Majeed et al. (2022) investigated the asymmetrical effects of nuclear energy on carbon emissions. FMOLS and DOLS estimators showed that nuclear energy has a negative impact on both short-term and long-term carbon emissions. The VECM finds a two-way causal relationship between nuclear energy and carbon emissions. Ozgur et al. (2022) studied the relationship between nuclear energy consumption and CO2 emissions in India from 1970-2016 using the Fourier ARDL test. In India, nuclear energy consumption has been shown to contribute to improving environmental quality. Sadiq et al. (2022a) studied the relationship between nuclear energy and CO2 emissions in BRICS countries using second-generation forecasting approaches. As a result, a bilateral causal relationship has been found between carbon emissions and nuclear energy consumption.

Jahanger et al. (2023) studied the relationship between CO2 emissions, GDP, nuclear energy use, and technological innovation variables using the MMQR method with data covering the top 10 economies that generated the most electricity using nuclear resources from 1990 to 2017. The empirical findings show that nuclear energy has reduced environmental pollution in the lower, middle, and upper percentages. With data covering 1993-2020 for BRICS countries, Hassan et al. (2024) examined the impact of GDP, renewable energy, geopolitical risk, environmental technologies, and nuclear energy consumption on greenhouse gas emissions using the Panel Quantile Regression method. The study's findings indicate that the use of nuclear energy negatively impacts greenhouse gas emissions. Furthermore, the papers of Baek (2015) for the top nuclear-producing countries, Jin & Kim (2018) for the 30 countries using nuclear energy, Saidi & Omri (2020) for the OECD countries, Azam et al. (2021) for China, Bandyopadhyay et al. (2022) for the top nine nuclear energy consuming economies (Canada, China, France, Germany, Japan, South Korea, Sweden, Russia, and the United States), Pata & Samour (2022) for France have proven the negative association between nuclear energy and environmental pollution.

On the other hand, the contribution of nuclear energy to environmental quality has yet to be established. In other words, the environmental impact of nuclear energy is still a subject of debate (Çakar et al., 2022). The negative environmental impact of nuclear energy is caused by radioactive waste. However, there is little evidence that

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nuclear energy pollutes the environment. Bian et al. (2021) focus on the relationship between climate change and earthquakes in Taiwan's nuclear power plants. The findings of the OLS method show that nuclear power plants have a positive relationship between risk perception, climate change, and the presence of earthquakes. Sadiq et al. (2022b) analyzed the impact of nuclear energy consumption on the country's environmental footprint, with the top ten ecological footprints from 1990-2017. The authors used Driscoll-Kraay Standard Errors, FGLS, and Panel Adjusted Standard Errors (PCSE) methods for long-term coefficient estimation. The findings revealed that nuclear energy consumption, environmental technology, and population density have significant negative effects on the ecological footprint and that globalization and economic growth have significant positive impacts on the environmental footprint.

Another important point in this study is investigating the source of environmental pollution in the context of technological innovations related to the environment. Environmental technology reduces the negative environmental impact of human activities through practices that protect natural resources and the environment. Environmental technologies, such as wind stations and photovoltaics, are also used to identify energy generation equipment (Usman et al., 2022). In recent years, developed countries have implemented environmental and technological developments in order to achieve their targets of reducing greenhouse gas emissions (Ahmed et al., 2020). Therefore, the relationship between environmental technology and environmental problems is an issue of interest to many academics and researchers (Usman & Hammar, 2021). Since the late 1950s, the relationship between environmental quality and technological progress has been investigated (Dietz & Rosa, 1997).

However, the study of the relationship between environmental technological innovations and environmental pollution is more recent. Ahmed et al. (2020) analyzed the relationship between environmental technological change, CO2 emissions, fossil and renewable energy consumption, and economic growth in Brazil, India, China, and South Africa. They found that developments in environmental technology could reduce CO2 emissions. Bai et al. (2020) determined that renewable energy technologies increase CO2 emissions in China. Alataş (2022) found that environmental-related technologies did not significantly impact CO2 emissions from the transportation sector between 1977 and 2015 for 15 EU countries. Hussain et al. (2022) concluded that environmental technologies reduced carbon emissions for E-7 countries. Fatima et al. (2023) examined the relationship between foreign direct investment inflows, trade openness, environmental technologies, environmental taxes, economic growth, and environmental pollution using data covering 1990-2020 for 36 OECD countries using the Panel ARDL method. Environmental technologies have a negative impact on CO2 emissions both in the long term and short term.

Another factor that contributes to economic growth is globalization (Panayotou, 2000). Globalization affects the environment through economic, political, and social integration (Kalaycı & Hayaloğlu, 2019). The environmental impacts of globalization

can be positive or negative. The positive effects of globalization on the environment can be reflected in the study of the ozone layer and the promotion of environmental norms and standards in the management of climate change issues (Kirkman, 2015). Moreover, globalization contributes to developing new technologies and raises environmental standards by improving the environmental awareness of individuals in countries that apply environmentally friendly production methods. One recent study that identified the positive impact of globalization on the environment was carried out by Aluko et al. (2021). Aluko et al. (2021) studied the relationship between globalization and environmental degradation in 27 selected industrialized countries and found that economic globalization reduces environmental deterioration.

Farooq et al. (2022) studied the relationship between globalization and environmental degradation using the panel's quantile regression method for 180 countries. General and political globalization help improve environmental degradation, while economic globalization pollutes the environment. Mehboob et al. (2024) examined the CS-ARDL method, which consists of nuclear energy consumption, environmental taxes, globalization of trade, economic growth, population density, and consumption-based CO2 emissions in the five countries with the highest carbon emissions between 1990 and 2020. According to the findings, globalization has contributed to improving environmental quality. Despite these positive effects, globalization can also cause an explosion. Globalization can undermine the quality of the environment by increasing production, energy consumption, international transport, and the use of natural resources (Kalaycı & Hayaloğlu, 2019).

Furthermore, liberalization of globalization trade can increase environmental pollution in these countries, causing polluting-intensive firms to move their investments to countries with weaker environmental laws (Gallagher, 2009). Empirical studies have also concluded that globalization increases environmental pollution. Pata (2021) found that globalization increased CO2 emissions in BRIC countries. Using the ARDL approach, Yurtkuran (2021) identified that globalization increased CO2 emissions for Türkiye. Globalization has deteriorated the quality of the environment, identified the MENA countries in their study by Heidary et al. (2021). One recent study by Haq et al. (2024) found that globalization increases environmental pollution in SAARC countries.

Nuclear energy is a source of energy that contributes to the solution of countries' energy supply problems (Ozgur et al., 2022). Thus, it may be interesting to discuss determining the environmental impact of nuclear energy compared to other environmentally friendly sources. Previous studies focused on the impact of nuclear energy consumption on economic growth, and research on the environmental effects of nuclear power has remained limited. It addresses the research gap by analyzing the impact of nuclear energy and other factors on environmental quality, particularly in the US. This study aims to investigate the relationship between nuclear energy consumption, environmental technologies, globalization, and environmental

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pollution in the United States during the 1970-2022 period by applying the ARDL method.

This study has some contributions to the current literature. The first is that while studies investigate the relationship between nuclear energy consumption and environmental pollution, research into environmental technologies and the impact of globalization should be more noticed. Globalization, on the one hand, promotes resource consumption and increases environmental pollution by increasing production, while on the other hand, it promotes environmentally friendly solutions by promoting technological advances. As environmental technologies evolve, cleaner energy production is also encouraged, and the risk of environmental pollution can be reduced. That is why we have incorporated the indicator of technological innovation and globalization into the relationship between nuclear energy consumption and environmental quality. Secondly, it is worth studying the environmental impact of nuclear energy on the US. As the world's richest and most developed country, the US economy depends on fossil-fuel energy sources, which are responsible for significant global carbon emissions. The US economy is one of the countries with the largest share in nuclear energy consumption. The third contribution of the study concerns the method. Using the ARDL method, our research analyses the short and long-term impact of nuclear energy, globalization, and environmental technologies on environmental quality. This study provides valuable insights into how the environmental quality of the US economy is developing.

The relationship between the quality of nuclear energy and the environment in the US (Pan & Zhang, 2020; Hassan et al., 2020; Hassan et al., 2023; Kartal et al., 2023), the relationship between environmental technologies and environmental quality (Adebayo & Özkan, 2024; Chien et al., 2021; You et al., 2022) and the relation between globalization and quality of the environment (Sun et al., 2021; Usman et al., 2020; Gangopadhyay et al., 2023) have been studied separately in the literature. As far as we know, no other study in the US examines the impact of nuclear energy consumption, environmental technologies, and globalization on environmental pollution (ecological footprint). So, this study can fill this gap in the literature.

METHODS

This section describes the sources of the relevant data by describing the data set using the study. The basic econometric model standing for the relationship was then introduced. Methodological information on the econometric method used to test this relationship has been provided and the test results have been. The study examines the relationship between environmental quality, globalization, environmental technologies, and nuclear energy consumption with data from the 1970-2022 period for the United States. For this purpose, the data set used in the study and the source of the related data are shown in Table 1.

Table 1. Used Variables and Resources

Variable	Description	Explanation	Resource
ECF	Ecological footprint	Carbon footprint per person (Gha)	Global Footprint Network
GDP	Economic growth	GDP per capita (2015 constant)	WDI
NUC	Nuclear energy consumption	Nuclear energy consumption per capita (kWh))	Our World in Data
TEC	Environmental technologies	Total number of patents for environmental technologies	OECD statistics
GLOB	Globalization	Globalization Index	KOF Swiss Institute of Economics
URB	Urbanization	Proportion of total urban population	WDI
TRA	Trade	Total trade share in GDP	WDI

The basic function adopted to describe the relationship using the variables in Table 1 is as follows:

$$ECF_t = f\ (GDP_t,\ NUC_t,\ TEC_t,\ GLOB_t,\ URB_t,\ TRA_t) \quad (1)$$

A time series model created around this model is as follows:

$$ECF_t = \beta_0 + \beta_1 GDP_t + \beta_2 NUC_t + \beta_3 TEC_t + \beta_4 GLOB_1 + \beta_5 URB_t + \beta_6 TRA_t + \mu_t \quad (2)$$

In the model, the ECF represents the ecological footprint per capita, is adopted as an environmental quality indicator, and constitutes the model's dependent variable. As independent variables, it represents GDP per capita, NUC per person consumption of nuclear energy, TEC environmental technologies, the degree of globalization of the GLOB, the urban population of the URB, and the share of total trade in GDP. μ_t is included in the model as an error term, while t corresponds to the time dimension of the study (1970-2022).

