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Determinants of Foreign Direct Investment in Indonesia: Do Presidential Regimes Matter?

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ABSTRACT

Research Originality: The originality of the research is the separation of data in different governments. The request is based on the leadership style, especially in the era of President Susilo Bambang Yudhoyono and President Jokowi.

Research Objectives: This study examines the determinants of foreign direct investment (FDI), both in the short and long term in Indonesia during the leadership of Presidents Susilo Bambang Yudhoyono (SBY) and Joko Widodo (Jokowi).

Research Methods: This study uses time series data on the World Development Indicators website from 2004 to 2021. Using Autoregressive Distributed Lag (ARDL)

Empirical Results: This study finds evidence that institutional quality, economic growth, and presidential regime in the short and long run significantly positively affect FDI. Meanwhile, the population negatively influences FDI in Indonesia in both the short and long run.

Implications: These findings imply that to draw in more foreign direct investment (FDI), Indonesia must enhance institutional quality, economic growth, presidential governance, and population control.

Keywords:

foreign direct investment, institutional quality; tax rate; economic growth, population, inflation

How to Cite:

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INTRODUCTION

As a developing country, Indonesia has shaped its foreign policy to attract Foreign Direct Investment (FDI) as a critical financial resource for economic development, starting from the presidency of Susilo Bambang Yudhoyono (2004-2014). Each president has prioritized different aspects of national growth. During Yudhoyono's tenure, the focus was on enhancing Indonesia's international influence. However, since Joko Widodo assumed office in 2015, the government's emphasis has shifted toward infrastructure investment and strengthening domestic industries, with support from FDI (Widiatmaja & Albab, 2019).

State development and construction require significant sources of funding. FDI is an essential funding source for economic growth and development projects. Giakoulas et al. (2022) state that FDI plays an important role but is strongly influenced by the country and company's effectiveness. According to Jaiblai and Shenai (2019), FDI is a significant funding source for a country's development, which is influenced by the non-economic and economic factors for the flow of FDI capital from foreign countries to domestic countries, especially developing countries (Jurčić et al., 2020).

FDI is essential for developing countries because it benefits investors and local governments (Asongu et al., 2018). For this reason, the government must adopt proactive policies that benefit the investment community (Contractor et al., 2021). A country's FDI can increase up to 70% if the government adopts investment-friendly guidelines and has democratic political and social conditions (Götz, 2020; Jensen, 2003). In addition, different government leadership philosophies also have an impact on foreign company investment (Edo et al., 2020). Bailey (2018) and Paul and Feliciano-Cestero (2021) state that participating countries and multinational corporate institutions investing in recipient countries through FDI will be seen as a huge and crucial aspect of international trade in the future. However, global companies investing in a country have indicators related to FDI flows from institutions and countries. The better institutional quality (I.Q.) of the destination country is one of the indicators relevant to attracting foreign direct investment. Oyebamiji et al. (2021) define I.Q. as a measure of a country's ability to manage corruption, implement effective regulations, and enforce the law. In choosing whether to invest FDI in a country, Bailey (2018) highlights the leading I.Q. indicators related to political stability, rule of law, and democracy.

According to empirical research, conflicting I.Q. findings have an impact on FDI. Ullah and Khan (2017) found that I.Q. impacts FDI in ASEAN, ASIA, and SAARC, GDP, Investment, and economic freedom also have a favorable effect on FDI in SAARC countries. Meanwhile, FDI is negatively influenced by labor and the government. Apart from the long-term cointegration between I.Q. and economic integration, Canh et al. (2021) found a negative relationship between I.Q. and FDI globally. According to Sabir et al. (2019), I.Q. impacts foreign FDI in high-income countries, especially in low- and middle-income countries.

I.Q. can encourage increased inward FDI in 79 countries (Awodumi, 2021). George et al. (2021) stated that I.Q. is not a determining factor for FDI in five African countries.

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Ogbonna et al. (2022) stated that the I.Q. reduces FDI flows to 46 African countries in an uncertain global environment. According to Aziz (2018; 2022), the I.Q does not directly influence FDI in Saudi Arabia. Studying BRICS countries, Chaudhry et al. (2022) found that the environment has a moderating effect on the negative relationship between I.Q. and FDI. Political institutions, taxation, population, economic growth, I.Q. and inflation, according to Dang and Nguyen (2021), have a detrimental impact on FDI in ASEAN.

The I.Q. of the Southern Central Coast (SCC) states was cited as a factor attracting FDI Hoang et al. (2022). Although the economic situation in developing countries also impacts the FDI, Huynh (2022) states that increasing FDI strongly correlates with increasing I.Q. In 34 Asian and European countries, Lee (2021) found that FDI is not linearly correlated with I.Q. The low I.Q. is not correlated with high FDI, and vice versa. I.Q. significantly influences the changes in FDI absorption (Sabir et al., 2019; Ullah & Khan, 2017; Aziz, 2022). A country's I.Q. ranking is an attractive factor that must be met to attract FDI and be chosen as an international business destination (Rygh et al., 2023; Samadi & Alipourian, 2021; and Silajdzic & Mehic, 2022).

A study in Indonesia by Suryanta and Patunru (2022) indicates that GDP and workforce skills directly influence Foreign Direct Investment (FDI). While intelligence quotient (I.Q.) contributes to FDI, the primary drivers of high FDI levels are macroeconomic factors, political openness, and infrastructure development in Indonesia. Additionally, Jazuli et al. (2022) argue that I.Q. enhances a country's competitiveness, which fosters economic growth and development in Indonesia. However, factors such as population, culture, and education also play significant roles.

Macroeconomic variables, besides I.Q., can influence whether or not FDI enters a country (Sabir et al., 2019; Suryanta & Patunru, 2022). The security and comfort of investments made by investors depend on macroeconomics that aligns with expectations. This is because investors use macroeconomic data as one of the indicators to determine their investment goals (Adebayo et al., 2020; Chiappini & Viaud, 2021; Ghahroudi & Chong, 2020; Ho & Rashid, 2011; Iwasaki & Tokunaga, 2020; Kueh & Soo, 2020).

Sabir et al. (2019) and Awad (2020) conclude that GDP and inflation adversely impact FDI in rich countries but had a favorable impact in developing countries. Inflation affects FDI in Iran (Ghahroudi & Chong, 2020; Kueh & Soo, 2020). Pavel et al. (2021) state that taxes impact FDI, and a country's tax structure is a significant determining factor in FDI by investors in Europe.

Furthermore, Davies et al. (2021) found that tax rates vary depending on the country of investment destination because FDI may be subject to different taxes depending on the country of origin and destination country. According to Dang and Nguyen (2021), who studied 7 ASEAN countries, taxes and inflation significantly impact foreign direct investment. Hsu et al. (2019) found that taxes are not a determining factor for FDI in China. According to Esteller-Moré et al.(2020), the non members of the OECD countries

experience a decrease in FDI due to higher taxes. Boly et al. (2020) revealed that the imposition of corporate taxes impacts net FDI in the destination countries.

The population of a country that is a recipient of FDI is also a determining element that influences FDI. According to Abdouli et al. (2018), the population in the BRICS countries favorably influences FDI. Adeniyi (2022) found that in 40 countries, FDI was influenced by a healthy population. Population, inflation, and economic growth in Nigeria are mentioned as factors by Nyoni and Bonga (2018). Due to legal issues, Da Fonseca and Jucá (2020) viewed that tax variables are too complex to be used as determining factors for international companies investing in other countries. Yiew and Lau (2018) stated that a country's FDI is supported by its population.

In addition, several other studies show that there are still differences in research findings. In South Eastern European (SEE) countries, Silajdzic and Mehic (2022) found a trade-off between I.Q. and FDI. Qamruzzaman (2023) revealed that there is still a short-term or long-term knowledge asymmetry regarding economic policy uncertainty with I.Q. in India and Pakistan. Because FDI directly and indirectly strengthens the Nigerian economy, Dada and Abanikanda (2022) found that I.Q. significantly influences Nigeria. Kaushal (2021) states that FDI in India is weakly affected by loose regulations.

The reviewed studies demonstrate that previous research presents varying findings regarding the factors influencing FDI. This study, however, offers a unique perspective by examining how I.Q. is applied at specific points during the two presidential regimes of President SBY and President Jokowi, highlighting the differences in their personalities and I.Q. levels. This distinction has not been explored in prior research on FDI determinants in Indonesia. This study aims to identify the factors affecting short-term and long-term FDI between 2004 and 2009.

The presidential regimes in Indonesia have implemented various policies. Therefore, this research has two objectives and provides a valuable contribution. First, the study explores the short—and long-run effects of institutional quality, economic growth, tax rate, population, and inflation on FDI in Indonesia. Second, the study investigates the extent to which the presidential regimes of SBY and Jokowi contribute to attracting FDI into Indonesia from both short—and long-run perspectives.

Thus, the study analyzes FDI measurement in Indonesia in various government situations, especially during the SBY and Jokowi administrations. Different emphases on development management across eras of the presidency contribute to the importance of measuring FDI. The government-era variable is used as a categorical variable in this research to highlight its superior qualities compared to related previous studies.

Therefore, the research contributes to various fields. First, we used principal components analysis to create a more accurate measure of institutional quality. Second, the current study fills the gap and contributes to the existing literature by examining various institutional factors where the Indonesian government has continuously tried to foster business reforms and improve IQ: starting a business, labor freedom, resolving bankruptcy, and cross-border trade. The third and most important justification for the influence of

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institutional and macroeconomic quality on FDI is good regulation and consistency in attracting foreign investment in the short and long term. Third, the government can utilize these findings to create successful strategies by regulating or creating institutional quality indicators to ensure incoming FDI is highly quality as the financial source for national economic development.

Environmental taxes can be broadly defined as taxes imposed on goods and services associated with environmental degradation, such as pollution, resource exploitation, and waste, or as direct taxes on environmental "bads" (Bosquet, 2020). For instance, carbon and emission taxes are considered environmental taxes, as they aim to reduce pollution-related emissions. Taxes applied to goods and services with high emission levels are known as output taxes, whereas those directly targeting harmful emissions fall under carbon emission taxes. In Indonesia, taxing these negative externalities has long been implemented, primarily through output taxes.

The recent initiative to adopt a carbon tax at the central level, as stipulated in Law 7 2021, complemented an already existing type of tax that can also be linked to mitigating emissions at the lower government level. For example, some of the taxes levied at the provincial level may indirectly mitigate carbon emissions. At the provincial level, there are taxes on recurrent annual vehicles tax; the vehicle registration tax refers to the tax that is levied when there is a change in vehicle ownership, and to some extent, there are also gasoline taxes. Although there is a subsidy at the national level for gasoline consumption, the provinces still receive tax revenues based on gasoline consumption at the gas (pump) station in the respective province. In addition to tax instruments, the government also implemented programs related to environmental protection. By the function of spending, spending is allocated for environmental protection at the central and lower-level governments.

This study aims to investigate the relationship between the presence of environmental tax and spending on air quality at the subnational level. We use Indonesia, a developing country that has introduced environmental tax and spending at the provincial level since the introduction of the decentralization era. Environmental protection in Indonesia is conducted not only by the national or central government but also by the lower-level governments. As a country with three tiers of government, the central – provincial – and local governments (municipalities or cities level of government), the policies on environmental protection naturally translate into taxes and expenditure policies at central and lower-level governments. However, the discussion in the existing literature, for the case of Indonesia, referring to the context of its multi-level government, rarely discusses tax policies and their link to government spending despite the nature and type of taxes and functional spending assigned to lower-level government.

Vehicle-related taxes constitute a major component of provincial tax revenue in most provinces, comprising 70 to 80% of total provincial tax income. However, on the expenditure side, environmental spending accounts for less than 1% of the total provincial budget on average. This limited allocation significantly constrains the scope and

effectiveness of environmental protection initiatives at the provincial and local government levels.

In terms of environmental outcomes, the government has regularly issued provincial-level environmental quality indexes since 2009. This environmental quality index includes the water quality index, air quality index, and land quality index. The environmental spending at both provincial and local governments is mainly in the form of spending on waste and sanitation. Thus, its linkages with water and land quality need to be clarified. Meanwhile, the air-quality index can be attributed to the main objective of vehicle-related taxes.

This study extends the ongoing literature in several areas. First, existing literature on the impact of environmental taxes and or environmental spending is primarily discussed in terms of type or specific program assessment referring to taxes or expenditure-related policies (Fullerton & Muelegger, 2019; Kaufmann, 2019; Kulin & Seva, 2019; Fairbrother, 2017). Regarding the tax-spending mix, only a few studies conducted taxes and spending as part of policy option assessment (Sommer et al., 2022). This paper uses Indonesia as a case study to examine a large developing country's context in a decentralized economy.