The analysis phase of the study was primarily tested with Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The different degrees of stability of the series depending on the unit root results obtained from both test results required the adoption of the Autoregressive Distributed Lag (ARDL) approach in the subsequent phase of co-integration and for the estimation of the short- and long-term ratio.

This approach, introduced by Pesaran & Shin (1995) and Pesaran et al. (2001), supplies consistent estimates of asymptotically normal long-term coefficients, regardless of whether they are series I (0) or I (1). The ARDL boundary test equation is formulated as follows (Pesaran & Shin, 1995):

$$\Delta ECF_t = \alpha + \sum_{i=1}^{z} \beta_{1i} \Delta(ECF)_{t-i} + \sum_{i=0}^{z} \beta_{2i} \Delta(GDP)_{t-i} + \sum_{i=0}^{z} \beta_{3i} \Delta(NUC)_{t-i} + \sum_{i=0}^{z} \beta_{4i} \Delta(\mathrm{TEC})_{t-i} + \sum_{i=0}^{z} \beta_{5i} \Delta(GLOB)_{t-i} + \sum_{i=0}^{0} \beta_{6i} \Delta(URB)_{t-i} + \sum_{i=0}^{z} \beta_{7i} \Delta(TRA)_{t-i} + \beta_8 ECF_{t-1} + \beta_9 GDP_{t-1} + \beta_{10} NUC_{t-1} + \beta_{11} TEC_{t-1} + \beta_{12} GLOB_{t-1} + \beta_{13} URB_{t-1} + \beta_{14} TRA_{t-1} + \varepsilon_t \quad (3)$$

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Where Δ represents the difference between the delays of the dependent and independent variables. The difference between each delay of dependent and independent variables represents the short-term dynamics. The ratio of each delay value of the variables that may occur in the dependent variables to the relative variable shows the long-term dynamics.

Long-term co-integration is calculated using F statistics, and the test results are evaluated on the critical values developed by Pesaran et al. (2001). These critical values are divided into two sections. First, all series are assumed to be I (1). The second assumption is that the variables are I (0). If the statistical value of F remains above the upper limit, the empty hypothesis of non-compliance is rejected. This results analysis, which indicates the existence of synchronization, takes it to the next stage, enabling the obtaining of an error correction model where short-term dynamics are obtained. This error correction model, calculated using the ARDL boundary test, can be formulated in equation 4. A negative and statistically significant ECT coefficient means that short-term imbalances in explanatory variables are balanced over the long term.

$$\Delta ECF_t = \alpha + \sum_{i=1}^{z} \beta_{1i} \Delta(ECF)_{t-i} + \sum_{i=0}^{z} \beta_{2i} \Delta(GDP)_{t-i} + \sum_{i=0}^{z} \beta_{3i} \Delta(NUC)_{t-i} + \sum_{i=0}^{z} \beta_{4i} \Delta(\mathrm{TEC})_{t-i} + \sum_{i=0}^{z} \beta_{5i} \Delta(GLOB)_{t-i} + \sum_{i=0}^{\mho} \beta_{6i} \Delta(URB)_{t-i} + \sum_{i=0}^{z} \beta_{7i} \Delta(TRA)_{t-i} + \sum_{i=0}^{z} + \beta_{8i} ECT_{t-1} + \vartheta_t \quad (4)$$

RESULTS AND DISCUSSION

In the analysis part of the study, a unit root test of the series was first performed. Both ADF and PP unit root tests were used. The results of both tests for both level and differential variables are summarized in Table 2. When examining Table 2, the ECF, GDP, TEC, GLOB, URB, and TRA variables remained stable at the first difference from both test results. However, results have been obtained that the NUC variable is stable. So, it can be said that the variables in the model have different degrees of integration. In this case, it is considered appropriate to adopt an ARDL approach, which is a time series analysis technique. In this context, co-integration tests were first conducted with the ARDL (3,3,0,4,3,0,4) model (see Table 3).

Table 2. Unit Root Test

	ADF		PP	
Variables	**Level**	**1 Difference**	**Level**	**1 Difference**
ECF	-0.013	-6.265***	-0.118	-6.214***
GDP	-1.528	-6.324***	-1.954	-6.307***
NUC	-2.657*	-4.436***	-10.596***	-4.750***
TEC	-0.596	-7.070***	-0.659	-7.070***
GLOB	-1.934	-5.992***	-1.934	-5.994***
URB	-0.341	-3.711**	0.967	-5.101***
TRA	-1.880	-6.104***	-1.912	-7.360***

* and *** indicate the statistical significance levels of %10 and %1 respectively.
Source: Data processing

Table 3. Co-Integration Relationship Results

		%10		%5		%1	
k	**F statistic**	**I (0)**	**I (1)**	**I (0)**	**I (1)**	**I (0)**	**I (1)**
6	11.923	1.99	2.94	2.27	3.28	2.55	3.61

According to Table 3, the F-statistical value was calculated at 11.923, showing that there is a long-term correlation between the series since the result is greater than the critical value at the 1 percent significance level. After the long-term co-integration relationship has been identified, the short- and longer-term ratio of the ARDL is moved to the stage of obtaining predictive results. Table 4 shows the results of the ARDL short-term error correction model.

The results of the analysis of short-term dynamics are in Table 4. Firstly, the result for the ECM coefficient, which stands for the ARDL model error correction ratio, is negative and statistically significant. This result means that short-term deviations recover rapidly over the long term. Nuclear energy consumption has a negative short-term impact on environmental quality in the United States. So, an increase in US nuclear energy consumption increases the carbon footprint by about 0.08 percent in the short term. Similarly, short-term economic growth, technology, and overall trade impact the carbon footprint, negatively affecting environmental quality in the US.

Analysis findings show that although nuclear energy is an important source of pollution in both the long and short run, this effect becomes more evident in the long run. This significant effect in the long run may be considered because of neglecting the environmental damage of nuclear energy in the short run. Therefore, the damage caused to sustainability over time by measures not taken in the short run for the negative impact of this energy source is remarkable. While the results of environmental technologies produce positive environmental effects with a delay of one, two, and three periods, this effect disappears in the long run. This result emphasizes the importance of patents, which are indicators of environmental technology, in areas that serve sustainability in the long run.

According to the ARDL's long-term ratio estimates, the impact of nuclear energy consumption on environmental pollution is not to be underestimated. The long-term effect is stark: an increase in nuclear energy consumption leads to a 0.47 percent rise in environmental pollution. While trade and globalization ratios show a negative trend, the environmental pollution reduction effect of GDP is statistically insignificant in the long term. Urbanization, on the other hand, has a significant long-term impact on environmental pollution. However, environmental technologies don't have a long-term positive impact.

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Table 4. ARDL Short and Long-term Analysis Results

ARDL Short-term Analysis Results			
Variable	**Coefficient**	**t-statistic**	**Prob.**
Δ(ECF (-1))	-0.190	-2.014	0.057
ΔNUC	0.083	3.043	0.006
Δ(NUC(-1))	-0.012	-0.488	0.630
Δ(NUC(-2))	0.080	3.325	0.003
Δ(NUC(-3))	0.079	2.897	0.008
ΔTEC	0.013	14.067	0.000
Δ(TEC(-1))	-0.047	-10.797	0.000
Δ(TEC(-2))	-0.055	-11.716	0.000
Δ(TEC(-3))	-0.053	-10.802	0.000
ΔGDP	0.930	9.141	0.000
Δ(GDP(-1))	0.566	3.144	0.005
Δ(GDP(-2))	-0.451	-3.681	0.001
Δ(GDP(-3))	0.281	2.535	0.019
ΔGLOB	0.001	1.320	0.201
Δ(GLOB(-1))	0.004	2.586	0.017
Δ(GLOB(-2))	0.000	0.286	0.777
Δ(GLOB(-3))	0.006	5.248	0.000
ΔTRA	0.000	1.432	0.167
Δ(TRA(-1))	0.003	3.987	0.000
Δ(TRA(-2))	0.004	7.616	0.000
Δ(TRA(-3))	0.003	4.574	0.000
ECM(-1)	-0.234	-11.347	0.000
ARDL Long-term Analysis Results			
NUC	0.474	3.797	0.001
TEC	0.262	1.718	0.101
GDP	-1.167	-1.155	0.261
GLOB	-0.022	-1.942	0.066
URB	0.085	4.347	0.000
TRA	-0.023	-4.708	0.000
C	-1.313	-0.394	0.697

Source: Data processing

Table 5. Diagnostic Test Results

Test	F statistic	Prob.
Breusch-Godfrey Serial Correlation LM Test	7.204	0.147
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.628	0.873
Ramsey RESET Test	1.069	0.314
	Jarque-Bera	Prob.
Normality Test	1.747	0.417

Source: Data processing

Considering the positive and long-run negative impact of GDP on environmental pollution in the short run, the importance of technology may be understood more clearly. The development of technology, whose importance in growth is undeniable, towards more environmentally friendly areas in the long run may reverse the environmental damage of economic growth. The increasing effect of urbanization on environmental pollution is a predictable result when considered on the axis of technology and growth. Although globalization and trade variables have a positive but insignificant effect on environmental degradation in the short run, both variables have a reduction in environmental pollution in the long run. It is a known fact that these two variables are complementary due to the increasing trade volume caused by globalization. Thus, the positive contribution of the US's trade as a developed country with developing countries specializing in pollution-intensive production to the US's carbon emissions is understood.

While nuclear energy contributes to environmental quality according to the widespread literature (Hassan et al., 2020; Bandyopadhyay & Rej, 2021; Danish et al., 2021; Ali et al., 2022; Majeed et al., 2022; Ozgur et al., 2022; Sadiq et al., 2022a), the opposite results are obtained in this study. The empirical outcome of both the long and short-term environmental impact of nuclear energy consumption is consistent with the results of studies by Bian et al. (2021). In fact, the operation of nuclear power plants without harming the environment is a hot topic. This underscores the need for further research and policy development in the field of nuclear energy. Although the use of nuclear power plants is an effective method for clean energy production, these power plants also have environmental risks. Radiation from nuclear plants pollutes water, air and soil. This brings negative effects on people and natural life.

Therefore, radiation and nuclear waste density are the biggest environmental disadvantages of nuclear power plants. On the other hand, since this study focuses on nuclear energy consumption, it reveals that the environmental aspects of the usage areas of this energy source should be investigated. The result means that nuclear energy, which the US economy considers an environmentally friendly energy source, is part of the country's environmental degradation. The results on the positive contribution of environmental technologies to the environment in the short run are like those of Ahmed et al. (2020) and Fatima et al. (2023). Thus, the findings on the environmental impact of nuclear energy consumption overlap with the limited number of studies in the literature that

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revealed this negative impact. In contrast, the results on environmental technology are consistent with widespread literature that reached similar findings.

Figure 1. Result of CUSUM and CUSUM of Squares

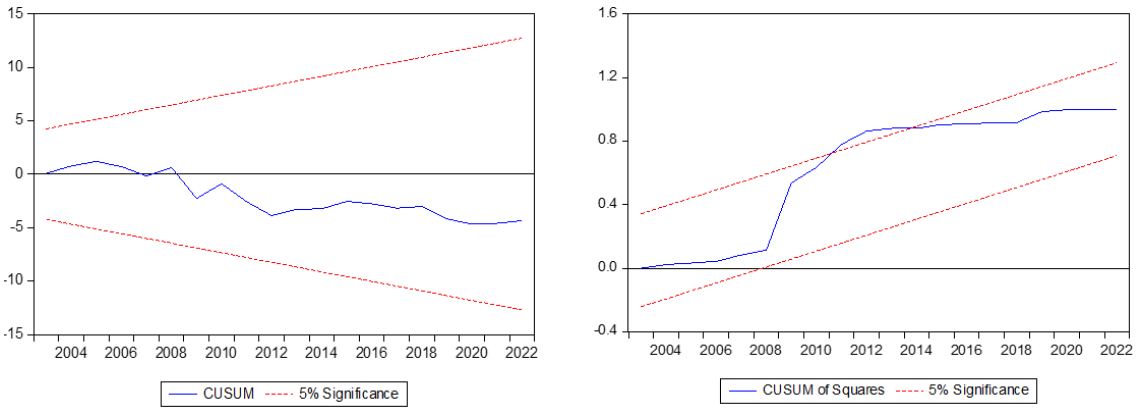

Table 5 displays the results of diagnostic tests aimed at identifying any potential econometric issues with the study model. The Breusch-Godfrey autocorrelation test, the Breusch–Pagan variable variance test, and the Ramsey RESET stability test were all conducted, and the model was found to be free of any statistical problems. The normality test further supported these results. Figure 1 provides a visual representation of the model's stability and any structural changes. The conclusion drawn from the CUSUM and CUSUMQ tests was that the model remained stable throughout the review period, without any structural alterations, thereby instilling confidence in the reliability of our results.

CONCLUSION

The study aims to analyze the impact of nuclear energy consumption, environmental technologies, and globalization on environmental pollution in the United States. The study used the ecological carbon footprint indicator as an indicator of environmental pollution. According to the findings, nuclear energy consumption has a negative impact on environmental quality in the United States, both in the short and long term. On the contrary, while long-term environmental technologies positively contribute to environmental quality with a reduced carbon footprint, globalization has not been seen to have a significant effect in the short or long term. The results show that the US is the world's leading source of nuclear energy consumption and faces environmental costs.

In light of the findings, US nuclear energy consumption is a significant threat to the environment, while developments in environmental technologies contribute positively to the country's environmental quality. Considering that nuclear energy consumption is a widely used energy source for electricity generation, minimizing pollution caused by nuclear energy use is vital for sustainable energy production. On the other hand, the view that nuclear power plants do not emit greenhouse gases has appeared today,

especially in the United States, which has a significant capacity to use nuclear energy, because the negative impact on environmental quality is essentially inevitable in nuclear power plant installation activities. Thus, exchanging nuclear energy with renewable energy sources will be a significant environmental breakthrough in all economic production and consumption processes. At the same time, all technological innovations that contribute to environmental quality in the environment and fields should be encouraged and adopted in all sectors of the economy that are environmentally relevant. There are precautions to be taken to prevent environmental risks. These measures include educating industrial waste, transitioning to clean energy production, recycling, and using waste management systems.

However, many studies are being carried out to reduce the environmental risks of nuclear power plants. For example, special storage facilities are built for nuclear waste management to ensure that waste is controlled. However, it is not possible to eliminate the environmental risks of nuclear power plants. Therefore, precautions must be taken, and the environmental impacts of nuclear power plants must be constantly inspected. Also, policies supporting investments in environmental technologies may be complementary to these measures. Environmental damage may be minimized with patent applications that contribute to the development of environmentally friendly technologies in waste management.

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Does Research and Development Influence Balance of Trade? A Noble GMM-PVAR Analysis

Kumar Debasis Dutta[1], Mallika Saha[2*], Asif Faysal[3]
[1,3]Patuakhali Science and Technology University, Patuakhali, Bangladesh
[2]University of Barishal, Barishal, Bangladesh
E-mail: [1]debasisdutta@pstu.ac.bd, [2]msaha @bu.ac.bd, [3]asiffaysal.pstu@gmail.com
[*)]Corresponding Author

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Abstract

Research Originality: Research and development expenditure (RDE) is essential for international trade to evolve continuously, especially during the fourth industrial revolution (4IR). Despite this significance, research on RDE and balance of trade (BOT) must be substantially improved. To the best of our knowledge, this study is the first to investigate the RDE-BOT nexus.

Research Objectives: This study aims to investigate the causal relationship between RDE and the balance of trade (BOT).

Research Methods: Using panel data of 64 countries, we analyse RDE-BOT relationship by employing the generalized method of moment panel vector autoregressive (GMM-PVAR) techniques.

Empirical Results: The results show that RDE and BOT affect each other. RDE may initially have a detrimental effect on BOT; however, investment in RDE improves export competitiveness and thereby upholds BOT.

Implications: Overall, the findings offer a nuanced understanding of RDE's potential benefits on trade outcomes and guide policymakers seeking to optimize their countries' trade positions in an increasingly globalized and knowledge-intensive economy.

Keywords:
balance of trade; research and development; GMM-PVAR

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INTRODUCTION

The BOT of a country, which is determined by its net export, is a crucial indicator for gauging its economic performance (Ahad, 2017), and to ensure a positive net export, RDE plays an important role (Sandu & Ciocanel, 2014). RDE, to address the contemporary challenges and foster growth during the 4IR, has become an unavoidable economic consideration, which, for its significance in the export market, has reached $1.7 trillion across the globe.

RDE, by affecting production capacity and participation in international trade, may substantially influence a country's trade balance. Particularly, by facilitating efficiency, quality of manufacturing activity, and advancement of goods and services, RDE can foster export diversification, e-commerce and e-trade, supply chain efficiency, and practical resource usage, ultimately reducing a negative trade balance (TEAM, 2023).

RDE-based innovations, which are more radical than non-RDE-based, generate products or services of a more significant innovation depth and provide more robust insulation against economic crises (Laursen & Salter, 2006). Though the outbreak of COVID-19, which has caused a 3.2% decrement in the global economy during mid-2020 (UN, 2020), the investment in RDE has exhibited a consistent average annual growth of 4.7% over the past decade (UIS, 2022), which indicates that countries have recognized the crucial role of RDE to facilitate economic recovery and foster sustainable growth in the face of various economic difficulties.

Theoretical studies also suggest that RDE reduces technological gap and endorses efficiency, innovation, and quality, gives birth to new products with competitive advantages, and leads to export growth (Grossman & Helpman, 1990; Keesing, 1967). Researchers have made a number of empirical attempts to investigate these theoretic claims, who have recognized RDE as a factor that influences product and process innovation of exporting firms, which produces superior return returnsporting concerns than domestic sales (Peters & Roberts, 2022). Following this higher payoff, exporting firms allocate higher RDE than domestic firms, endogenously generating higher productivity growth rates and boosting export performance (Aw et al., 2011). Even small and medium-sized firms' participation (SMEs) significantly and positively depends on the RDE-sales ratio (Falk & de Lemos, 2019). Especially in the case of manufacturing firms, RDE helps to innovate technologies and introduce better processes, which can make production easier (Souder & Padmanabhan, 1989; Van Beveren & Vandenbussche, 2010)and more efficient (Haaland & Kind, 2008). Besides, the high-tech industry is highly involved in RDE, where there is a positive correlation between total RDE and the level of exports with the dominance of private RDE (Sandu & Ciocanel, 2014).

The relationship between RDE, production, and export performance can better define the export scenario. RDE has a larger impact on productivity both in the present and future (Antonietti & Cainelli, 2011; Halpern & Muraközy, 2012; Ricci & Trionfetti, 2012). Quality is one of the prerequisites to attain export success and productivity (Lages et al., 2009), which can be maintained through product differentiation, where RDE plays a key role (Lin & Saggi, 2002).

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Theories and empirical evidence indicate that companies invest in RDE to differentiate products and services from competitors and to sustain in the competitive market(Cellini & Lambertini, 2002; Grossman & Helpman, 1990). Higher productivity, advanced production processes, contemporary technologies, and product differentiation together sponsor a firm as well as an economy to export more, which suggests RDE has a positive correlation with export performance (Barrios et al., 2003; Carboni & Medda, 2018; Girma et al., 2008; Ito & Pucik, 1993).