The working of policies may be inter-related, as policies on taxation may also function as a disincentive to emit emissions and or reduction in the consumption and or ownership of the respective goods and services perceived to contribute to carbon emission affecting as well not only private but also government response in terms of its public spending (Aydin & Esen, 2018; Safi et al., 2021). Given this context, the second research gap of this study is to understand which instruments, environmental-related taxes, and or the spending program on the environment may contribute to improving environmental protection indicators.

Prior studies in Indonesia, most of them separately, address the impact of sub-national level environmental spending or particular sub-national government revenues on the outcome of environmental protection (Mutiara et al., 2021; Cadman et al., 2019). The environmental protection outcome that is used in those studies is mainly on the forestry-related outcome, which is generally only applied to some regions, especially provinces with large urban areas. The novelty of our study is that it examines a more general context of the sub-national government's intervention by linking the use of environmental-related taxes/revenues with the spending allocation in the respective sector.

This study makes a significant contribution to the empirical literature on FDI in Indonesia, focusing on the differences in economic policies during the leadership of President Susilo Bambang Yudhoyono (SBY) and President Joko Widodo (Jokowi). The research examines the period from 2004 to 2021, a crucial time frame for understanding the economic dynamics under these two different presidencies. This specific geographic and temporal focus enables a deeper understanding of the regulatory policy changes and the factors influencing them in Indonesia. By emphasizing the country's unique economic, political, and technical conditions, this study provides more nuanced insights into how

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policies implemented during these two eras have affected FDI inflows. Additionally, the analysis of the 2004–2021 period offers an opportunity to compare how differing regulatory policies under SBY and Jokowi have influenced the investment climate and how the interaction of these policies with other factors has impacted the levels and composition of FDI in Indonesia.

This study is limited to the provincial level, given that environmental taxes are relatively dominant taxes for the provinces rather than local governments. As we do not include the environmental taxes of the municipalities, the spending correspondence in this study is only assessed at the provincial government level as well. This study is structured as follows: Section 2 explains the data and method. Section 3 discusses and analyzes the empirical result. The last section concludes the paper.

METHODS

This study utilizes time series data from the World Development Indicators website, spanning the period from 2004 to 2021. The data up to 2021 are robust and comprehensively available, facilitating a deeper and more detailed analysis. The dataset includes information on tax rates, institutional quality, economic growth (measured by Gross Domestic Product – GDP), population, and inflation (Table 1). To increase the number of observations, quarterly data for this research were interpolated from annual data.

According to Tang (2008), interpolated data offers the advantage of increasing statistical power due to a larger number of observations, resulting in more accurate and unbiased model estimations. The -t- Chow-Lin approach was applied to produce 68 quarterly data points for each variable, enabling more reliable conclusions (Zhou, 2001). The use of consistent and valid quarterly interpolation techniques is supported by previous empirical studies (Dash et al., 2022; Rashid & Jehan, 2013; Tang & Chua, 2012). The study examines six independent variables—namely, institutional quality, tax rates, GDP, population, inflation, and the period of presidential regimes—and one dependent variable, FDI. To construct a composite index of institutional quality (I.Q.), we conducted a principal component analysis (PCA).

This study adopts the Autoregressive Distributed Lag (ARDL) model. estimating time series data for cointegration, the ARDL model developed by Pesaran et al. (2001) and; Pesaran and Shin (1995) is more valid and consistent for testing short-run and long-run relationships than alternative cointegration testing techniques. The advantage of the ARDL method is that it can provide accurate and reliable estimation results, both for small and large sample numbers. According to Odhiambo (2009), this method is different from other traditional methods because this method allows the stationarity test to be carried out at several levels of integration, such as I(0), I(1), or both, while other conventional methods limit the integration sequence of the stationarity test. The ARDL approach eliminates short-term and long-term dynamic impacts and obtains balanced results by using time series data over a short period (Li & Shao, 2022).

Table 1. Operational Variables

Variables	Definitions	Measurements	Scales	Sources
FDI	Total foreign investment is divided by GDP.	FDI_{it} = *Total investment*$_{it}$:GDP_{it}	Ratio	World Bank, World Development Indicators online database
Institutional Quality (IQ)	Corruption index developed by the International Country Risk Guide (ICRG).	Indicators of democracy and accountability, political stability and absence of crime or terrorism, government effectiveness, quality of regulations, the rule of law, and oversight of corruption.	Ratio	World Bank, Worldwide Governance Indicators online database
Tax Rate (TR)	Tax ratio of tax revenues as a percentage of GDP.	Tax Ratio of tax revenue as a percentage of GDP.	Ratio	World Bank: World Development Indicators online database
Gross Domestic Product (GDP)	Annual GDP growth percentage rate.		Ratio	World Bank, World Development Indicators online database)
Population (PP)	Number of populations	Population	Nominal	World Bank, World Development Indicators online database)
Inflation (INF)	Annual inflation rate	Percentage change in the consumer price index	Ratio	World Bank, World Development Indicators online database)
T. P	Presidential regime time	SBY presidential period (2004-2014) = 0, Jokowi presidential period (2015-2021) = 1	Categorical (Dummy)	n. a

To measure the effects of determinants of the FDI in the short-term, the study estimates the following model:

$$D(FDI_{it}) = \beta_0 + \beta_1 D(INSQ_t) + \beta_2 D(TR_t) + \beta_3 D(GDP_t) + \beta_4 D(PP_t) + \beta_5 D(INF_t) + \beta_6 (D) + \varepsilon_t \quad (1)$$

Meanwhile, the long-term effects of determinants of FDI is estimated using the following model:

$$\Delta FDI_{it} = \beta_0 + \beta_1 \Delta(INSQ)_t + \beta_2 \Delta(TR)_t + \beta_3 \Delta(GDP)_t + \beta_4 \Delta(PP)_t + \beta_5 \Delta(INF)_t + \beta_6 \Delta(D) + \varepsilon_t \quad (2)$$

where FDI is the Foreign Direct Investment; IQ is institutional quality, TR is tax rate, GDP is gross domestic product, PP is population, D is dummy period and ε is error term.

The unit root test is first carried out to validate the stationarity of the variables before estimating the ARDL model. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, which are often used in the literature, have the benefit of illustrating a series of structural breaks that cause biased results (Sufyanullah et al., 2022). Second, we test the long-term relationship between the variables using the cointegration

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test. According to Pesaran et al. (2001)when it is not known with certainty whether the underlying regressors are trend- or first-difference stationary. The proposed tests are based on standard F- and t-statistics used to test the significance of the lagged levels of the variables in a univariate equilibrium correction mechanism. The asymptotic distributions of these statistics are non-standard under the null hypothesis that there exists no level relationship, irrespective of whether the regressors are I(0, when the bound F-statistic value is greater than the crucial values I(1) and I(0), cointegration is confirmed, which indicates that the relationship is likely to persist over time. To test the short-term and long-term stability of the model. We use plots of the cumulative sum of cumulative sums ((CUSUM) and CUSUMSQ) to test the strength of the short-run and long-run models (Brown et al., 1975).

RESULT AND DISCUSSION

Table 2 reports the descriptive statistics of the investigated variables. As illustrated in Table 2, a low coefficient of variation in the data was due to the low standard deviation (SD) value compared to the average. The average for the previous period was 1.8775 with a SD of 0.6724, which indicates that FDI fluctuations were quite low compared to GDP during the period studied. The institutional quality variable has the highest and lowest negative values (1.5465 and -0.98417), and a negative average value of 0.4106 with a SD of 0.7416. This shows how bad institutional governance in Indonesia is currently in general. The average value of the tax rate is 11.0248, with a negative SD of -1.3593, and the lowest and highest values are 8.3129 and 13.3106, respectively.

Table 2. Descriptive Statistics

Var.	Mean	SD	Min	Max
FDI	1.8775	0.6724	0.4873	2.9161
IQ	0.4106	0.7416	-0.9817	1.5465
TR	11.0248	1.3593	8.3129	13.3106
GDP	3.7558	1.7438	-2.0650	6.3450
PP	258,067,787.90	10,228,075.64	240,615,369.87	274,597,930.37
INF	5.6461	3.0415	1.5601	13.1086

Indonesia's potential for trade openness remains promising, even with relatively high tax rates. The country's GDP fluctuates between -2.065 and 6.345, with an average of 3.7558 and a standard deviation (SD) of 1.7438, indicating that Indonesia's economic growth is generally trending in a positive direction. With a population of 274 million, Indonesia has an average population of 258,067,787 and a SD of 10,228,075, presenting significant consumer market potential. Lastly, inflation ranges from 1.56% to 13.10%, with an average of 5.6461% and a SD of 3.0415, suggesting that Indonesia's economy remains robust and favorable for investment. Findings from stationarity tests and conventional assumptions, as well as the results of residual estimates using the statistical software of EViews, are reported in Table 3.

Table 3. Unit Root Tests

Variables	Stationary tests	ADF	PP
FDI	Levels	-4.3436***	-4.5469***
IQ	Levels	-1.1713	-1.5547
	First Difference	-3.3463***	-3.5941
TR	Levels	-1.0900	-0.7281
	First Difference	-3.2711***	-3.4619***
GDP	Levels	-0.1750	-0.2541
	First Difference	-4.7514***	-4.8806***
PP	Levels	-2.0153	-1.3024
	First Difference	-3.4980	-3.6451
INF	Levels	-0.7765	-0.7920
	First Difference	-5.3433***	-5.3433***

Note: *** significant at 1%. ADF is Augmented Dickey-Fuller Test. PP is Phillips-Perron Test.

As indicated in Table 3, the results of the stationarity test conducted as part of the Autoregressive Distributed Lag (ARDL) Model analysis were employed to verify the order of integration. This study utilized the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to assess the stationarity of the time series data. Evaluating the stationarity of both the ARDL variables and residuals is essential for obtaining reliable results when implementing the ARDL model. The application of the ARDL model ensures a consistent and stable relationship between the variables, effectively avoiding spurious associations.

The variables in this research are stationary at the level and first different, according to the ADF and P.P. test results in the table. At the level, the FDI variable is significant. At the first level of difference, the variables IQ, TR, GDP, PP, and INF is stationary. Based on the results of the ARDL residual cointegration test, which shows the level of stationarity, the ARDL model used is valid and robust to prevent misleading in estimating the Autoregressive Distributed Lag Model (ARDL) both in the short and long term between variables. In addition, before assessing ARDL, a free explanation regarding the fulfilment of cointegration and stability tests is offered to ensure the model is accurate and valid in the short and long term (Sufyanullah et al., 2022)

The results of the ARDL cointegration test based on the F-statistic F are presented in Table 3. With significance levels of 1%, 2.5%, 5%, and 10%, the F-statistic value of 8.2439 exceeds the upper critical limit value, thus concluding that FDI, IQ, T.R., GDP, P.P., and INF have a long-run equilibrium cointegration relationship in this example. Because of these findings, the null hypothesis in this study, which states that there is no cointegration, is rejected.

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Table 4. ARDL Bounds Test Cointegration

F-Bounds Test	Value	Sign.	I(0)	I(1)
		10%	2.53	3.59
F-Statistics	8.2439	5%	2.87	4
Regressor	6	2.5%	3.19	4.38
		1%	3.6	4.9

Note: The table reports the Bound test. H0 for the time-series Bound test is that there is no cointegration within variables. *; **; and *** denote significant at 10%, 5%, and 1% respectively

In addition, the results of verifying the stability of long-term model coefficients using the cumulative sum (CUSUM) of recursive residues and the cumulative sum of squares of recursive residues (CUSUMSQ) proposed by Brown et al. (1975).