Unlike the RDE-export relationship, RDE's relationship with import has been researched with a niche orientation for special aspects. Theoretical propositions regarding the RDE-import link are mixed, which suggests that depending on the legality and cost, parallel import, in general, might influence firms to reduce RDE (Li & Maskus, 2006), though cheaper R&D fuels imports of inputs and liberalization and easy access to inputs might stimulate RDE (Bøler et al., 2015), especially for high-tech industries import competition might elevate RDE (Zietz & Fayissa, 1992). The empirical discourse encompasses a few studies that have discussed the relationship between technology import and RDE. Scholars argue that, in some instances, RDE and technology imports are symbiotic in terms of innovation strategy. Technology import is considered beneficial for RDE because of its innovation benefits and process modification, which can increase productivity (Chang & Robin, 2006; Gonchar & Kuznetsov, 2018). However, importing technology by firms with formal research institutes does not complement the RDE; instead, in the presence of international innovation technology, importing substitutes RDE (Lee, 1996) and emphasizing domestic RDE efforts tend to reduce the reliance on importing technology (Kim & Stewart Jr, 1993). Moreover, importer firms are found to have higher RDE than non-importer firms (Katrak, 1989), and import competition induces RDE to be reallocated towards more productive and profitable firms (Xu & Gong, 2017).

However, aside from the growth of worldwide RDE and its significance in achieving a positive trade balance, the impact of RDE on BOT still needs to be explored, with just a few studies on RDE's impact on either exports or imports providing an incomplete picture. This study aims to shed light on the causal relationship between RDE and BOT for an unbalanced panel of 64 countries covering the period 1996 to 2020 to address this empirical exigency and lack of systematic investigation regarding the direct relationship between RDE and BOT using advanced econometric techniques, GMM-PVAR.

The contribution of this study is multidimensional. We have investigated the relationship between RDE and BOT, while most of the previous research has investigated the impact of RDE on either import or export performance only. Studying BOT in this context, instead of considering either export or import individually, enables us to address the existing trade-RDE debate by offering findings that link both export and import to the research and development activity in a single setup.

Moreover, studies discussing the RDE-import relationship have primarily focused on the technology import, whereas we have considered BOT. Therefore, this study complements the previous studies by encompassing the holistic export-import tendency of the selected economies.

To our knowledge, this paper is the first of this nature. Empirically, we explored the unique importance of RDE as a favorable contributor to achieving a positive BOT. Integrating RDE as a catalyst of innovation and competitiveness can significantly influence a country's net exports. Though RDE may initially be disruptive to the BOT, a nation should actively partake in RDE, recognizing its impact and potential to tap into overseas trade and global economic trends. RDE generates synergy by driving improvements and efficiencies.

Additionally, unlike previous research, this study adds to the current literature with results derived by advanced econometric methodologies such as GMM-PVAR. The findings, inferring the causality between RDE and BOT, help better understand RDE's distinct implications and guide policy circles in developing appropriate strategies for improving the economic performance of the selected nations.

METHODS

Due to the availability of RDE data, we use an unbalanced panel of 64 countries and years ranging from 1996 to 2020 to examine the causal relationship between RDE and BOT. The Data for RDE and BOT are sourced from the World Bank. Inspired by the trade theory of the technology gap, numerous research initiatives have been undertaken to investigate the relationships between innovation or RDE and trade. However, due to the need for studies investigating the holistic measure of trade, we investigate the relationship between RDE and BOT using the GMM-PVAR estimation. The primary justification behind our utilization of GMM-PVAR is to investigate the endogenous link between RDE and BOT. Second, the complex interaction between RDE and BOT will be deciphered with the help of panel Granger causality analysis, which allows for considering the potential of both unidirectional and bidirectional causalities. Impulse response functions (IRF) can be utilized to analyze the dynamic links between RDE and BOT.

In order to have a better understanding of the variables, we begin the GMM-PVAR analysis by doing several panel unit-root tests. The construction of the GMM-PVAR model continues with the following phase: determining the appropriate lag order for the variables. The degree of freedom is decreased when the lag order is too long, and the sample may appear skewed. When determining whether delayed order is optimal, we take into consideration the characteristics of the sample and use the Akaike information criterion (AIC), the Schwarz criterion (SC), and the Hannan and Quinn information criteria (HQIC). After that, we applied the GMM-PVAR model in the following way: Y_{it} = [Research and development expenditure $_{it}$, Balance of trade $_{it}$] is a vector of k endogenous variables for country i at time t. The reduced form of the dynamic relationship among the endogenous variables can be described by:

$$Y_{it} = A_{0i} + A(\ell)Y_{it-1} + e_{it}$$
$$i \in \{1, 2, ..., N\}, t \in \{1, 2, ..., T_i\} \quad (1)$$

where A_{0i} is a 1×k vector of time-invariant country-specific intercepts, $A(\ell)$ are k×k matrices of lagged coefficients, $A(\ell) = \sum_{j=1}^{p} (A_{j\,j-1})$, that collect the own and cross-

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effects of the ℓ lag of the dependent variable on their current observations. Finally, e_{it} is a 1 × k vector of idiosyncratic disturbances where $E(e_{it}) = 0$, $E(e_{it,}\ \acute{e}_{it}) = \Sigma_e$ (being Σ_e a nonsingular matrix) and $E(e_{is,}\ \acute{e}_{is}) = 0$ for t≠s.

RESULTS AND DISCUSSION

Descriptive statistics

Descriptive statistics reveal the statistical parameters of the variables used in the study (see Table 1). BOP is characterized by a large variation across the observation, with a standard deviation of 94547.028 and a mean of 4902.31. This large variation is attributed to the wide range of trade balance encompassing the trade deficit of the USA, amounting to -763533 in 2006, to China's trade surplus, amounting to 358572.63 in 2000. The reasons for such variations in trade balances among countries are, on the one hand, large government spending, strong domestic demand, cheap international alternatives, home overconsumption than domestic production, low rate of domestic savings relative to investment needs, and on the other, greater demand for a country's goods and services at the global market, edge over others in producing and exporting of particular goods, undervalued home currency, and cheaper exports. Regarding RDE, though some countries are found to be less research-focused compared to others (Colombia has an RDE of 0.131), relative to BOP, RDE is less dispersed, with a standard deviation and mean of 0.996 and 1.629, respectively.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min.	Max.
BOP	1625	4902.31	94547.028	-763533	358572.63
RDE	1518	1.629	0.996	0.131	5.436

To investigate the causality between RDE and BOT, first, we take log of both the variables and identify the panel unit-root of them (see Table 2). Before estimating the GMM-PVAR, we check out the panel unit-root of the variables. We perform both first- (Table 2) and Pesaran's second-generation (Pesaran, 2007) tests. The result of Pesaran's second generations shows in Table 3. While first-generation tests need variables to be independent across nations in order to calculate unit-root, which is typically difficult to do for co-movements of macroeconomic variables, second-generation test (Pesaran, 2007) allows for cross-sectional reliance of variables in a panel. The results reveal that all variables with and without trend at their first differences have stationarity.

Choosing the right lag-order is crucial when performing a GMM-PVAR analysis. Lag shorter than the minimum needed to meet the criteria may not adequately explain the system's mechanics and may also add bias to the results due to missing or neglected factors (Boubtane et al., 2013). Besides, over-parameterization may occur if there are unwarranted lags in data collection. In light of this, we select the second-order GMM-PVAR model using the overall coefficient of determination as given by Akaike information

criterion (AIC), Schwarz criterion (SC) and Hannan and Quinn information criterion (HQIC) (Andrews & Lu, 2001). Since OLS estimation may provide biased coefficients in dynamic models, we employ the generalized method of moments (GMM) to do the estimation. Furthermore, we transform all the variables using forward mean differencing or orthogonal deviations (Abrigo & Love, 2016; Love & Zicchino, 2006) and to remove the fixed effects, which are correlated with regressors (Gabriel & de Santana Ribeiro, 2019).

Table 2. First-generation panel unit-root test

Variables	No trend		Trend		Cross Sections	Observations
	Statistic	Prob	Statistic	Prob		
Panel A: Augmented Dickey–Fuller unit-root test						
logRDE	119.2693	0.7399	141.7124	0.2276	65	1518
ΔlogRDE	564.0554	0.0000	469.9221	0.0000	65	1453
logBOT	129.7710	0.4892	123.0526	0.6544	65	1625
ΔlogBOT	751.2383	0.0000	578.9709	0.0000	65	1560
Panel B: Phillips–Perron unit-root test						
logRDE	130.0606	0.4820	122.2152	0.6741	65	1518
ΔlogRDE	1016.5847	0.0000	899.1753	0.0000	65	1453
logBOT	117.4831	0.7767	124.3738	0.6227	65	1625
ΔlogBOT	1129.6121	0.0000	900.2099	0.0000	65	1560
Panel C: Im–Pesaran–Shin unit-root test						
logRDE	7.1442	1.0000	4.0771	1.0000	65	1518
ΔlogRDE	-19.1504	0.0000	-6.2638	0.0000	65	1453
logBOT	0.6449	0.7405	-1.5382	0.0620	65	1625
ΔlogBOT	23.3046	0.0000	-19.3334	0.0000	65	1560

The null hypothesis is that the variable follows a unit-root process.

Table 3. Pesaran Second-generation panel unit-root test

Variables	No trend		Trend		Cross Sections	Observations
	Statistic	Prob	Statistic	Prob		
logRDE	-0.703	0.241	2.875	0.998	65	1518
ΔlogRDE	-8.067	0.000	-6.007	0.000	65	1453
logBOT	1.315	0.906	1.042	0.851	65	1625
ΔlogBOT	-10.019	0.000	-5.768	0.000	65	1560

The null hypothesis is that the variable follows a unit-root process.

We analyze the causal link between yearly RDE expenditures and BOT in order to shed insight on the nature of the relationship that exists between them. The relationship between RDE and BOT is shown in Table 4, and the findings show that BOT has a positive impact on RDE in the first lag, while RDE has significant adverse effects on BOT in the second lag. The possible reason behind these findings could be that higher BOT may insist the authorities invest heavily in RDE, while RDE may require the

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purchase of different equipment and materials to facilitate research, which may lead to higher imports and unfavorable BOT.

Table 4. GMM-PVAR estimation

Response of	Response to	
	$logBOT_t$	$logRDE_t$
$logBOT_{t-1}$	0.003	0.046***
	(0.096)	(0.011)
$logBOT_{t-2}$	-0.166*	0.016
	(0.096)	0.012
$logRDE_{t-1}$	0.226	0.325
	(0.461)	(0.240)
$logRDE_{t-2}$	-0.795**	0.043
	(0.393)	(0.097)
Hansen p-value	0.79	

Two variable VAR model is estimated by GMM, country-time and fixed effects are removed prior to estimation. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

After the unit-root tests and the GMM-PVAR estimations, we make use of the GMM-PVAR Granger causality test with the goal to evaluate if RDE causes BOT or vice versa. Table 5 contains the outcome of the granger test to determine whether or not a causal relationship exists as well as an explanation of the causal link between RDE and BOT.