Figure 1. The plot of the Cumulative Sum of Recursive Residuals

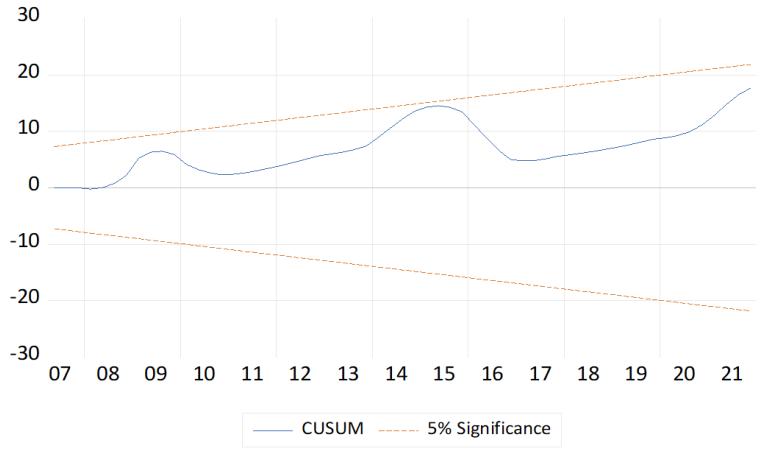
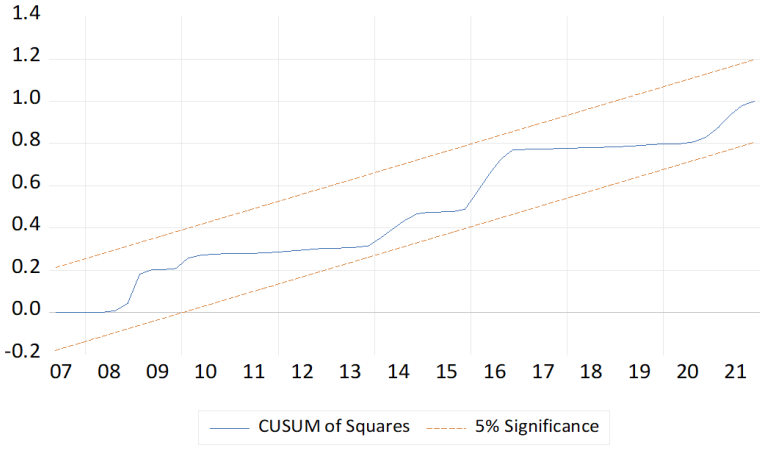


Figure 2. Plot of Cumulative Sum of Squares of Recursive Residuals



Our models are structurally stable, proven by the evaluation results of the CUSUM and CUSUMQ statistical plots shown in Figure 1 and Figure 2. There are no sudden structural changes because the values do not exceed the crucial limit value at the

5% significance level. The model used in this research is acceptable and valid in the long term; changes in the cumulative numbers are constant, and the 95% confidence interval has no effect. Because the ARDL model passes all previous diagnostic tests, these findings conclude that this model is suitable for estimating short-term and long-term relationships.

Table 5 explains the findings from the regression estimates of variables influencing FDI over the last decade. Short-term estimation findings show that FDI is not affected by tax rates or inflation. This can be observed from the respective coefficient values of -0.0217 and -0.0253, below the thresholds of 1%, 2%, and 10%. Meanwhile, the estimation results for the institutional quality variable (IQ), GDP, Population Number (PP), and the presidential regimes' dummy variables are respectively 0.3784***, 0.3417***, -2.8299***, and 0.7339***, with a significant level of 1%.

Table 5. ARDL Model Estimation in the Short and Long Term

Panel A: short run	Coeff.	S.D	T-Statistic	Prob.
IQ	0.3784***	0.1015	3.7285	0.0004
TR	-0.0217	0.0783	-0.2775	0.7823
GDP	0.3417***	0.0914	3.7367	0.0004
PP	-2.8299***	0.6519	-4.3407	0.0001
INF	-0.0253	0.0273	-0.9271	0.3574
Dummies	0.7339***	0.1986	3.6940	0.0005
C	2.5232	0.9852	2.5611	0.0129
Panel B: Long run				
IQ	1.4442***	0.5159	2.7995	0.0068
TR	-0.0829	0.2960	-0.2801	0.7803
GDP	1.3039***	0.4070	3.2036	0.0021
PP	-10.7988***	3.6663	-2.9453	0.0045
INF	-0.0966	0.1205	-0.8015	0.4259
Dummies	2.8006***	0.8145	3.4383	0.0011
Panel C: Specification tests; F-Stat = 333.3026; P-value = 0.0000; R2 = 0.8230				

Note. ***, *** and * (level of significance 1%, 5% and 10%)

Meanwhile, the long-term analysis revealed that the independent variables—institutional quality (IQ), GDP, population (PP), and government dummy—significantly influenced FDI. Conversely, the tax rate and inflation variables did not demonstrate significance. This finding is further supported by the F-statistics (Table 5: Panel C). Additionally, the post-decade analysis shows that FDI attracted during the SBY administration was notably higher than the Jokowi administration, highlighting a superior performance in FDI attraction during the former's tenure.

Based on the estimation results from the Auto-Regressive Distributed Lag (ARDL) model, Foreign Direct Investment (FDI) in Indonesia is influenced by institutional quality

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(IQ), economic growth (GDP), population (PP), and presidential regime dummies over the past decade. In contrast, tax rates (T.R.) and inflation (INF) do not exert significant effects in the short term. These findings are consistent with the long-term determinants of FDI in Indonesia. The variable for institutional quality demonstrates a significant positive influence on FDI, both in the short and long term. This result aligns with Ullah and Khan (2017), which tested various regions; Canh et al. (2021), which utilized global data; Sabir et al. (2019), which examined countries across different income levels; and Ogbonna et al. (2022), which focused on Africa, all of which identified a positive relationship between institutional quality and FDI.

The observed inverse relationship indicates that the institutional quality of a country can become unstable in the eyes of investors, leading to a decline in FDI value. In essence, as institutional quality improves, the Indonesian government can further attract FDI. This study underscores the importance of institutional quality as a significant factor influencing FDI in Indonesia, highlighting the crucial role that government policies can play. However, this result contrasts with the findings of Peres et al. (2017) and Asongu et al. (2018), which reported that institutional quality did not significantly impact FDI in developing countries. The regulations regarding institutional quality set by the government suggest that these factors effectively enhance service quality and encourage FDI inflows into Indonesia. Furthermore, this indicates that foreign investors are not overly concerned about sudden policy changes, preferring to invest in countries with stable institutional quality and consistent policies.

In contrast, tax rates do not significantly affect FDI in the short or long term. These results imply that the Indonesian government's tax policies must be more effective and may hinder investor attraction. This finding aligns with research by Jemiluyi and Jeke (2023), which examined African countries, and Camara (2023), which focused on 90 developing countries, concluded that a country's tax structure does not significantly influence FDI. The negative impact of taxes on FDI indicates that foreign investors are reluctant to invest in countries where high tax rates erode profits. Supporting this, Shirodkar and Konara (2017) also found that taxes negatively impact FDI due to reduced profitability for firms. This result highlights that the Indonesian government has yet to adopt competitive strategies, such as tax exemptions or reductions, to provide incentives for attracting foreign investment. Consequently, taxes remain a primary determinant for foreign investors when making investment decisions, as they often compare tax rates with those in other countries.

Moreover, GDP exhibits a relatively large positive coefficient in the short and long term. This trend suggests that Indonesia's welfare is improving, and its reliance on other countries is diminishing alongside GDP growth. This improvement indicates that Indonesia may be outperforming other countries in terms of investment. These conclusions affirm the influence of GDP on FDI, as supported by the studies of Awad (2020), Sabir et al. (2019), and Suryanta & Patunru (2022).

This study highlights the significance of economic growth and its influence on foreign direct investment (FDI) in Indonesia. Economic growth has short-term and long-

term effects, creating greater opportunities for foreign investors to generate profits as they recognize the potential for increased product sales. Indonesia has experienced consistent annual economic growth, indicating a stronger capacity to absorb FDI. Economic growth catalyzes attracting FDI, bringing employment opportunities, technology, and enhanced productivity to recipient countries (Jui et al., 2024).

In addition, the population plays a significant role in impacting FDI, although the coefficient is negative in both the short and long term. This result suggests that, despite Indonesia's sizeable working-age population, the country needs to be in a favorable demographic position. These findings align with research on FDI by Wei et al. (2022) focusing on China, Arain et al. (2019) investigating the South Asian region, and Immurana (2021) in Ghana. They demonstrate that FDI has not effectively absorbed Indonesia's demographic capital and available labor force, which prioritizes skilled labor and high productivity. Our results indicate that population growth may hinder FDI inflows, as investors may encounter a workforce with lower qualifications. This decline in productivity can lead to reduced profitability, as foreign investors may be concerned about low returns on investment and the additional costs associated with training new employees (Immurana et al., 2023). Furthermore, Indonesia's relatively low per capita income can diminish demand for goods and services, further limiting investment potential.

Lastly, inflation appears to have an insignificant impact on FDI, with a negative coefficient in both the short and long term. Indonesia's inflation rate remains reasonable, allowing investors to achieve satisfactory investment returns. The relatively stable inflation in Indonesia serves as a favorable indicator for attracting FDI, suggesting that one reason for continued FDI inflows is the potential value of investments reflecting low economic risk. The government's ability to manage inflation significantly influences FDI flows (Ndoricimpa, 2017). Effective government policies that maintain inflation at controlled levels smooth the economic cycle, promoting growth through the efficient use of productive resources. In the long term, this approach fosters an increase in FDI directed toward Indonesia.

These findings are consistent with research by Tung (2019) in Vietnam, Feng and Wen (2023) in China, and Edo and Nnadozie (2023) in Sub-Saharan Africa, all of which indicate that inflation does not significantly affect foreign direct investment. The SBY and JKW administrations can influence FDI through categorical variables represented by dummy coefficients. However, the SBY era has more effectively attracted investors to Indonesia. As noted by Götz (2020) and Jensen (2003), the era of democratization presents a more favorable environment for investors and multinational corporations.

CONCLUSION

This study holds significant importance as it delves into the short-term and long-term effects of various factors influencing foreign direct investment (FDI) in Indonesia from 2004 to 2021. The findings reveal that institutional quality (IQ), GDP growth,

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and the presidential regime (represented by dummy variables for SBY and JKW) have a substantial positive impact on FDI growth in both the short and long term. Conversely, the analysis uncovers that population growth, inflation, and tax rates have a significant negative effect on FDI during the same periods.

These results carry significant implications for policy and regulatory frameworks in Indonesia. The positive trajectory of institutional quality suggests that the country's institutions and regulations are effectively designed to attract FDI. Government reforms aimed at reducing regulatory complexity have significantly bolstered FDI inflows. The government needs to maintain consistent economic growth, as this will further enhance FDI. This condition can be achieved through stable macroeconomic policies, improved financial access, and a well-structured tax system. Currently, the existing tax structure poses challenges that can deter foreign investment; thus, the government must establish regulations and laws that streamline access for foreign investors looking to allocate their capital in Indonesia.

Furthermore, while Indonesia has maintained a relatively stable inflation rate over the past two decades, this stability presents its own set of challenges for investors. The government should implement a policy that establishes an annual inflation target, which can help encourage further FDI. Additionally, population growth remains a concern as a shortage of knowledge and skills necessary for sustainable development often accompanies it. To address this, the government must prioritize and invest in training and education initiatives that equip citizens with the skills needed, particularly in anticipation of the demographic dividend expected in 2045.

The analysis suggests that FDI inflows were more robust during the SBY administration, attributed to a reliance on soft political power and high-level governance strategies that enhanced Indonesia›s standing in various global and international forums. However, this study does have limitations, as it only analyzes data from two presidential regimes—SBY and Jokowi. Future research should consider a more extended timeframe, incorporating additional presidential administrations since Indonesia's independence in 1945, to provide a more comprehensive understanding of FDI dynamics in the country.

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Determinants of Foreign Direct Investment in Indonesia After Pandemic

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ABSTRACT

Research Originality: The Covid-19 pandemic brought out the phenomenon of a rapid increase in investment after it has ended in Indonesia. This study gives a significant contribution in analyze the impact of pandemic on foreign direct investment.

Research Objectives: The aim of this research is to predict whether there is a relationship of interest rates, inflation, labor force, GDP, and exchange rate with investment.

Research Methods: This research is also to examine the asymmetric relationship among variables using the NARDL (Nonlinear Autoregressive Distributed Lag) method to identify the long-run effects of these variables on the investment after the Covid-19 pandemic in Indonesia. It uses the secondary data from 1980-2022.

Empirical Results: The results of research show that there is a long-run asymmetric effect of the variables of interest rates, GDP, and exchange rates on the foreign direct investment. It means that changes in these variable factors do not only affect the size of investment, but also the speed of its increase after the pandemic. Meanwhile, there is no asymmetric effect of the variables of labor force and inflation on the investment.

Implications: This research provides a picture and new insights related to the foreign direct investment dynamics in Indonesia after the Covid-19 pandemic. This study implies that require a different policy approach in an effort to increase the investment in Indonesia.

Keywords:

investment; gross domestic products; covid-19; non-linear autoregressive distributed lag (NARDL)

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INTRODUCTION

The year 2020 was the beginning of the crisis in Indonesia, precisely in March when it was confirmed that Indonesia had tested positive for the COVID-19 outbreak. The disease outbreak spread rapidly in all countries of the world. The government has also taken policy decisions to minimize the very rapid spread of this virus by implementing social restrictions, maintaining distance from other people, reducing traveling outside the house, and temporarily discontinuing the community's economic activities (Jiang et al., 2021). At the beginning of the COVID-19 presence, the government as policymakers only focused on handling the health, which threatened many lives and even death. However, it turned out that the COVID-19 pandemic has caused much harm to other parties, including the economy in Indonesia.

Economic recovery is the primary goal of the problems that are occurring. The existing policies to minimize the spread of COVID-19 resulted in economic activity discontinuing (Sánchez et al., 2022). The COVID-19 pandemic outbreak was not only detrimental to the health sector; in 2020, it also had an impact on foreign direct investment (FDI) in ASEAN, which decreased by 25% to US$137 billion, whereas, in 2019, the previous value reached US$182 billion (Atri et al., 2023).

Indonesia is a country that has thousands of islands spread out with a very large population, many provinces, and diverse natural resources that are attractive to investors either from within or outside the country (Budiono & Purba, 2023). Indonesia still really needs a large budget to implement sustainable economic development. Relying on domestic funds alone is still insufficient to carry out the development because the amount of domestic savings still needs to be increased to meet the required investment. Investment is considered an essential factor in the economic growth (Bader, 2010). There are three financing efforts to obtain the investment: debt-related financing, domestic financing, and foreign direct investment (Morrissey & Udomkerdmongkol, 2012).

Domestic financing can be provided through debt, while foreign investment can be a joint venture with other investors in the country. Compared with the portfolio, foreign direct investment is more profitable. This condition is because the state feels the investment is conducted in the form of capital, transfer of knowledge, and technology (Lembong, 2013). Foreign Direct Investment (FDI) is essential for achieving sustainable growth in any country, including Indonesia. FDI is an important factor in encouraging economic growth in each country (Asiamah et al., 2019).

Indonesia is one of the countries that requires foreign capital as a source of financing for domestic development. Investment in foreign countries is an important form of international capital flow. It is also an inevitable trend in economic globalization, just as Foreign Direct Investment (FDI) is the main driving force of the global economy today (Ma & Du, 2022). Trends in foreign direct investment in Indonesia fluctuate every year. This condition may happen because Indonesia, as a developing country, is tied to global economic conditions, which could be due to a financial crisis, a trade war, or significant conditions such as the United States or Europe that can influence the investors' interest

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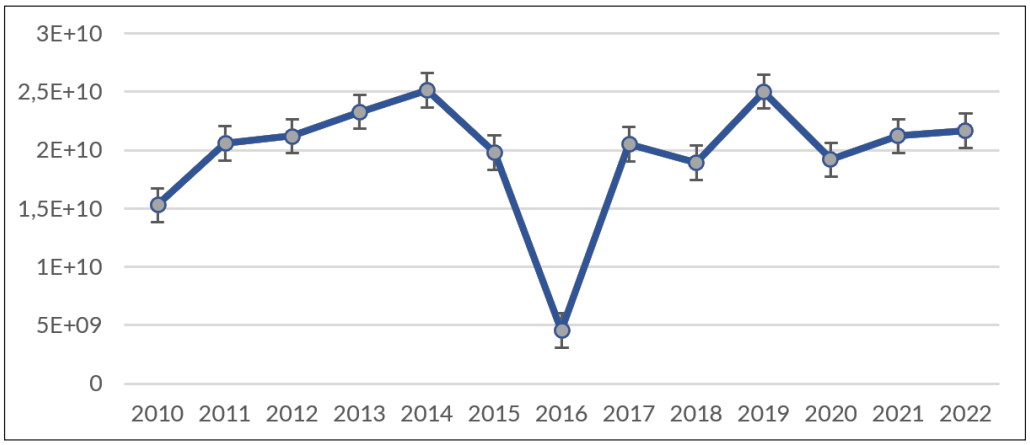
to invest in Indonesia (Caballero, 2013). Trends in foreign direct investment can be seen in Figure 1.

Figure 1. Foreign Direct Investment in 2010-2022



Source: World Bank (2023)

Based on the data in Figure 1, it can be seen that foreign direct investment in Indonesia fluctuated in 2010-2022. From 2010 to 2014, investment in Indonesia has increased every year. However, in 2015, foreign direct investment experienced a significant decline, and this was also followed in the following year, in 2016, in which it experienced a more drastic decline. In 2017, foreign direct investment increased again, but in 2018, it experienced another decline, although slightly, and in 2019, it increased again. However, in 2020, the investment experienced another significant decline due to the COVID-19 outbreak that almost affected the whole world, not just Indonesia, and also caused huge losses for all countries (World Bank, 2023).

Based on the data World Health Organization recorded until October 28th2022, the total number of confirmed cases of COVID-19 reached 629 million with 6.59 million deaths. Therefore, the spread of the COVID-19 pandemic has significantly impacted aspects of life in the economic, social, and health sectors worldwide (Zhang et al., 2023). During the 2016-2022 period, investment in Indonesia experienced relatively slow growth, in addition to the pandemic outbreak in Indonesia in 2020. This situation is very worrying not only in Indonesia but also in countries worldwide. Then, in 2019, the investment experienced an increase from the previous year but decreased again in 2020, which occurred due to the impact of the COVID-19 pandemic that had a significant effect on the economy in Indonesia, including a decrease in foreign direct investment in Indonesia.

An economic condition can be seen from the condition of its capital market. The country's economic condition is correlated with the condition of its capital market. However, the capital market tends to be more reactive to potential crises. This tendency may occur because capital market players generally have a forward look, which is the estimation of the company's financial performance in the future. Viewing the problems in Indonesia, where the COVID-19 pandemic has increased enormous economic uncertainty

(Rito & Azzahra, 2018), this is the leading cause of the decline in investor confidence that impacts the decline in investment, as seen in Figure 1.

The year 2022 is the new normal era where there will be an increase in investment achievements. Based on Badan Koordinasi Penanaman Modal (2022) has published data on investment realization achievements in the first quarter (January-March period) in 2022 amounted to IDR 282.4 trillion, which was higher by 28.5% compared to the same period in 2021. The achievements for the first quarter of 2022 also experienced an increase of 16.9% compared to the fourth quarter of 2021. The achievements for the first quarter of 2022 also contributed 23.5% of the budgeted realization target of IDR 1,200 trillion. Viewing the increase in investment realization, it increased by double digits in the first quarter of 2022 compared to the first quarter of 2021. This data shows that the confidence of domestic and foreign investors is increasing in government policies, especially in the investment sector. Indonesia is one of the investment targets, considering that the Southeast Asian region still has great potential compared to other countries or regions after the end of the pandemic. With the soaring increase in investment, it is hoped that it can create quality jobs for the community, mainly due to the large number of workers being laid off due to the impact of the pandemic. Therefore, to support the community's welfare, the government needs to work hard to overcome this matter and increase the investment so that the community can feel the benefits in the future.

It is interesting for the writers to identify the factors that caused the investment to proliferate after the Covid-19 pandemic. At the same time, later, this research can be used as material for consideration by a business or the government, especially in making policies to optimize the investment in Indonesia in the future for the country's progress and the welfare of the society. This result is also reinforced by Goodell (2020), who states the direct and indirect impact of COVID-19 on the financial market economy and institutions. This condition has never happened before, causing widespread and even damage to the global economy in every sector; not only the economy but investment has been affected by this pandemic, and its negative impacts continue. Goodell's (2020) argument, stating the ongoing impact of the COVID-19 pandemic on the economy, is undoubtedly different from the conditions that occur based on the data in Figure 1.

Therefore, the writers think investment conditions will move quickly after the pandemic because interest rates, inflation, labor force, gross domestic product, and exchange rate influence them. The labor force factor supports the increase in investment; when the total labor force is higher, the investment will also increase (Nguyen, 2021). The level of investment is also related to the exchange rate; when the exchange rate strengthens against foreign currencies, this can create enthusiasm for investing (Harchaoui et al., 2005). The changes in interest rates can describe the economic situation, which also affects all macroeconomic variables, such as GDP, inflation, and employment levels (Wuhan et al., 2015). Therefore, interest rates really influence the investment. Investment is essential for future cash flow growth, profitability, and the development of prospects.

Although there has been much research on investment throughout the world or in Indonesia, most of the previous research has focused on companies or the agricultural sector,

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like the research of Sánchez et al. (2022), which refers to investment in the agricultural sector in the recovery era after the Covid-19. The research results show that investment in agriculture has proven to be one of the drivers of economic recovery after the Covid-19 pandemic. In addition, the effects of macroeconomic aggregates such as GDP and household consumption are beneficial in foreign loans. The previous research by Budiono and Purba (2023) found that electrical energy, clean water, and HDI positively influence investment.

Research by Huyen (2015) explains the factors that influence investment in Vietnam, which are two factors that are becoming of great interest to international business partners: economic and marketing factors and infrastructure factors. In addition, provinces with friendly political or legal factors and the availability of resources and financial factors can attract more foreign investors. Furthermore, research by Miškinis & Sakalauskaitė (2014) explains the main factors that determine FDI in Russia: market size, large cities' presence, oil and gas resources, and political and legislative risk factors.

Therefore, this research differs from the previous ones (Budiono & Purba, 2023; Sánchez et al., 2022; Huyen, 2015; Miškinis & Sakalauskaitė, 2014). The new thing is that this research uses different variables from the previous ones, including the variables of exchange rate, interest rates, inflation, GDP, and labor force. Huyen (2015) proves that financial factors such as the exchange rate significantly affect investment in Thanh Hoa province, Vietnam. Then, this research includes the labor force variable that has not been studied much by the previous research to test whether the labor force factor also influences investment in Indonesia after the pandemic. Then, the method used is also different, using a model that is not widely used to analyze the investment, the Nonlinear Autoregressive Distribution Lag (NARDL) model.

This research aims to find the relationship between interest rates, inflation, labor force, GDP, and the exchange rate with investment in Indonesia after the COVID-19 pandemic. In addition, it is also used to model the asymmetric relationships among the variables and to differentiate between the short-run and long-run effects of independent variables. Later, this research can be used by policymakers, especially the government or business people, regarding the determining factors that must be considered in increasing investment in Indonesia after the COVID-19 pandemic. Afterward, the research can provide specific insight into the dynamics of foreign direct investment in Indonesia after the COVID-19 pandemic. Understanding the determinants of foreign direct investment in Indonesia can also provide an overview of the factors that influence the investment and can help Indonesia recover its economy to develop more quickly after the COVID-19 pandemic and in the future.

METHODS

This quantitative research uses an econometric approach, using time series data. The research uses secondary data from the World Bank in Indonesia from 1980 to 2022, with 32 observations used. Then this research uses Nonlinear Autoregressive Distributed Lag (NARDL) analysis that has been updated by (Pesaran & Shin, 2012). The NARDL model tests asymmetric relationships of variables observed in the long run. The NARDL model

has the advantage of detecting the asymmetric effects that the independent variable can have on the dependent variable.

This model helps to determine whether the independent variables, which are interest rates, inflation, GDP, labor force, and exchange rates, can attract the foreign investment. The model is developed as follows:

$$INV_t = \beta_o + \beta SB + \beta KURS + \beta PDB + \beta INF + \beta AK + \varepsilon \quad (1)$$

Description:

INV : Investment
SB : Interest rate
KURS : Rupiah exchange rate
PDB : Gross Domestic Product
INF : Inflation
AK : Labor force
β : Constanta
ε : Error terms

Equation (1) can be modified based on the NARDL model so that it is expanded into an asymmetric long-run equation. Due to non-linearity in the time series, the model is extended to make a space for asymmetric relationships. In the situation where time series are co-integrated, asymmetry and structural damage may occur in the data. The asymmetric NADRL model incorporated in the extended version of the ARDL model is determined as follows:

$$INV_t = \beta^+ SB^+_t + \beta^- SB^-_t + \beta^+ KURS^+_t + \beta^- KURS^-_t + \beta^+ GDP^+_t + \beta^- GDP^-_t + \beta^+ INF^+_t + \beta^- INF^-_t + \beta^+ AK^+_t + \beta^- AK^-_t + \varepsilon_t \quad (2)$$