Table 5. VAR granger causality results

Causal direction	Chi-square	df	p-value
logBOT → logRDE	15.894	1	0.000
logRDE → logBOT	6.056	1	0.048

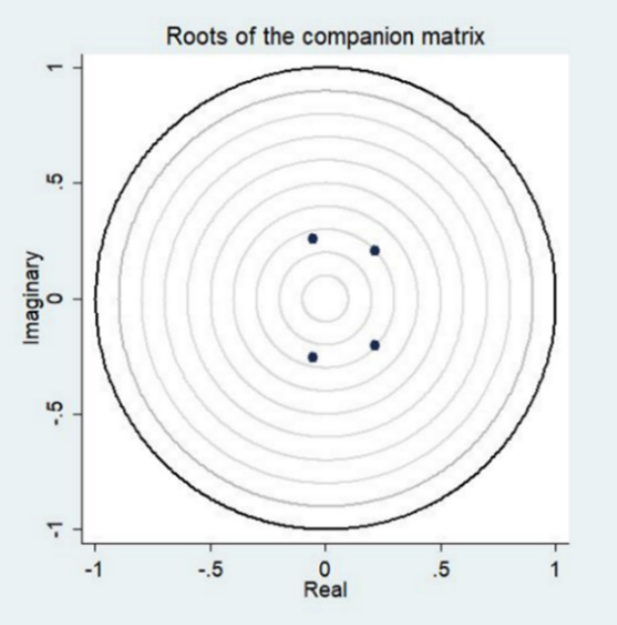
The null hypothesis that BOT does not granger-cause RDE is rejected with 99% confidence and the null hypothesis that RDE does not granger-cause BOT is rejected with 95% certainty. On the basis of the results of these GMM-PVAR granger causality tests, one can conclude that RDE and BOT have a two-way relationship.

Even if identifying limits are imposed on the parameter estimations, the coefficients of the GMM-PVAR in reduced form cannot be interpreted as causal links (Abrigo & Love, 2016). To circumvent this limitation, we conduct additional research employing the impulse response function (IRF) and the forecast-error variance decomposition (FEVD). However, before determining IRF and FEVD, we first investigate the GMM-PVAR stability criterion. Since each of the eigenvalues of the estimated coefficient matrix are less than one and lie within the unit circles (Figure 1), which are depicted on the RDE stability graph, we conclude that the estimates are stable. This indicates the accuracy of the estimates.

In the subsequent phase, we compute the IRF to explain the response of RDE or BOT to a perturbation in another related variable, presuming that the magnitude

of all other shocks is equal to zero. Figure 2 depicts the IRF, with the shaded regions representing the 95% confidence interval and the solid lines representing the orthogonal IRF of the relevant variable over five years. The IRF confidence intervals are derived from the distribution of the fitted reduced form of the GMM-PVAR model and are based on the outcomes of 200 Monte Carlo simulations. During our discussion of the findings, our primary focus will be the connection between RDE and BOT, which is of significant importance to us.

Figure 1. Stability Graph



The reactions of RDE and BOT to a jolt in RDE and BOT, respectively, may be found in the left column and the right column of the IRF diagram shown in Figure 2. According to this graphical depiction (second row, first column of figure-2), the relationship between RDE and BOT is nonlinear; RDE first exerts a negative influence, followed by a brief positive effect that converses to zero.

The possible explanation that is compatible with these findings might be that initially, RDE may have a detrimental effect on BOT due to the fact that RDEis very technology-heavy and necessitates the use of nonrenewable energy sources like oil, gas, coal, etc., which may not be readily accessible domestically. Because of this, nations that put a lot of effort into RDE can find themselves in a position where they have to import huge quantities of these resources (Chen, 2017). This can lead to an increase in the proportion of a nation's imports to exports, which might make the trade imbalance worse in the short run. Subsequently, investment in RDEleads to greater rates of product and process innovation, which can make the manufacturing process simpler and less expensive (Haaland & Kind, 2008; Souder & Padmanabhan, 1989; Van Beveren & Vandenbussche, 2010). Another possible explanation consistent with these findings could be that RDE

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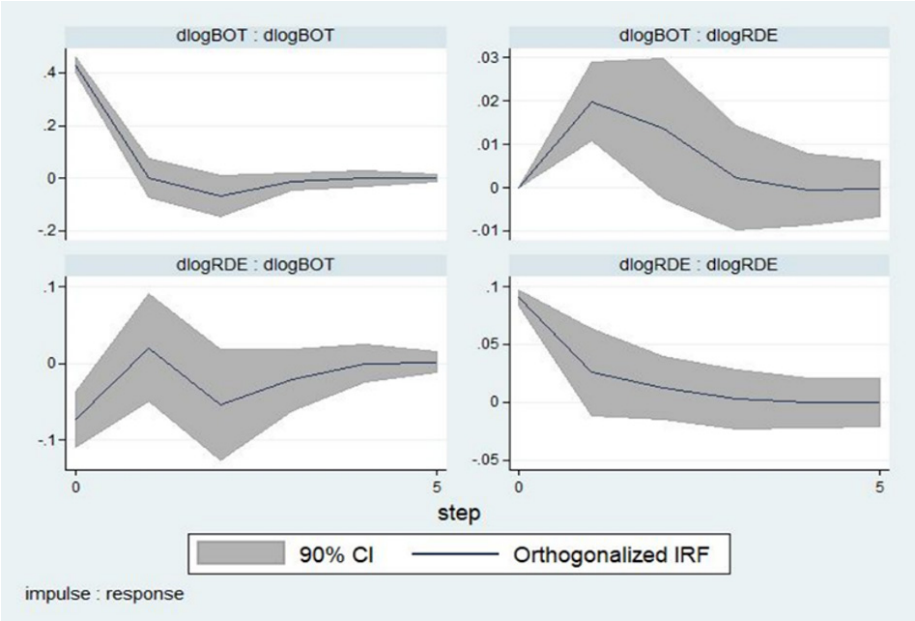
Figure 2. IRF plot



leads to higher product and process innovation rates in developing countries. Therefore, it increases export performance (Antonietti & Cainelli, 2011; Halpern & Muraközy, 2012; Ricci & Trionfetti, 2012) for exporting enterprises with a higher economic return on sales to export markets than sales to domestic markets (Aw et al., 2011; Peters & Roberts, 2022). This condition is because exporting firms with a higher economic return on sales to export markets have a greater incentive to sell their products abroad. As a result, RDE has a beneficial impact on the overall trade balance.

On the other hand, a higher BOT always encourages more investment in RDE (first row, second column of Figure 2). This result is obvious, as higher BOT implies higher exports and thus higher foreign exchange earnings for the government, which might motivate them to invest in RDE to increase the earnings further.

Table 6. Variance decomposition analysis

Forecast Horizon	Impulse Variable		Impulse Variable	
	logRDE	logBOT	logRDE	logBOT
	Response on logRDE		Response on logBOT	
2	0.957	0.042	0.030	0.969
4	0.938	0.061	0.046	0.953
6	0.938	0.061	0.046	0.953
8	0.938	0.061	0.046	0.953
10	0.938	0.061	0.046	0.953

After IRF, we evaluate the cumulative contribution of one variable to explaining changes in other variables using FEVD and report the findings in Table 6. The variance decomposition indicates that the aggregate comprehensive BOT of an economy explains

roughly 6.1% of the variations in RDE, whereas RDE only explains 4.6% of the changes in BOT. According to these findings, RDE and BOT have a reciprocal impact on one another.

CONCLUSION

RDE is crucial in driving innovation and technological advancements and stimulates export performance and overall trade balance. Despite having such importance, studies related to RDE and BOT still need to be included, which warrants further investigation regarding causality and interaction between them. To fill this gap, we explore the RDE and BOT nexus using GMM-PVAR and find that RDE causes BOT and vice versa. Our findings show a dynamic relationship between RDE and the country's trade balance. Though RDE hampers the BOT, it contributes to a favorable trade balance in the long run. This result implies that since RDE needs to import technology and necessary inputs, which may not be readily accessible domestically, it may have a detrimental effect on BOT initially; however, RDE leads to more excellent rates of product and process innovation, which can make the manufacturing process efficient and less expensive and thereby improve export competitiveness and BOT. Similarly, an improved trade balance can provide a conducive environment for increased RDE, which may lead to technological advancements, innovation, and further export growth.

The findings of this study underscore the relevance of RDE for BOT, adding to knowledge related to innovation and trade; yet, our analysis has some limitations. We were unable to analyze the most recent information due to data constraints. Despite the limitation, policymakers can use this knowledge to their advantage. It can empower them to encourage innovation, boost export competitiveness, and promote sustainable trade in today's globalized, knowledge-intensive economy.

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Factors Affecting Consumers' Comprehensive Vehicle Insurance Policy Purchasing Behavior

Muhammet Kutlu[1*], Serpil Sumer Adin[2], Hilal Mola[3], Şeyma Şahin Kutlu[4]
[1]Bandırma Onyedi Eylül University, Balıkesir, Türkiye
[2]Atatürk University, Erzurum, Türkiye
[3]Atatürk University, Erzurum, Türkiye
[4]Bandırma Onyedi Eylül University, Balıkesir, Türkiye
E-mail: [1]mkutlu@bandirma.edu.tr, [2]serpil.sumer@atauni.edu.tr,
[3]hilal.karatas@atauni.edu.tr, [4]ssahin@bandirma.edu.tr
[*)]**Corresponding Author**

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Abstract

Research Originality: With increasing vehicle values in Türkiye and high insurance costs, consumers' vehicle insurance purchasing preferences emerge as a dilemma. The study examines consumers' insurance purchasing behavior in this dilemma's context of risk and overconfidence tendencies.

Research Objectives: This study aims to reveal the effects of individual characteristics, attitude toward risk, and overconfidence tendencies on comprehensive vehicle insurance policy purchasing behavior.