Where β^+ and β^- represent long-run parameters, NARDL applies decomposition of the independent variables into positive and negative partial amount for increases and decreases. Asymmetric effects of variables with positive changes such as SB^+, $KURS^+$, GDP^+, INF^+, and AK^+ as well as negative changes in SB^-, $KURS^-$, GDP^-, INF^-, and AK^-. Then it is expanded into the following formula:

$$SB_t^+ = \sum_{i=1}^{t} \Delta SB_t^+ = \sum_{i=1}^{t} \max(SB_t, 0)$$

$$SB_t^- = \sum_{i=1}^{t} \Delta SB_t^- = \sum_{i=1}^{t} \min(SB_t, 0)$$

$$KURS_t^+ = \sum_{i=1}^{t} \Delta KURS_t^+ = \sum_{i=1}^{t} \max(KURS_t, 0)$$

$$KURS_t^- = \sum_{i=1}^{t} \Delta KURS_t^- = \sum_{i=1}^{t} \min(KURS_t, 0)$$

$$GDP_t^+ = \sum_{i=1}^{t} \Delta GDP_t^+ = \sum_{i=1}^{t} \max(GDP_t, 0)$$

$$GDP_t^- = \sum_{i=1}^{t} \Delta GDP_t^- = \sum_{i=1}^{t} \min(GDP_t, 0)$$

$$INF_t^+ = \sum_{i=1}^{t} \Delta INF_t^+ = \sum_{i=1}^{t} \max(INF_t, 0)$$

$$INF_t^- = \sum_{i=1}^{t} \Delta INF_t^- = \sum_{i=1}^{t} \min(INF_t, 0)$$

$$AK_t^+ = \sum_{i=1}^{t} \Delta AK_t^+ = \sum_{i=1}^{t} \max(AK_t, 0)$$

$$AK_t^- = \sum_{i=1}^{t} \Delta AK_t^- = \sum_{i=1}^{t} \min(AK_t, 0)$$

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Equation (2) can be written in the form of infinite error correction as presented by Pesaran et al. (2001)

$$\Delta INV_t = \alpha_o + \alpha 1 INV_{t=1} + \alpha 2 SB^+_{t=1} + \alpha 3 SB^-_{t=1} + \alpha 4 KURS^+_{t=1} + \alpha 5 KURS^-_{t=1} + \alpha 6 GDP^+_{t=1} + \alpha 7 GDP^-_{t=1} + \alpha 8 INF^+_{t=1} + \alpha 9 INF^-_{t=1} + \alpha 10 AK^+_{t=1} + \alpha 11 AK^-_{t=1} + \sum_{i=1}^{t} \rho 1i\ \Delta INV_{t=1} + \sum_{i=1}^{t} \rho 2i\ \Delta SB^+_{t=1} + \sum_{i=1}^{t} \rho 3i\ \Delta SB^-_{t=1} + \sum_{i=1}^{t} \rho 4i\ \Delta KURS^+_{t=1} + \sum_{i=1}^{t} \rho 5i\ \Delta KURS^-_{t=1} + \sum_{i=1}^{t} \rho 6i\ \Delta GDP^+_{t=1} + \sum_{i=1}^{t} \rho 7i\ \Delta GDP^-_{t=1} + \sum_{i=1}^{t} \rho 4i\ \Delta KURS^+_{t=1} + \sum_{i=1}^{t} \rho 5i\ \Delta KURS^-_{t=1} + \sum_{i=1}^{t} \rho 6i\ \Delta GDP^+_{t=1} + \sum_{i=1}^{t} \rho 7i\ \Delta GDP^-_{t=1} + \sum_{i=1}^{t} \rho 8i\ \Delta INF^+_{t=1} + \sum_{i=1}^{t} \rho 9i\ INF^-_{t=1} + \sum_{i=1}^{t} \rho 10i\ \Delta AK^+_{t=1} + \sum_{i=1}^{t} \rho 11i\ \Delta AK^-_{t=1} + \mu t \quad (3)$$

Equation (3) regulates the inclusion of short-run and long-run coefficients in the error correction model. The short-run coefficient is represented by the variable Δ. And the long-run one is the variable α. This equation is based on the NARDL model and it assumes an asymmetric relationship among variables.

The first step is to carry out a data stationarity test. This test is conducted to see whether the data is in equilibrium or disequilibrium condition (Shin et al., 2012). The stationary test uses the Augmented Dickey Fuller (ADF) and Philip Perron (PP) models. In this test the data is said to be stationary if the calculated t-value for the ADF and PP statistical values is greater than the critical t-value, otherwise the data is not stationary. Second, estimation is carried out using the OLS method, which is used to eliminate the significant lags. Third, testing the long-run relationship of the independent variable to the dependent variable, which is called the co-integration test. In the co-integration test uses the Wald test, in which the F-critical value in the co-integration test is the F-critical table by (Pesaran et al., 2001). The co-integration test is accepted if the F-statistic value is greater than the F-table -I bound upper. If the F-statistic value is smaller than the F-table -0 bound lower, there is no co-integration. If the F-statistic value is at the upper and lower bound values, there is no decision in that matter (Pesaran et al., 2001).

Afterwards, if the co-integration test results are significant, the next step is to carry out an asymmetric test. The null hypothesis of the asymmetric H0: $\sigma_3 - \sigma_4$ alternative hypothesis Ha: $\sigma_3 \neq \sigma_4$ the null hypothesis of the short-term asymmetry H0: $\alpha 3 = \alpha_4$, the alternative hypothesis Ha: $\alpha_3 \neq \alpha 4$ are both tested using the Wald test (Pesaran & Shin, 2012). If it turns out that an asymmetric effect is found, there will be an increase or decline in interest rates, inflation, labor force, GDP, and exchange rate against the investment.

RESULTS AND DISCUSSION

Much research discusses investment, such as the study conducted by Malefane (2007). However, only a little research discusses investment conditions after the COVID-19 pandemic and the role of labor force factors on investment. This research is used to predict the relationship between interest rates, inflation, GDP, labor force, and exchange rates on investment after the Covid-19 pandemic. Apart from that, it is also to model asymmetric relationships between variables to differentiate between

the short-term and long-term effects of independent variables. This research is also different from previous research in that the analysis of this research uses the NARDL (Nonlinear Autoregressive Distributed Lag) method, which has yet to be widely used in investment research.

The first step in the NARDL model analysis is to test the stationarity. Before testing the NARDL model, the data must be stationary at the level stage or at the first difference. If the data turns out stationary at the second difference, the NARDL model cannot be carried out. Researchers use the unit root test to obtain the stationary data results in this stationarity test. This research uses the Phillips-Perron standard and Augmented Dickey-Fuller (ADF) for the stationary test. The result of the stationary test is shown in Table 1.

Table 1. Stationarity Test

Variables	Augmented Dickey Fuller		Phillips-Perron	
	Level	1st Differ.	Level	1st Differ.
Investment	0.2190	0.0002	0.1741	0.0002
Exchange Rate	0.0001	0.1067	0.0001	0.0000
Interest Rate	0.6654	0.0000	0.6944	0.0000
Inflation	0.0020	0.0979	0.0019	0.0001
GDP	0.9924	0.0026	0.9898	0.0026
Labor Force	0.7010	0.0042	0.4618	0.0463

Source: Data processed (2023)

Based on the research results of the unit root testing that has been conducted, which is shown in Table 1, it is noted that the exchange rate and inflation have been stationary at this level. Meanwhile, investment, interest rates, GDP, and labor force are stationary at the first difference level. Therefore, none of the data is stationary at the second difference level, so the NARDL model test can be used and carried out to test the asymmetric relationship of interest rates, inflation, GDP, labor force, and exchange rates with the investment in Indonesia after the Covid-19 pandemic. The following results from the optimum lag determination test can be seen in Figure 2.

The following testing step is determining the best NARDL model using the Schward criteria. A good NARDL model can be conducted by comparing the Schward Criteria values of the NARDL model. Based on the number of lags used for each model, the testing conducted produces the best NARDL model in the research, shown in Figure 2. It can be seen in Figure 2 that the horizontal axis represents the NARDL model, and the vertical axis represents the SC model. The optimal and ideal NARDL model is the one with the smallest or lowest SC value. According to Figure 2, the best model is (2,2,2,2,2,2,2,2,0) with an SC value of 1.98.

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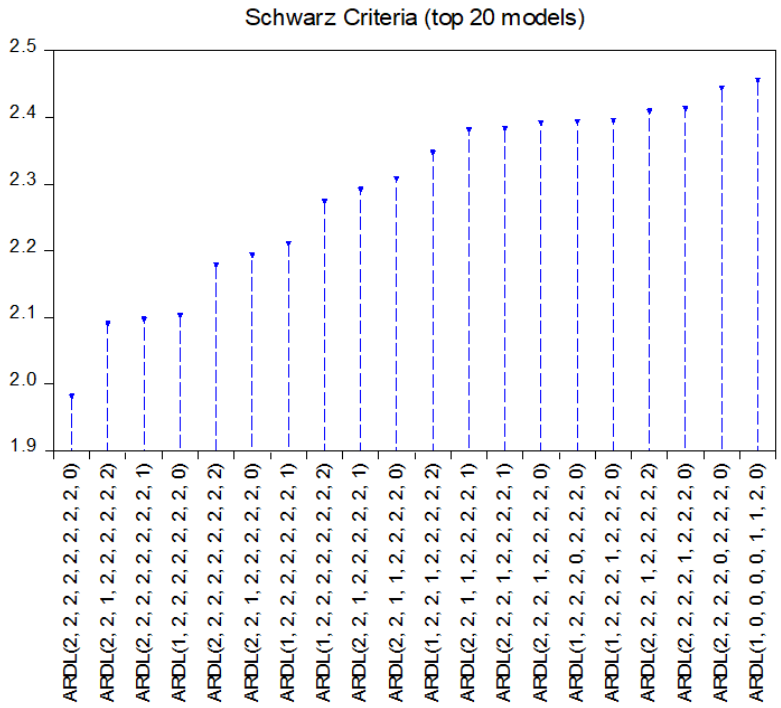
Figure 2. Results of Optimum Lag Determination (Best Model) Using Criteria



Source: Data Processed, 2023

Another crucial aspect of our research is the co-integration test. This test is not just a formality but a necessary step to understand the relationship among the variables. If there is no co-integration relationship in the analysis, this method model cannot be used. The testing uses the Wald test and is compared with the Bound table. The data can be said to be co-integrated if the F-statistic value is greater than upper I(1). Meanwhile, if it does not contain co-integration, the F-statistic value in the Wald test is smaller than lower I(0). The following results of co-integration testing conducted using the Wald test (see Table 2).

Table 2. Co-integration Test

F-stat	Bound Table	
	I(0)	I(1)
3.484	2.11	3.15

Source: Data Processed (2023)

Table 2 shows the results of the co-integration test, where the F-statistic value is 3.483891, the Bound I(0) table is 2.11, and I(1) is 3.15. These results can explain that the model has a co-integrated relationship, which means that the asymmetric influence of the exchange rate, GDP, interest rates, labor force, and inflation on the investment in Indonesia has a long-run co-integration relationship because the F-statistic value is greater than the upper bound value I(1).

Our research methodology involves applying the NARDL model, chosen for its ability to describe the relationship between the investment variable and independent variables. The NARDL model estimation is used to predict the short-run and long-run relationships of the proposed variables, which are interest rates, inflation, GDP, labor force, and exchange with investment in Indonesia post-COVID-19. Symbol (D) denotes changes in variables in the short run. The estimation results of the NARDL model are presented in Table 3.

Table 3. Estimation Results of Long-Run and Short-Run of NARDL Model

	Variable	Coefficient	Standard error	Prob
	C	-26.63916	10.12251	0.0581
Short Run	AK	2.18E-07	1.14E-07	0.1274
	DSB+	-0.002040**	0.00066	0.0365
	DSB-	0.002759	0.00219	0.2762
	DKURS+	-0.315681*	0.115741	0.0526
	DKURS-	-0.690478***	0.138499	0.0076
	D(GDP)	-1.30E-11	7.64E-12	0.1645
	DGDP(t-1)	1.83E-11*	6.70E-12	0.0524
	DINF+	-0.255853**	0.066875	0.0187
	DINF-	0.640065**	0.212948	0.0397
Long Run	KURS-	-0.343521**	0.087855	0.0174
	INF-	0.826085	0.392933	0.1034
	PDB	6.20E-12	6.27E-12	0.3785
	AK	1.71E-70	1.20E-07	0.2270
	SB+	-0.000985	0.000501	0.1270
	Diagnostic Test			
	R^2	0.988122		
	Adj R^2	0.916857		
	ARCH Test		0.8619	
	Normality Test		0.326572	
	Autocorrelation Test		0.3087	

Notes: *, **, and *** each represents the significance level 10%, 5% and 1%.
Source: Data Processed (2023)

Our discussion and analysis reveal the output results of short-run and long-run relationships (positive and negative shocks) among the variables, as shown in Table 3. The nonlinear relationship between shocks of the independent variable and the dependent variable can be explained as follows: the short-run NARDL estimation results based on the interest rate show that only changes in interest rate+ have a significant impact on the investment. This means that the investment level is stable when facing changes in

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interest rates in the short run. Our findings, supported by the work of Karamelikli & Karimi (2022), suggest that the interest rate has no significant coefficient in the short run. However, there are also supporting findings that interest rate+ has a significant effect on investment (Abel & Eberly, 1999). This relationship between interest rate and investment suggests that an increase in the interest rate can also support investment. These findings underscore the importance for the government, as a policy maker, to consider the impact of interest rate increases when planning investment.

The exchange rate variable shows that the exchange rate coefficient has a significant value. These results show that changes in the exchange rate significantly impact foreign direct investment. However, this impact depends on the direction of changes in the exchange rate, where it can be seen that an increase in the exchange rate tends to reduce the investment, while a decline in the exchange rate tends to increase the investment. The following research by Bahmani-Oskooee et al. (2018) shows that the exchange rate is indeed experiencing changes in the effects of short-term asymmetries on investment. These findings have important implications for economic and policy decision-making. This research can help the government and the policymakers to consider changes in the exchange rate when planning investment policies in the short run. In addition, the government needs to be able to monitor changes in the currency exchange rate in the investment strategies.

The inflation variable shows that the inflation+ coefficient has a significant value. These results indicate that short-run inflation significantly impacts investment. An increase in inflation tends to reduce the investment, while a decrease in inflation can increase the investment. It requires the appropriate policy efforts so that the government can use this research as material to consider the impact of changes in inflation in planning investment policies in the short run. The results of the research are in line with the research by Valadkhani et al. (2009) and (Kamasa et al. (2022), which have a negative influence on investment. The research results provide insight into when a higher inflation rate can cause a decline in the total output. When inflation occurs, it will cause prices to soar so that people's purchasing power will decrease. When people's purchasing power decreases, it will affect the company profits, which will also decrease. This condition makes the investors reluctant to invest because the results will be less. This result means higher investment growth can only occur if the government controls inflation.

The GDP variable shows that the GDP coefficient is not significant. This result means that current GDP growth (GDP) does not significantly impact investment, while GDP growth in the previous period GDP(t-1) significantly impacts in the short term. The findings in this research follow research by Akter and Rahman (2023), which states that GDP is a significant determining factor in FDI. However, this research is different from the research conducted by Fathia et al. (2021), which shows that the GDP variable positively affects foreign direct investment. Special attention is required to the impact of previous GDP growth on investment. In addition, the current GDP variable is not a significant factor in determining the investment level after the Covid-19 pandemic.

Then, the labor force variable shows that the labor force is not statistically significant, which means that changes in the labor force do not significantly impact investment in the short run. The labor force variable is not the dominant factor determining investment in the short run. This research differs from the results of Akter & Rahman (2023), showing that the labor force and FDI have a significant positive relationship. However, this finding was made by Pratama et al. (2016), whose research results show that the individual labor force is not significant but has a positive influence. This condition can happen because of the number of labor forces in Indonesia; not all meet the requirements that foreign companies or investors seek according to their wishes. Therefore, the labor force variable does not significantly impact the investment.

Then, the long-run results of NARDL can be seen in Table 3, showing that only the exchange rate- variable is significant for the investment, which means that when there is a 1% increase in the exchange rate-, the investment will experience a decline of 34.35%. Exchange rates have an important role in the global economy. Changes in currency exchange rates can affect the competitiveness of a country›s exports and imports, as well as foreign direct investment and capital flows. In the long run, only the exchange rate variable is significant. This result could happen because the exchange rate can affect import costs, export product prices, and economic stability. These findings differ from those of previous researchers, such as Khatabi et al. (2020) and Williams et al. (2022), who state that when the exchange rate increases, it also causes an increase in foreign direct investment. However, research by Hniya et al. (2021) consistently strengthens the author's findings, explaining that FDI has a negative relationship with exchange rates. In the long run, the exchange rate tends to reduce the investment. An investor will undoubtedly prefer to invest in a stable economy.

Meanwhile, other variables such as inflation, labor force, GDP, and interest rates do not significantly affect investment in the long term. This result means that inflation has little effect on investment in the long term. Research conducted by Alshamsi et al. (2015) and Sari et al. (2023) revealed that inflation has a positive and insignificant effect on investment. The results of foreign direct investment show that inflation is not an obstacle to entering foreign direct investment. Therefore, inflation does not directly influence investors' interest in making foreign direct investments. Because the majority of people still have trust and access to money. Inflation in Indonesia is relatively low compared to other countries because consistent price components support it.

The labor force shows a positive value but not significant. This result means that the labor force influences investment in the long term. This result is based on research by Okşak and Koyuncu (2021), which shows that there is no significant relationship between investment and the labor force. Based on macroeconomic theory, the labor force can be a potential source of labor for investment. However, this theory also explains that other factors can influence the relationship between the labor force and investment, such as the level of education or skills. GDP does not have a significant influence on investment in the long term. This result is from Barro &

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Sala-i-Martin's (1990) research, which followed the theory that GDP only significantly influences investment in the short term. Meanwhile, in the long term, investment is more influenced by other factors that are not researched, such as political stability and economic policy.

The results of long-term estimation show that interest rates do not significantly influence investment in the long term. This research supports the findings of Fahmi & Septiani (2023), where the results of this research interest rates have an insignificant effect. This research can affect investment because the higher interest rates in a country will cause investors to invest less capital, or it will affect the amount of investment, which will decrease. Based on the theory, loans will become more expensive when interest rates rise, affecting the project. However, if interest rates fall, borrowing costs will be cheaper, and more investor projects and developments will occur.

Table 4. Asymmetric Test Using Wald Test

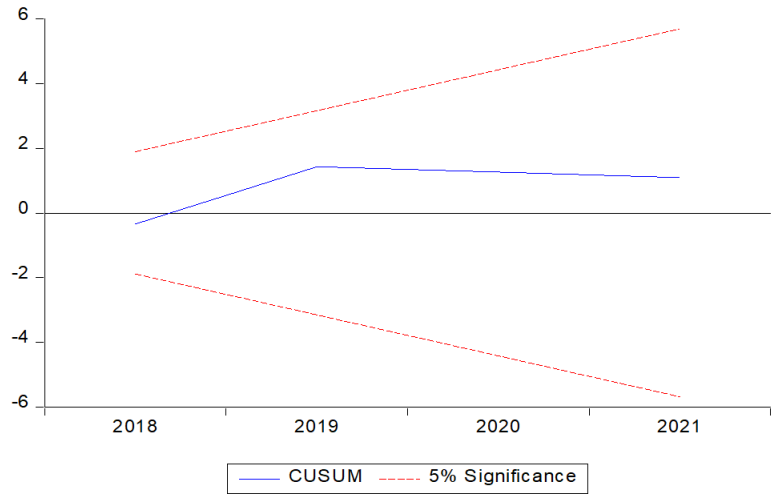
Variables	Coefficient	Std. Error
Interest Rate	0.012711**	0.011493
Exchange Rate	0.012533**	0.007293
GDP	0.012150**	0.012675
Inflation	1.964.485	1.286.121
Labor Force	2.345.117	2.343.362

Notes: *,** and *** each represents significance level 10%, 5% and 1%.
Source: Data processed, 2023

In the diagnostic test results in Table 3, the model›s goodness is explained by the R2 value of 0.988122 and the adjusted R2 of 0.916857. This result is evidence of the dependent variable (investment) that can be explained by the independent variables (exchange rate, interest rates, inflation, GDP, labor force) by 98.8 percent. Then, there are several diagnostic tests to ensure and confirm that the NARDL model used in this research is valid and the best model. The classical assumption test is conducted, which consists of the ARCH test to test for heteroscedasticity, normality test, and LM to test autocorrelation. This condition can be seen at the end of the table, where the results show that this research is free from all classical assumptions and problems. After obtaining the classical assumption test, it can be continued with the following analysis, the Wald test, shown in Table 4.

The Wald test results in Table 4 show that there is a significant long-run asymmetric relationship among the variables for the exchange rate, GDP, and interest rate, where there is a long-run asymmetric influence between the exchange rate, GDP, and interest rate variables on the investment in Indonesia after the Covid-19 pandemic. Meanwhile, there has been no long-run asymmetric influence on investment for the inflation and labor force variables since the COVID-19 pandemic in Indonesia.

The next step is testing the stability of the NARDL model, which is applied in this research by testing the CUSUM test. This test is used to determine whether the model under the research is stable. The image below shows the results of the cusum test, which displays the blue line between the significance lines (red line). Based on the results of the cusum test, the blue line is still between the two red lines with a significance level of 5%. This result means that the model in this research is stable and can also be used to explain long-run co-integration. The CUSUM test results are shown in Figure 3.



Source: Data Processed (2023)

CONCLUSION

Investment is a determining factor that influences Indonesia's economic growth. More detailed studies and knowledge of foreign direct investment are necessary for a country's economic development, especially in Indonesia. This research uses the NARDL method to determine the asymmetric effects of foreign direct investment determinants. This research has five variables: interest rates, inflation, GDP, labor force, and exchange rate. The NARDL model estimation results find long-run asymmetric effects of exchange rates, GDP, and interest rates on investment in Indonesia after the COVID-19 pandemic, while there is no influence on the inflation and labor force variables.

Meanwhile, the short-run NARDL estimation results show that interest rates, exchange rates, and inflation significantly affect investment after the COVID-19 pandemic. In contrast, the GDP variable currently does not significantly impact investment, nor does the labor force variable. There are changes in the labor force, but they do not significantly impact investment. The research results may occur due to the existing limitations and other factors influencing the investment.

The results of this research can be a beacon of hope for the parties involved in foreign direct investment, especially the government in Indonesia. They can use these results to create policies that can better optimize investment, thereby bolstering economic growth

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in Indonesia. The information from NARDL›s estimation results regarding investment determinants can be used as a benchmark for understanding the potential impact of investment determinants when they increase or decrease. This can guide future research to add other variables or use other methods to test the latest updates and uncover more about the investment phenomenon in Indonesia. Moreover, other countries can also use this research as a reference or compare the investment conditions in their own countries, fostering a sense of global collaboration and shared progress.

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Impact of COVID-19 Vaccination and Financial Policies on Indonesia's Property Loan Growth

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ABSTRACT

Research Originality: This study provides a novel examination of the impact of COVID-19-related financial policies on property loan growth in Indonesia, a critical area with limited prior quantitative research.

Research Objectives: The purpose of this research is to assess how interventions such as Loan-to-Value (LTV) over Finance-to-Value (FTV) ratio (LTV/FTV) relaxation, COVID-19 vaccination as a metric for public activity restrictions, and changes in deposit insurance rates have influenced property loan dynamics during the pandemic.

Research Methods: Using monthly banking data from January 2016 to May 2022, this study employs ARIMA Intervention Analysis to capture the effects of these policies.

Empirical Results: The empirical results reveal a significant positive shift in property loan growth ten months after the first intervention and a notable impact two months after the third intervention, whereas the second intervention shows limited influence.

Implications: These findings imply that integrating COVID-19 vaccination targets into public policy and adjusting deposit insurance rates are effective strategies for sustaining the property loan sector during economic crises. These results provide insights into the role of vaccination targets and financial adjustments in supporting the property loan sector during economic disruptions, offering valuable considerations for future policymaking in similar contexts.

Keywords:

property loans; loan to value; deposit insurance rate; COVID-19 vaccination.

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INTRODUCTION

The COVID-19 outbreak in Indonesia severely impacted human life and material resources, profoundly affecting socio-economic fabric and public welfare. Furthermore, the pandemic has adversely affected Indonesia's financial system, as evidenced by the decline in various domestic economic activities. Key metrics reflecting this downturn include GDP contraction, Business Activity Survey results, the Manufacturing Index (PMI), the Retail Sales Index, and financial services performance (Lehmann, 2023). A collaborative effort between the Financial System Stability Committee and the Government is imperative to mitigate these impacts.

The stability of Indonesia's financial system can be assessed using a dual framework of macroprudential and macroprudential indicators. Microprudential indicators focus on individual institutions and include banking capital adequacy ratios, asset quality, profitability, liquidity, and market-based indicators. In contrast, macroprudential indicators take a systemic perspective, encompassing broader economic factors like GDP growth, balance of payments, inflation rates, interest rates, and foreign exchange rates (Warjiyo & Juhro, 2022).

During the pandemic, banking loan indicators in Indonesia also experienced fluctuations due to restrictions on public activities. The property sector's contribution to Indonesia's GDP is only 3.0%, which is lower than that of the Philippines (3.8%, Thailand at 22.3%, Malaysia at 38.4%, and Singapore (44.8%. This data indicates that Indonesia's housing sector development needs to catch up. Following the 1998 economic crisis, the Global Financial Crisis (GFC) happened in 2008, primarily due to the high volume of non-performing housing loans in the United States. The collapse of the American economy had a significant impact, reducing foreign investment in Indonesia and leading to unstable exchange rates, weakening the Indonesian Rupiah. This situation increased systemic risks, including a higher dependency on imports, rising commodity prices, reduced food supply, and ultimately eroding the economic resilience of Indonesia (Ardiyono & Patunru, 2023; Liang, 2022).

Indonesia has adopted accommodative macroprudential policies to facilitate loan recovery and economic revitalization. These include the relaxation of loan-to-value (LTV) over financing-to-value (FTV) ratios for property financing and the introduction of zero-down payment requirements for vehicle financing through PBI Number 23/2/PBI/2021 (Peraturan Bank Indonesia, 2021). Furthermore, the Indonesia Deposit Insurance Corporation (IDIC) has incrementally lowered the Deposit Insurance Rate, a move aimed at bolstering the financial system's stability and facilitating national economic recovery. In a notable decision at the Board of Commissioners Meeting on May 25, 2022, LPS established a historical low by lowering the Deposit Insurance Rate to 3.50% for Rupiah-denominated deposits in Commercial Banks, 0.25% for foreign currency deposits in Commercial Banks, and 6.00% for Rupiah deposits in Rural Banks. This policy adjustment is crucial, considering the property sector's high potential and significant employment absorption, which exhibits strong forward and backward linkages (Balcilar et al., 2021).