Research Methods: A questionnaire was administered to 428 selected vehicle owners in Turkey, and the questionnaire results were analyzed using the binary logit model.

Empirical Results: The study found that gender, education level, income level, market value of the vehicle, attitude towards risk, and self-confidence level have statistically significant effects on comprehensive vehicle insurance policy purchase decisions.

Implications: The relationship between risk-taking behavior, overconfidence, and insurance purchasing behavior requires further discussion. Government policies that increase insurance awareness are recommended to weaken this relationship.

Keywords:

risk-taking behavior; comprehensive vehicle insurance policy; purchase behavior; binary logit model

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INTRODUCTION

Individuals are exposed to unpredictable risks in everyday life, such as earthquakes, fires, floods, natural disasters, and accidents. These unforeseen risks cause financial and emotional losses (Akkurt & Okur, 2022: 99). In the event of exposure to an unforeseen risk, the individual experiences the anxiety and stress of compensating for the damage that may occur. Individuals and organizations want to secure themselves to eliminate their anxieties and worries about unforeseen risks (Karagöz et al., 2019). The desire of individuals and organizations to secure themselves for a specific fee has led to the emergence of the concept of insurance. When evaluated from the consumer's perspective, insurance aims to meet the needs of individuals to secure themselves and their assets. In this regard, meeting the household's insurance needs is part of meeting the needs related to household risk management (Kawiński & Szumlicz, 2023). Agbo & Agbaji (2019) define insurance as a protection against financial losses resulting from uncertainty and risk. The risk factor is essential for the formation of an insurance contract. For the risk to be insured, it must have an economic value (Gülbitti, 2007). Insurance is of economic importance on both micro and macro scales. On a micro-scale, compensating for the financial loss that individuals and businesses will face in case of exposure to a risk protects the living standard of individuals and prevents the disruption of the production processes of businesses (Özen & Yurdakul, 2020). On a macro scale, it ensures the stability of financial markets by managing the risks and eliminating the financial losses and damages caused by them (Yıldırım et al., 2020).

Although there are many types of insurance in the insurance industry, the industry is divided into life and non-life insurance. While life insurance protects individuals against financial losses due to premature death and illness, non-life insurance protects individuals and businesses against financial loss. Motor and non-motor vehicle insurance is a non-life insurance type. There are four types of motor and non-motor vehicle insurance in Turkey. Among them, traffic insurance (motor vehicle liability insurance for highways) is compulsory (Balkı & Göksu, 2022). As per traffic insurance, in the event of an accident, the at-fault party covers the resulting damage within a specific legal framework. The increasing number of vehicles in traffic and the existence of risks other than accident risk have led to the development of comprehensive vehicle insurance (casco insurance) within motor and non-motor vehicle insurance. Comprehensive vehicle insurance, which differs from traffic insurance in terms of content and scope, protects vehicles from financial damages against several risks such as flood, fire, accident, and theft (Yayar & Daşcı, 2019). The comprehensive vehicle insurance policy also covers damages caused by animals, falling objects, and intentional damages (Mihaela et al., 2013). As expected, insurance premiums also increase as the scope of insurance expands. In addition, the rise in vehicle prices, that is, the value of the insured asset, increases insurance premiums. These expectations and realities are the main reasons for conducting this study for Turkey.

Due to the rapid increase in vehicle prices with the recent fluctuations in exchange rates, vehicle prices in Turkey have an important place in the consumer budget. Since the prices of vehicles classified as imported goods in Turkey adapt quickly to economic

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variables such as exchange rates and inflation, vehicles are seen as investment instruments like stocks and precious metals. Therefore, purchasing a vehicle emerges as an alternative for consumers who want to protect their assets against inflation. In this case, it becomes essential for the consumer to insure the purchased or existing vehicles with insurance. However, insurance premiums are also increasing due to increases in vehicle prices and possible damage coverage costs. This situation causes consumers to face a dilemma between covering the high cost of comprehensive vehicle insurance and accepting the possible risks to the asset. Considering the findings that individuals' attitudes towards risk in Turkey are around the world average (Falk et al., 2016) and the level of overconfidence is relatively high (Stankov & Lee, 2014), their behavior in the face of the dilemma consumers face emerges as a natural research problem. It has also been reported that Turkish drivers tend to take risks more than other countries (Şimşekoğlu et al., 2012; Şimşekoğlu et al., 2013). This study uses individual characteristics to explain consumers' purchasing behavior regarding comprehensive vehicle insurance policies, especially their attitude toward risk and overconfident tendencies. Individuals' insurance policy purchasing behavior in Turkey also makes sense from a macroeconomic perspective. Turkey is a developing country, and the supply of funds is important for economic growth and financial development in such countries.

Regarding fund supply, insurance is the second sector after financial markets. Therefore, transferring the funds to be gained through premiums generated by the sale of comprehensive vehicle insurance policies to financial markets will create a new fund supply and contribute to economic growth and financial development. Thus, this study may set an example for countries with characteristics similar to Turkey's. Given the importance of the insurance industry, which is constantly growing and developing, for the economy and the financial system, the results obtained from the study on the factors affecting policy purchasing can provide inferences for insurance companies and policymakers.

Regarding asset size, the insurance industry ranks second, after the banking industry, in the financial system in Turkey (Insurance Association of Türkiye, 2021). Considering that the insurance industry is a growing market, the desire of insurance companies to increase their preferability and gain a competitive advantage by getting a larger market share has led researchers to investigate consumers' purchase preferences. A consumer's choice to purchase a product or service is a process that involves various decision processes and is influenced by various factors (Panjaitan et al., 2019). Consumers who buy products or services need limited information and fewer decision-making processes. However, when they purchase an expensive or unusual product or service or something rarely, the decision-making process is prolonged because they need more comprehensive information about the price, brand, and image of the product or service in question (Techasurin et al., 2020). When purchasing comprehensive vehicle insurance, individuals make decisions by researching and evaluating the information they get. The purchase of comprehensive vehicle insurance is influenced by price, information, cost, consumer expertise, perceived risk, and socio-demographic characteristics, besides the transparency

of the contract (Filiz & Şengöz, 2010; Störmer, 2014; Demiray-Erol & Alma, 2016; Zakaria & Ayoub, 2023). In addition to these factors, the insurance company's brand and image affect consumers' comprehensive vehicle insurance policy purchase behaviors (Techasurin et al., 2020; Zheng et al., 2021).

While Sarman et al. (2020) explain traffic insurance purchasing behavior with personality characteristics, they emphasize the effect of neurotic character on insurance purchasing behavior. It can be stated that the individual's pessimistic expectations and perspective strengthen the precaution-taking behavior. Another study on the vehicle insurance example reported the effects of Huyssteen & Rudansky-Kloppers (2024) age, education level, and household income variables on insurance policy purchasing behavior. Studies on different types of insurance have also shown that variables such as education, income, gender, and age affect insurance purchasing behavior (Ulbinaite et al., 2013; Lim et al., 2023). Ulbinaite et al. (2013) also emphasized that insurance decisions depend on financial evaluations, such as the insurance premium, and that conditions are essential for male consumers. Alex and Aithal (2022) have not confirmed the effect of demographic variables such as gender and education level on comprehensive motor insurance policy purchasing behavior. However, income, occupation, marital status, family size, distance traveled by the vehicle, risk preference, the number of vehicles owned, and the price of the vehicle affect purchase behavior (Akan, 2012; Dragos & Dragos, 2017; Dansu et al., 2018).

Furthermore, the insurance company's quick response (Kwofie et al., 2018), proximity, reliability (Akan, 2012), convenience, and compatibility with technology also impact customer preference. Other factors that affect the behavior of insurance consumers are advertising of the insurance product, distribution channels, legal factors, characteristics of insurers, and demographic variables (Ioncică et al., 2012). The quality of the service offered by the insurance company is another factor affecting the customer's comprehensive vehicle insurance preference. If the customer has had a bad experience, they do not prefer the same company again and tell the people around them about their experience (England et al., 2022).

Individuals' risk-taking behavior is one of the most important factors affecting their comprehensive traffic insurance purchasing decisions. Some studies relating different types of insurance to individuals' risk perceptions reveal that risk perception impacts consumers' decisions to purchase insurance policies (Yang et al., 2020; Liu et al., 2016; Boyer et al., 2017; Baltacı, 2020). Lyu & Barré (2017) verify risk aversion's direct and indirect effects on insurance policy purchasing behavior for the agricultural insurance example. This finding was also confirmed by Masud et al. (2021), who examined the relationship between the decision to purchase life insurance and risk perception. Masud et al. (2021) also confirm this finding by examining the relationship between the decision to purchase life insurance and risk perception. It has also been reported that individuals' perspectives on insurance and risk differ depending on their personality types. Bregu (2022) reported that overconfident individuals are less likely to purchase a vehicle insurance policy when the probability of loss is unknown and the possible loss depends on their abilities. Thus,

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the impact of overconfidence tendency on comprehensive car insurance policy purchasing decisions becomes a matter of discussion. Additionally, it was revealed that individuals with less security knowledge were more likely to purchase insurance (Hsu et al., 2016). Thus, it is predicted that individuals with higher knowledge and overconfidence will tend to take more risks.

In summary, in the studies in the literature on insurance purchasing behavior, demographic characteristics such as the customer's income, occupation, marital status, family size, distance traveled by the vehicle, risk preference, number of vehicles owned, and price of the vehicle. In the literature (to the best of the authors' knowledge), one study investigates the effect of overconfidence, which affects purchasing behavior and can lead the customer to make wrong decisions about automobile insurance on comprehensive automobile insurance policy purchasing behavior. Consumers with a high tendency to overconfidence assume a high level of risk because they are more self-confident (Pikulina et al., 2017). This tendency causes cognitive laziness in the consumer and leads to wrong decisions (Tan et al., 2012). The possible effect of the overconfidence tendency, which affects the risk-taking level of consumers, on vehicle insurance policy purchasing behavior constituted the motivation of the study. This study attempts to determine the effect of overconfidence bias and individual risk-taking attitude, which is frequently handled in behavioral economics, on consumers' comprehensive vehicle insurance purchases (in addition to the variables previously discussed in the literature), thus seeking to answer the question, "Do overconfidence bias and risk-taking attitude affect comprehensive vehicle insurance purchases?". The study is anticipated to contribute to the literature in this respect.