In the public health domain, the Indonesian Government has implemented a comprehensive COVID-19 vaccination program and the 3M health protocol (masking,

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social distancing, hand washing) to curb the virus's spread, aiming to reduce transmission rates, decrease infections and fatalities, and achieve herd immunity, thereby safeguarding socio-economic productivity. Additionally, remote working policies, widespread rapid testing, and large-scale social restrictions have been instrumental in managing the pandemic's impact. The integration of vaccination achievement targets in determining the level of Public Activity Restrictions or *Pemberlakuan Pembatasan Kegiatan Masyarakat* (PPKM) in Java and Bali is outlined in the Minister of Home Affairs Instruction No. 42 of 2021, exemplifying the comprehensive public health policy mix.

Extensive research has been conducted on the Indonesian Government's policy response to COVID-19. Suryahadi et al. (2021) explored the dual impact of the pandemic and social protection programs on poverty in Indonesia, highlighting the critical role of government interventions in mitigating poverty during the crisis. Their findings underscore the importance of timely and targeted social protection measures, although they also point to limitations in reaching all vulnerable populations. Cross-country analysis using daily vaccination data and high-frequency economic activity indicators across 46 countries from December 16, 2020, to June 20, 2021, revealed a significant correlation between increased per capita vaccination and enhanced economic activity. This study also found evidence of a non-linear effect of vaccination, with greater marginal economic benefits at higher vaccination rates (Deb et al., 2022). Dorlach (2023) delves into the tensions within individualized funding policies for older and disabled persons, offering insights into the broader implications of personalization and collaboration in social policy during crises.

Previous research has investigated the effects of macroprudential policies on property markets, focusing on the loan-to-value (LTV) ratio as a key regulatory tool. Paramitha et al. (2020) analyzed the impact of the LTV ratio policy on property development. Their findings indicate that changes in LTV ratios significantly influence market dynamics, affecting both property developers' behavior and the property sector's overall growth. Additionally, Zhao and Liu (2023) analyzed the real estate market affected by housing policies, emphasizing the significant role of LTV ratios in shaping housing demand and price stability. Fischer et al. (2021) explored the dynamic effect of monetary policy on regional housing prices. They demonstrated that regional differences in housing market responses can be substantial, with varying impacts based on local regulatory environments and housing supply elasticities. Several studies have also analyzed the impact of the COVID-19 outbreak on various economic sectors, particularly the real estate and housing markets. Cui (2023) comprehensively analyzed how the pandemic has led to significant disruptions in real estate markets, with varying effects depending on regional and economic contexts.

Similarly, Balemi et al. (2021) reviewed the broader impacts of COVID-19 on global real estate markets, noting a marked shift in market dynamics and investor behavior due to the crisis. Svobodová & Hedvičáková (2021) further examined the specific impacts of the pandemic on mortgage loans, highlighting how the crisis affected borrowers' ability to obtain loans and the subsequent implications for financial institutions. Their research provides insight into the challenges the housing credit sector faced during the global pandemic, emphasizing the critical role of policy interventions in mitigating these effects. These

studies underscore the importance of understanding the specific effects of policy relating to COVID-19 on the housing sector, particularly in emerging markets like Indonesia.

However, quantitative research analyzing COVID-19 policy impacts in Indonesia remains limited, primarily focusing on qualitative (Ayuningtyas et al., 2021; Mahendradhata et al., 2022; Maison et al., 2021; Yuda & Qomariyah, 2022) or legal, conceptual, or descriptive quantitative approaches (Grogan, 2022). While previous studies have extensively explored the impacts of macroprudential policies, such as loan-to-value (LTV) ratios and financial interventions, as well as the broader effects of COVID-19 on various sectors, including real estate and housing, limited quantitative research has focused on the combined effects of specific financial and public health policies during the COVID-19 pandemic in Indonesia. Most existing research has either taken a qualitative approach or focused on legal, conceptual, or descriptive quantitative methodologies.

There needs to be a more comprehensive quantitative analysis that examines how the relaxation of LTV/FTV ratios, vaccination rates as a public health metric, and changes in the Indonesia Deposit Insurance Corporation (LPS) deposit insurance rates have collectively influenced property loan growth during the pandemic. This gap is particularly relevant in Indonesia's emerging market, where the property sector's contribution to GDP is notably lower than in other Southeast Asian countries. Thus, the current study addresses this gap by providing an inferential and nuanced quantitative assessment of the effectiveness of these combined policy interventions on Indonesia's property loan sector, contributing new insights into the effectiveness of financial policies in maintaining economic resilience during global crises.

METHODS

This study meticulously uses monthly banking property loan data spanning January 2016 to May 2022, publicly provided by Bank Indonesia. The dataset, which is presented in Billion Rupiah, underwent a thorough preprocessing stage to ensure data integrity and consistency, which involved cleaning, normalization, and handling of missing values, if any, to prepare it for rigorous analysis. The careful selection and processing of the data ensures the reliability and validity of the findings, offering significant insights into economic resilience and policy effectiveness. The variables in this research are listed in Table 1.

Table 1. Research Variables

Variable	Description	Unit
Response	Property loans (y_1)	Billion Rupiah
Predictor (Dummy)/ Intervention Variables	Time from first COVID-19 case reported to WHO (Intervention I (x_1)	Binary (December 2019)
	Time of Initiation of Relaxation Policy on Loan-to-Value (LTV) over Financing-to-Value (FTV) rasio (Intervention II (x_2)	Binary (March 2021)
	Time of vaccination as a metric for public activity restriction (PPKM) levels in Java and Bali and decrease in deposit insurance rate (Intervention III (x_3)	Binary (September 2021)

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This study employs an Intervention Analysis, extending the univariate ARIMA model, to measure the impact of policy changes on time-dependent variables using the data presented in Table 2.

Table 2. Research Data Structure

No	Time	Total Loan (the Billion Rupiah)	Loan Growth The (Billion Rupiah)	x_1	x_2	x_3
1	16-Jan	609727,6618	-10736,3882	0	0	0
2	16-Feb	614168,159	4440,4972	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
47	19-Nov	1021859,564	-2442,5889	0	0	0
48	19-Dec	1029588,43	7728,8659	0	0	0
** First COVID-19 Case Reported to the WHO						
49	20-Jan	1013459,519	-16128,9108	1	0	0
50	20-Feb	1016499,755	3040,2364	1	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
** Implementation of LTV/FTV relaxation policy **						
63	21-Mar	1069467,836	8351,6611	1	1	0
64	21-Apr	1070515,289	1047,4533	1	1	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
** Start of PPKM implementation with vaccination drives and decrease in deposit insurance rate**						
69	21-Sep	1107734,777	9662,8426	1	1	1
70	21-Oct	1104708,821	-3025,9558	1	1	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮
76	22-Apr	1135512	2476,978	1	1	1
77	22-May	1141232	5719,984	1	1	1

The ARIMA model is expressed in Equation (1).

$$Y_t = \alpha + \sum_{i=1}^{p} \phi_i Y_{t-i} + \sum_{j=1}^{q} \theta_j e_{t-j} + e_t \quad (1)$$

The ARIMA is employed to forecast property loan trends before interventions. Predictor variables *(X)*, represented as dummy variables, mark significant policy events and interventions, such as the onset of COVID-19, relaxation of the LTV/FTV policy relaxation, and PPKM implementation with vaccination drives. Y_t represents the property loan at a time *t*, α is a constant, ϕ_i are the coefficients of the autoregressive part, Y_{t-i} are the lagged values of the series, θ_j are the coefficients of the moving average terms, and e_t the error term at the time *t* (Wei, 2019). The careful selection and definition of these variables (Table 1) are pivotal to accurately capturing the essence and impact of these policy interventions. This study also integrates Transfer Function models to analyze the interventions' impact *(X)* where the dependent variable *Y* is a function of its past values and past errors *(e)* (Wei, 2019).

$$Y_t = \frac{\omega_s(B)}{\delta_r(B)} B^b X_t + e_t \quad (2)$$

Where:

$\omega_s(B) = \omega_o + \omega_1 B + \omega_2 B + \cdots \omega_s B^s$ X_t : Intervention variables

$\delta_r(\mathrm{B}) = 1 - \delta_1 \mathrm{B} - \cdots - \delta_r \mathrm{B}^r$ e_t : Noise/error that follows the ARIMA model

B : Backshift operator

The $\omega(B)$ and $\delta(B)$ represent the transfer function weights. The impact of an intervention, represented in terms of duration, is denoted by b^*, s, and r. The term b is the time required for the intervention to have its initial effect, s is the additional time during which the effects of the intervention are still felt but cannot be represented by a function, and r is the additional time during which the effects are still felt more gradually and thus can be described by a function. To estimate the values of b, s, and r, the response function Y_t^* is used as follows:

$$Y_t^* = Y_t - n_t = \frac{\omega_s(B)}{\delta_r(B)} B^b X_t \quad (3)$$

Where:

Y_t: Actual data

n_t: Forecast results from the ARIMA modeling of pre-intervention data (Y_t)

This model allows the study to assess the impact of interventions on property loans by considering both the immediate and lagged effects of policy changes.

The analysis involves identifying government policies (interventions) related to property loans, comparing pre- and post-intervention trends, testing the stationarity of property loan data, and evaluating the significance and duration of the intervention effects. The final phase involves a comprehensive evaluation of the models based on residual analysis and statistical metrics like R-squared values and the Akaike Information Criterion (AIC).

RESULTS AND DISCUSSION

The findings of this study are significant, showing that while the relaxation of LTV/FTV had a minor impact, significant loan growth occurred with the introduction of COVID-19 measures, especially during vaccination-based restrictions and reductions in deposit insurance rates. This suggests that combining financial policies with public health measures can effectively support the property loan market during crises. Policymakers should continue integrating these approaches, using vaccination progress to guide restrictions and financial interventions to boost market confidence. The details of the empirical results is written in the following paragraphs.

This study reveals significant shifts in Indonesia's property loan market dynamics during the COVID-19 pandemic, with a marked decline in loan growth immediately following the pandemic's onset, followed by a delayed but substantial recovery influenced by governmental interventions. The most prominent finding is a 46.5% decrease in average

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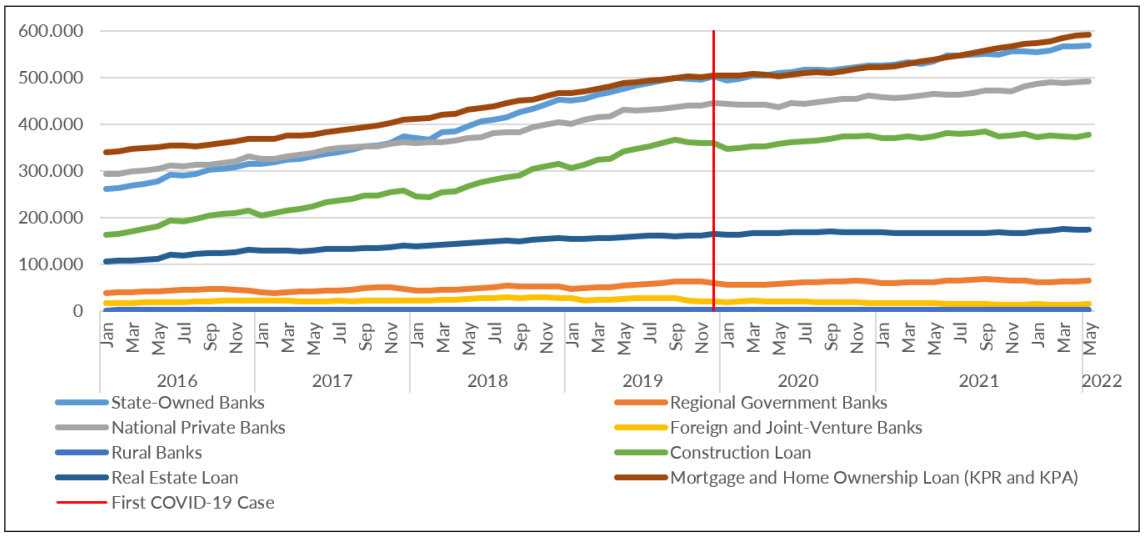
property loan growth post-COVID-19 compared to pre-COVID-19 levels, which was statistically significant (). Additionally, the ARIMA model identified a significant positive impact on loan growth following policy interventions, particularly the PPKM vaccination metric and Deposit Insurance Rate reduction.