METHODS

This study aims to reveal the factors affecting vehicle owners' purchase decisions regarding comprehensive vehicle insurance policies. The study population consists of vehicle owners in Turkey. A questionnaire designed to determine the participants ' socio-economic characteristics, risk perspectives, and self-confidence levels was administered face-to-face and online to 428 people selected from the population by convenience sampling. The number of samples (people who can be reached and agree to answer the questionnaire) is sufficient to represent the population. Yamane (1973) reveals that at least 400 samples are sufficient in cases where the population exceeds one hundred thousand and the confidence level is 95%. Consumers included in the research were selected using the convenience sampling method. This non-probability sampling method allows the researcher to include the easiest-to-access samples in the study. Despite its possible limitations, the convenience sampling method is valid in most study designs (Sedgwick, 2013). In this regard, a questionnaire was applied to vehicle owners who could be reached through non-probability selection. Since censored estimate models were not used, the samples were selected from among the vehicle owners.

In summary, the criteria for sample selection are as follows: it is a condition that the individual who can be reached online or face to face is willing to participate

in the research and has a vehicle. The vehicle owner was asked about his/her current comprehensive vehicle insurance policy ownership status. The questionnaire includes demographic variables, risk-taking attitudes, and other questions to infer overconfidence tendencies. The study's dependent variable is individuals ' comprehensive vehicle insurance policy purchase behavior. The dependent variable was tried to be explained via binary choice models using a series of independent variables, including questions to determine individuals' risk-taking attitudes and self-confidence levels.

Binary choice models are models in which decision units are faced with two choices. They attempt to explain the probability that a decision unit will choose alternatives like purchasing or preferring in the face of choices such as purchasing or not purchasing, preferring or not preferring. Among the binary choice models, the binary logit model was used in this study. The binary logit model has the same infrastructure as its alternative, the binary probit model, but differs in terms of the cumulative distribution function on which the model is based. The binary logit model is derived from the logistic cumulative distribution function. The model can be written as

$$P = \Lambda(x_i'\beta) = \frac{e^{(x_i'\beta)}}{1+e^{(x_i'\beta)}} \quad (1)$$

where P is the probability of occurrence and Λ is the logistic cumulative distribution function (Wooldridge, 2020: 561). The results obtained from the logit model were evaluated using coefficients and marginal effect values. In addition, interpretations were made considering the odds ratio, which is defined as the ratio of the probability that the decision unit will choose or assign the alternative 1 to the variable of interest to the probability that the decision unit will choose or assign the alternative 0 (the ratio of the probability of occurrence to the probability of non-occurrence) and formulated as $\frac{P}{(1-P)} = e^{(x_i'\beta)}$ (Wooldridge, 2020; Berry et al., 2010).

RESULTS AND DISCUSSION

A questionnaire was administered to 428 people to determine the factors affecting individuals' comprehensive vehicle insurance policy purchase behaviors in Turkey. The questionnaire form includes questions to represent some participants' personal characteristics, traffic frequencies, risk perspectives, and self-confidence levels. Table 1 summarizes the characteristics of the participants, the categories in which the relevant characteristics were examined, and the descriptive statistics of the answers obtained.

The study's dependent variable is individuals' comprehensive vehicle insurance policy purchase behavior. Based on the findings, 59.11% of the participants purchased a comprehensive vehicle insurance policy for their vehicle, while 40.89% did not purchase any. 70.09% of the participants were women, and 29.91% were men. Given that the rate of women among those who have a driver's license in Turkey is 26.8% as of 2020 (TURKSTAT Gender Statistic, 2021), it can be stated that the sample of the study is good in terms of gender distribution. The average age of the sample was 38.89 years, and the average traffic experience was 15.02 years. The education of

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Table 1. Descriptive Statistics

Variables		Frequency	Percent
Comprehensive vehicle insurance policy	No	175	40.89
	Yes	253	59.11
Gender	Female	128	29.91
	Male	300	70.09
Education	Primary/middle school	19	4.44
	High school	59	13.79
	Bachelor's degree	178	41.59
	MA/PhD	172	40.19
Income level (Turkish liras)	0-12,500	93	21.73
	12,501-20,000	106	24.77
	20,001-30,000	147	34.35
	30,001 and above	82	19.16
The market value of the vehicle (Turkish liras)	0-300,000	70	16.36
	300,000-599,999	180	42.06
	600,000-899,999	108	25.23
	900,000-1,199,999	38	8.88
	1,200,000 and above	32	7.48
Material damage traffic accident	No	383	89.49
	Yes	45	10.51
Traffic accident with injuries	No	422	98.60
	Yes	6	1.40
Weekly traffic frequency	Rarely	31	7.24
	Several times	75	17.52
	Frequently	322	75.23
Average kilometers per year	0-5,000	66	15.42
	5,001-10,000	134	31.31
	10,001-15,000	130	30.37
	15,001 and above	98	22.90
A second person driving the vehicle	No	202	47.20
	Yes	226	52.80
Attitude towards risk	Risk taker	79	18.46
	Risk neutral	44	10.28
	Risk averse	305	71.26
Level of self-confidence about the traffic question	Not confident	34	7.94
	Slightly confident	82	19.16
	Fairly confident	195	45.56
	Completely confident	117	27.34
Variables		**Mean**	**Std. Deviation**
Age		38.894	9.811
Driving experience (in years)		15.023	9.922

the participants was examined in four categories: primary/middle school, high school, bachelor's degree, and MA/PhD. 81.5% of the participants had a bachelor's degree or higher. This data led to the belief that the findings regarding risk perception would be more accurate. Other characteristics considered likely to affect the decision unit's comprehensive vehicle insurance policy purchase behavior were income and the approximate market value of the vehicle subject to the insurance policy. The monthly income levels of the participants were analyzed in four categories, taking into account the current conditions of the labor market. The market value of the vehicle subject to the insurance policy was analyzed in five different categories. The participants were not provided with any measure of the vehicle's market value. Thus, it was anticipated to determine the effect of perceived market value on comprehensive vehicle insurance policy purchase behavior.

The variables of accident history and traffic frequency were included in the model to determine the effects of the participants' characteristics regarding traffic participation on their comprehensive vehicle insurance policy purchase behaviors. While 10.51% of the participants stated that they had had a material damage traffic accident in the last year, 1.40% had had a traffic accident with injuries. The weekly traffic frequency, measured in three categories, and the average kilometers per year, measured in four categories, were attempted to determine the participants' traffic frequency. Another question related to the participants' traffic frequency was whether the vehicle subject to the comprehensive insurance policy was being used by a second person or not.

Individuals' risk perspectives and self-confidence levels, considered to contribute to the study's originality and are likely to have significant effects on comprehensive vehicle insurance policy purchase behavior, were included in the model as independent variables. While 18.46% of the participants described themselves as risk takers, 71.26% described themselves as risk averse. 10.28% of the participants were risk-neutral, based on their responses. The individuals' self-confidence levels were determined using a traffic knowledge question. The participants were asked a traffic knowledge question that took much work to answer. Following the question, they were asked how confident they were in their answers. Regardless of the accuracy of their answers, their confidence levels were included in the model to represent their levels of self-confidence.

Table 2 presents the estimation results and marginal effect values of the binary logit model constructed to examine the factors affecting individuals' decisions to purchase a comprehensive vehicle insurance policy. It was found that the variables of gender, education level, income level, market value of the vehicle, attitude towards risk, and self-confidence level have statistically significant effects on comprehensive vehicle insurance policy purchase decisions. The male vehicle owners were seen to be 19% less likely to purchase a comprehensive vehicle insurance policy than the female owners, who are the reference group. Based on the evaluation of the odds ratio, the women were 2.45 times more likely to purchase a comprehensive vehicle insurance policy than the men. Based on the coefficients for the education level categories, the probability of purchasing a comprehensive vehicle insurance policy increases as the education level rises.

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Table 2. Binary Logit Model Estimation Results and Marginal Effects

Variables	β	Std. Error	95%CI		dydx	Std. Error
			Low.	Upp.		
Gender (reference: female)						
Male	-0.896**	0.331	-1.545	-0.247	-0.198	0.068
Age	0.035	0.024	-0.012	0.082	0.008	0.006
Education (reference: Primary/middle school)						
High school	1.176	0.758	-0.310	2.662	0.255	0.140
Bachelor's degree	1.877**	0.744	0.418	3.336	0.427	0.130
MA/PhD	2.099***	0.771	0.589	3.609	0.476	0.134
Income level (reference: 0-12,500 Turkish liras)						
12,501-20,000	0.671*	0.364	-0.043	1.385	0.164	0.088
20,001-30,000	0.971**	0.394	0.198	1.743	0.229	0.092
30,001 and above	0.347	0.517	-0.665	1.360	0.086	0.128
The market value of the vehicle (reference: under 300,000 Turkish liras)						
300,000-599,999	1.531***	0.374	0.798	2.263	0.341	0.070
600,000-899,999	2.404***	0.439	1.544	3.264	0.536	0.077
900,000-1,199,999	3.027***	0.612	1.828	4.227	0.636	0.088
1,200,000 and above	3.951***	0.741	2.498	5.403	0.722	0.071
Material damage traffic accident (reference: No)						
Yes	0.390	0.415	-0.422	1.203	0.088	0.088
Traffic accident with injuries (reference: No)						
Yes	-0.690	1.108	-2.863	1.483	-0.170	0.274
Driving experience (in years)	0.012	0.024	-0.036	0.060	0.003	0.006
Weekly traffic frequency (reference: Rarely)						
Several times	0.273	0.572	-0.849	1.394	0.055	0.120
Frequently	-0.455	0.539	-1.511	0.601	-0.105	0.117
Average kilometers per year (reference: 0-5,000 km)						
5,001-10,000 km	-0.259	0.416	-1.074	0.556	-0.060	0.094
10,001-15,000 km	-0.007	0.438	-0.866	0.852	-0.002	0.097
15,001 km and above	-0.542	0.491	-1.504	0.421	-0.129	0.114
A second person driving the vehicle (reference: No)						
Yes	0.217	0.247	-0.267	0.701	0.051	0.058
Attitude towards risk (reference: Risk taker)						
Risk neutral	-0.189	0.464	-1.099	0.720	-0.047	0.114
Risk averse	0.903***	0.331	0.255	1.552	0.217	0.080
Level of self-confidence about the traffic question (reference: not confident)						
Slightly confident	0.497	0.540	-0.562	1.555	0.096	0.109
Fairly confident	-0.249	0.483	-1.195	0.697	-0.056	0.105
Completely confident	-0.975*	0.511	-1.977	0.026	-0.235	0.114
Constant	-4.578***	1.363	-7.249	-1.906		

The individuals with bachelor's and MA/PhD degrees were seen to be approximately 47% and 42% more likely to purchase comprehensive vehicle insurance than the reference group, respectively.

Those with income levels TL 12,501-20,000 and TL 20,001-30,000 were approximately 8.8% and 9.2% more likely to purchase a comprehensive vehicle insurance policy than the reference group, respectively. A consistent finding is the effect of vehicle market value on purchasing a comprehensive vehicle insurance policy. Individuals with a vehicle with a market value of TL 1,200,000 and above were approximately 52 times more likely to purchase a comprehensive vehicle insurance policy than the reference group. The high probability of purchasing a comprehensive vehicle insurance policy compared to the reference group also applies to other vehicle value categories.

The study obtained significant findings on the effect of risk-taking behavior and self-confidence on comprehensive vehicle insurance policy purchase behavior. The risk-averse individuals were determined to be 8% more likely to purchase a comprehensive vehicle insurance policy than the risk-takers. The evaluation based on the odds ratio indicated that the risk-averse individuals were 2.46 times more likely to purchase a comprehensive vehicle insurance policy than the risk-takers. As the individuals' self-confidence levels increased, the coefficients related to their comprehensive vehicle insurance purchase behaviors decreased. The individuals who were "completely confident" in their answer to the question in the questionnaire form were 11% more likely to purchase comprehensive vehicle insurance than those who were "not confident." The evaluation based on the odds ratio showed that individuals who were not confident were 2.65 times more likely to purchase a comprehensive vehicle insurance policy than the completely confident ones.

The confidence intervals for the parameters in Table 2 show that the effect of some independent variables on comprehensive traffic insurance purchasing behavior was found to be statistically insignificant. The relationship between the variables of the person's age, traffic accident history, and the second person driving the vehicle and insurance purchasing behavior was not statistically confirmed. Weekly traffic frequency and average kilometers per year variables, representing the frequency of vehicle use, are among the variables whose effects on insurance purchase decisions are insignificant.

The study took comprehensive vehicle insurance policy purchase behavior as a dependent variable. In addition to demographic characteristics, many independent variables, such as whether the individual has a history of accidents, average weekly traffic frequency, risk-taking behavior, and overconfidence bias were included in the model. The study found gender, education level, income level, vehicle market value, attitude towards risk, and self-confidence level to have statistically significant effects on individuals' comprehensive vehicle insurance policy purchase behavior. These findings are similar to the study findings of Demiray-Erol and Alma (2016), Huyssteen and Rudansky-Kloppers (2024), Ulbinaite et al. (2013), and Lim et al. (2023). The study findings differ from those of Alex and Aithal (2022), who cannot confirm the effect of demographic variables

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on insurance purchasing decisions. The statistically significant effects of education level and income level are consistent with the results of Demiray Erol & Alma (2016) and Eygü & Soğukpınar (2012), while the significant effect of gender is inconsistent with the results of Demiray Erol & Alma (2016).

Contrary to expectations, the fact that the customer has had a traffic accident with injuries or material damage does not impact the decision to purchase a comprehensive insurance policy. The findings in this respect differ from those obtained in the Lim et al. (2023) study. Lim et al. reported the impact of disease history on the decision to purchase health insurance. However, in this study, accident history could not be associated with the decision to purchase insurance. This situation can be interpreted as previous accident experiences cannot suppress the attitude towards risk and the tendency towards overconfidence. The effect of overconfidence tendency and risk-taking attitude variables on vehicle insurance policy purchasing behavior was significant. Since the risk in traffic insurance depends on the driver's abilities, overconfident individuals are less likely to purchase insurance. This finding confirms Bregu (2022). In addition, it is revealed that the risk perception created by traffic insurance in individuals differs from that of other insurance types, such as health insurance.

The findings of the present study are consistent with Akan (2012), Dragos & Dragos (2017), Dansu (2018), Lyu & Barré (2017), and Masud (2021) in terms of the relationship between individuals' risk perceptions and income levels and comprehensive vehicle insurance policy purchase behavior. Additionally, it is important that the effect of the gender variable on comprehensive vehicle insurance policy purchase behavior was found to be significant. Findings show that men purchase fewer comprehensive vehicle insurance policies than women. This situation is compatible with the fact that women in Turkey are still at a disadvantage in traffic and feel the need to insure themselves and their vehicles.

CONCLUSION

This study aims to explain individuals' comprehensive vehicle insurance policy purchasing behavior with individual characteristics. In addition to other characteristic features, the effect of the consumer's self-overconfidence tendency and attitude toward risk on insurance purchasing preference has been aimed at being revealed. Therefore, the null hypotheses that several individual characteristics, overconfidence, and attitude towards risk do not affect comprehensive vehicle insurance policy purchasing behavior were tested. In line with the purpose of the study, a questionnaire was applied to 428 vehicle owners in Turkey, and the data obtained was analyzed using a binary logit model. Although the number of samples is sufficient to represent the population, this number constitutes a research limitation because only vehicle owners who could be reached and agreed to answer the questionnaire were included in the sample.

The research findings reveal that the null hypothesis can be rejected for the variables of gender, education level, income level, vehicle market value, attitude towards risk, and

self-confidence level. Higher education level, female vehicle owner, higher income level, higher vehicle value, the individual's risk avoidance, and lack of overconfidence tend to increase the likelihood of individuals purchasing a comprehensive traffic insurance policy. A high level of education will increase the knowledge about possible risks and provide a higher awareness of risks. The effect of income level and vehicle market value on the decision to purchase insurance is consistent with expectations for Türkiye. The fact that vehicle prices have a high share of consumer budgets in Türkiye turns vehicles into investment and savings tools. Therefore, it can be inferred that decisions to purchase vehicle insurance policies in Turkey are made to protect investments and savings rather than the risks that may occur due to an accident. This inference is also supported by the statistically insignificant effect of previous accident experiences on purchasing decisions. The effects of attitude towards risk on insurance purchasing behavior are consistent with expectations. However, risk needs to be discussed more in insurance behaviors to protect existing assets. Overconfidence tendency affects individuals' belief that they will not make mistakes. Therefore, individuals who are overconfident avoid comprehensive vehicle insurance policies, protecting them against traffic mistakes. It can be stated that these individuals are aware of the risk, but they are mistaken in believing that they will not be exposed to risk because they are overconfident. More studies are needed considering the literature gap on overconfidence and risk-taking behavior.

Considering that individuals' insurance policy purchasing behavior provides liquidity to the financial system and the place of insurance in the financial system in Turkey, insurance activities support the financial system. By raising risk and insurance awareness, policymakers can strengthen the financial sector and protect individuals against possible losses. In addition, insurance agencies and public regulators should help individuals make rational decisions by helping them overcome their tendency to be overconfident. In Turkey specifically, the fact that women tend to purchase more traffic insurance is related to the fact that women feel more risk in traffic. Active policies are recommended against this perception.

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   f. **Result and Discussion.** This section explains the results of the study. Data should be presented in Tables or Figures when feasible. There should be no duplication of data in Tables and Figures. The discussion should be consistent and should interpret the results clearly and concisely, and their significance. It also should supported to suitable literature. The discussion should show relevance between the result and the field of investigation and/or hypotheses. The discussion also should compare the result with previous research.
   g. **Conclusions.** This section concludes and provides policy implications, if any, of the study.
   h. **References.** This section lists only the papers, books, or other types of publications referred in the manuscript. We suggest authors to use reference management software like EndNote, Mendeley, Zotero, etc., to prepare citations and the list of references.
4. The authors should provide an index of subject, namely the specific term in the manuscript. The authors should also provide the index of authors, namely the key authors of papers referred in the manuscript. Please write the family name followed by the given name.
5. Estimation result from a software package is not allowed to be directly presents in the paper. They should be presented in equations with the appropriate estimation results.
6. Table format should contain only heading and contents. Please provide the top and bottom lines, along with the line(s) that separate the heading and the contents. Example:

Table 1. The Growth of Third Party Fund, Financing and Asset (Billion rupiah)

	2012	2013	2014	2015	2016	2017
Fundraising	52.271	76.036	115.415	147.512	174.018	186.608
Financing	46.886	68.181	102.655	147.505	179.284	187.886
Asset	66.090	97.519	145.467	195.018	229.557	244.197

Source: Islamic banking statistics, Bank of Indonesia

7. The manuscript is prepared in a quarto paper, single-sided, and double-space format. A new paragraph should start 5 characters from the left margin, using 12-size, garamond font type.
8. The manuscript is written in proper English, either British or American English, but not the combination of both.
9. The top and bottom margins are 1 inch.
10. The title is written using capital letters of 14 font size, centre position.
11. Sub titles are written using capital letters, started from the left margin.
12. Sub of sub titles are written using capital letters only at the beginning of each word except for connecting words. They should be started from the left margin.
13. References should be those of the last ten years publication, unless they are key references.
14. Citation in the text body should be written using the family name and years of publication. Example:
    a. Mareta (2018) concludes that there is an impact of ….
    b. According to Kotler (2010), intra industry trade can be …
    c. Wagner (in McCain, 1990) states that …
    d. The definition of flypaper effect is … (Wagner, 1976).
15. Tables and figures should be presented as follows:
    a. The name of tables and figures should follow a numbering system (Arabic numbering system). The names of the tables and figures are on the top and bottom parts of the tables, respectively.
    b. The tables and figures should provide the source of information, if any, at the bottom part of both.
16. References should be written in alphabetical order, without any number. They should be written using the following criteria:
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       Mareta, B. M. (2018). The Impact of ASEAN-Korea Free Trade Agreements on Indonesian Export of Manufacturing Goods. Etikonomi, 17(2), 161-184. https://doi.org/10.15408/etk.v17i2.7342.
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