These findings indicate that while the initial impact of the pandemic on property loan growth was severe, effective government policies were instrumental in stabilizing and eventually increasing loan growth. The effect of these interventions was observed to be permanent, with Intervention I (pandemic onset) leading to an increase in property loan growth by Rp 11,256.3 billion and Intervention III (PPKM and Deposit Insurance Rate reduction) contributing an additional Rp 9,773.3 billion.

Figure 1. Position of Commercial and Rural Bank Property Loans from January 2016 to May 2022



Since 2016, there has been a steady increase in loans across all categories, with the highest loan value in mortgage (KPR) and KPA categories reaching Rp 590,638 billion, and the highest among banking groups being state-owned banks at Rp 568,032 billion as of May 2022. This resilience is evident even in the face of the COVID-19 pandemic, as shown in Figure 1, which indicates a flattening trend in loan growth. In Figure 2, differences in mean and variance between the pre- and post-COVID-19 phases indicate significant shifts in property loan market dynamics during the pandemic, but also underscore its resilience.

Despite the significant 46.5% decrease in average property loan growth post-COVID-19 relative to pre-COVID-19 ($p = 0.006$), as revealed by a t-test with unequal variances, there is potential for recovery. The normality of both data phases was confirmed using the Kolmogorov-Smirnov test (pre-COVID-19: $p = 0.07$, post-COVID-19: $p = 0.143$). These results, while indicating a decline, also point towards a potential recovery in property loan growth following the pandemic. Besides that, table 3 identified the property loan trends and its mean levels.

Figure 2. Property Loans Growth Month-to -Month

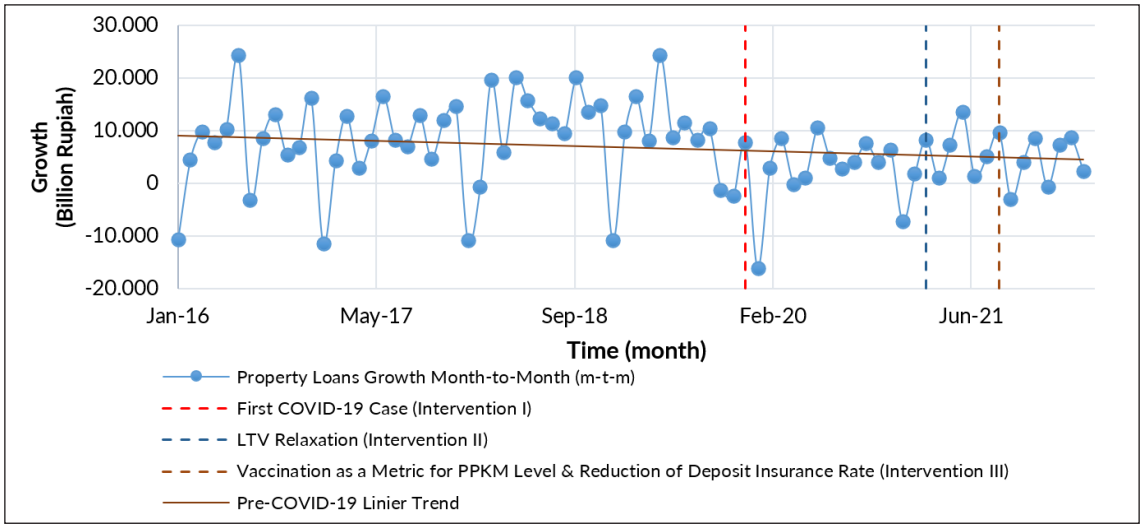


Table 3. Identification of Property Loan Trends and Mean Levels

No.	Segment Phase	Stationarity Test			Trend	Mean Level
		statistics	p-value	Conclusion		
1	Pre-COVID-19	-7.182	0.01	Stationary	Constant	- (Rp 8,540 Billion)
2	Pre-LTV/FTV Relaxation (Post COVID-19)	-4.2353	0.01505	Stationary	Constant	< No. 1 (Rp 2,617 Billion)
3	Post- LTV/FTV Relaxation	-2.0608	0.5492	Not Stationary	Upward	> No. 2 (Rp 6,159 Billion)
4	Post-vaccination Metric for PPKM Levels and Deposit Insurance Rate Reduction	-4.8523	0.01	Stationary	Constant	< No. 3 (Rp 4,796 Billion)

The government implemented various policies to react to the post-COVID-19 decline in property loans and other economic indicators. Figure 2 shows a segmented linear trend based on these policy interventions across the four phases. The vaccination as a metric for PPKM levels in Java and Bali and the Deposit Insurance Rate (Intervention III) reduction is analyzed, anticipating an increase in bank loan demand as public confidence is restored with declining COVID-19 cases and stable banking liquidity.

Figure 3 illustrates a rising linear trend (blue line) in the pre-COVID-19 era, indicating growth from January 2016 to November 2019. This phase also exhibits a seasonal pattern with a recurring decrease in loan growth each January. Post-COVID-19, the three segments — pre-intervention II, post-intervention II, and post-intervention III

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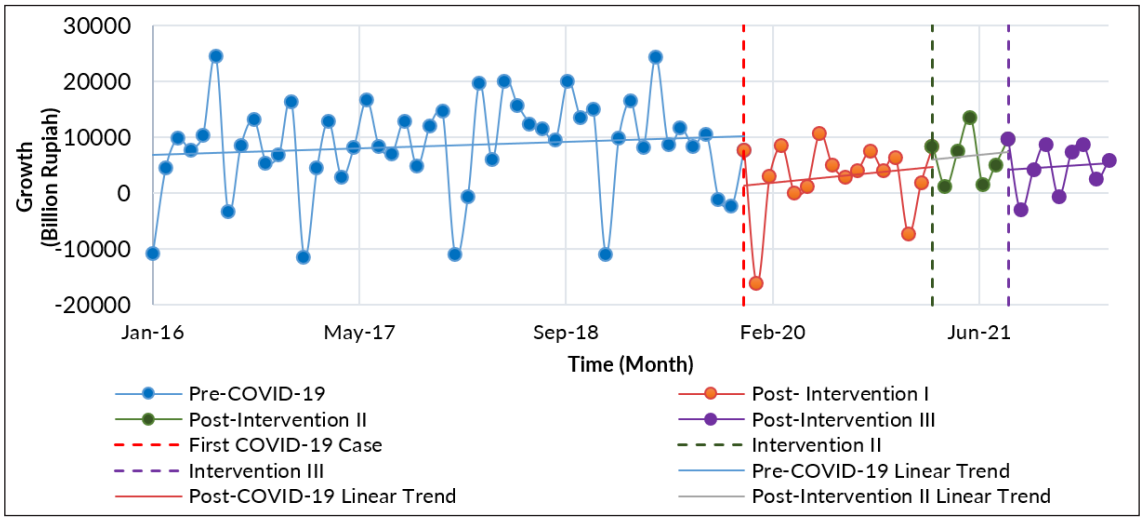
— exhibited rising trends (orange, green, and purple lines), with each phase showing varying mean levels compared to the preceding phase.

Based on the Dickey–Fuller test results, the initial indications of an increasing trend in the second and fourth segments are refuted. It is concluded that the Post-COVID-19 and subsequent Intervention III phases have a stable or constant property loan growth trend despite a decrease in the mean level. The movement patterns of the other two segments were consistent with prior indications.

Figure 3. Month-to-month Property Loan Growth According to Policy Phases



In the second phase of the research, a time series intervention analysis is used to examine the growth of property loans in banking. First, pre-Intervention I data (50 observations) is modeled using the Box-Jenkins procedure. Decomposition methods are employed to identify trends, cyclical, seasonal, and irregular patterns in the time series. Based on Figure 4, there is an increasing trend in pre-COVID-19 data, necessitating regular differencing of 1, although the Dickey-Fuller test shows that the trend increase is not significant. Seasonal differencing of 12 is then applied, as Figure 3 also indicates a seasonal pattern with loan growth declining every January during the pre-COVID-19 pandemic period. After differencing, stationarity testing for the mean is conducted using the Dickey-Fuller Test, resulting in a p-value of 0.01 < 0.05, leading to the rejection of H_0 and concluding that the data remain stationary. ARIMA model identification is then performed using correlogram observations, comparing the ACF and PACF plots of the data with theoretical ACF and PACF plots (Figure 5).

The ACF and PACF plots (Figure 5) after differencing were examined, leading to the selection of several model candidates. These are then tested for parameter significance and goodness-of-fit. $ARIMA(0,1,1)(0,1,0)^{12}$ model was selected as the best fit due to all significant parameters, meeting the white-noise and normal-distribution assumptions, and having the lowest AIC value. It also achieved an R^2 of 0.613. This result indicating that the model explains 61.3% of the variance in Indonesia's loan growth data, while the

remaining 38.7% is influenced by other variables excluded from the model. Consequently, the $ARIMA(0,1,1)(0,1,0)^{12}$ model is utilized for forecasting post-Intervention I data.

Figure 4. Decomposition of Pre-intervention I Data

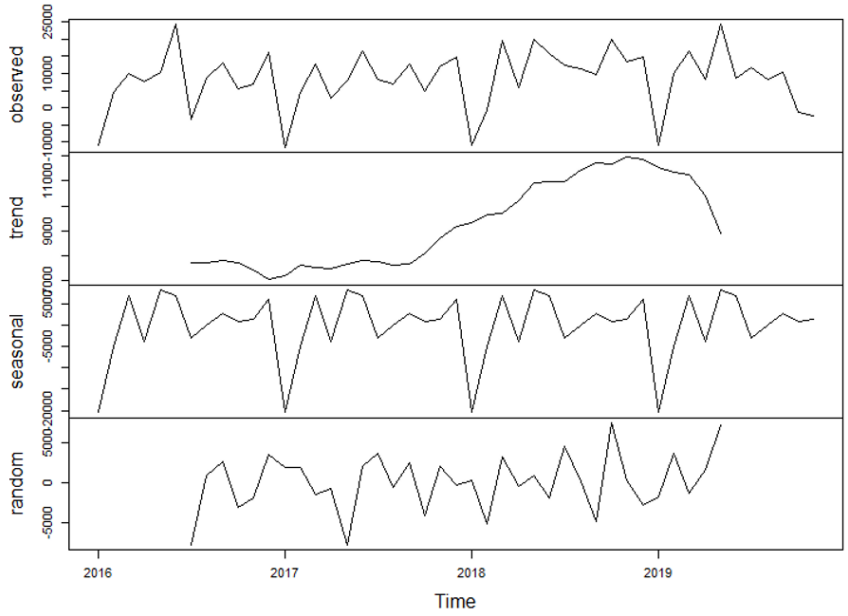
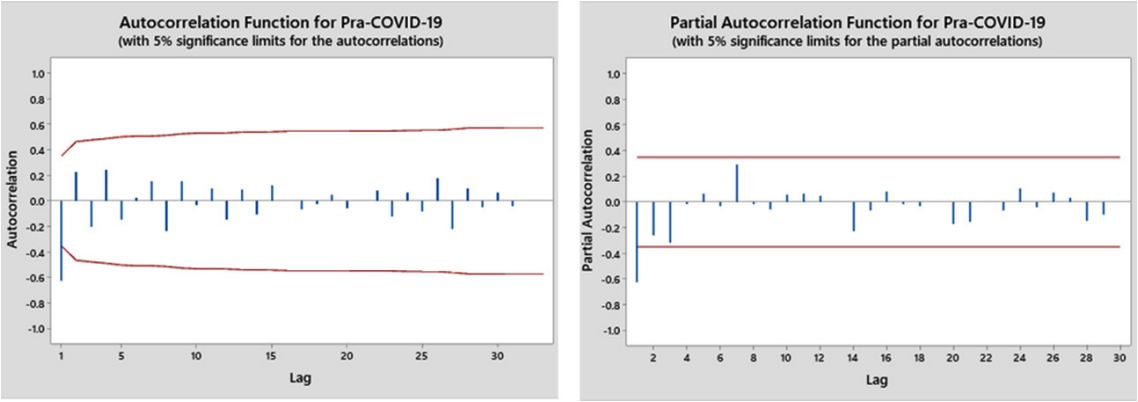


Figure 5. ACF and PACF Plots of Pre-Intevention I Data



The graph in Figure 6, derived from equation (3), spans T-5, five months before Intervention I (July 2019), to T+14, fourteen months after Intervention I (February 2020). Upper and lower bounds were calculated using $3\times\sigma$ (RMSE of modelN_t), yielding ±17,628.26. These bounds (horizontal red lines) help estimate the orders of *b*, *s*, and *r*, while the vertical lines indicate the start of the intervention. The response function, the difference between the forecast from the pre-Intervention I model and actual data, visualizes the effect of Intervention I. Forecasted data represent scenarios in which the intervention did not occur (counterfactual), with bounds determining the reasonableness of the difference or effect.

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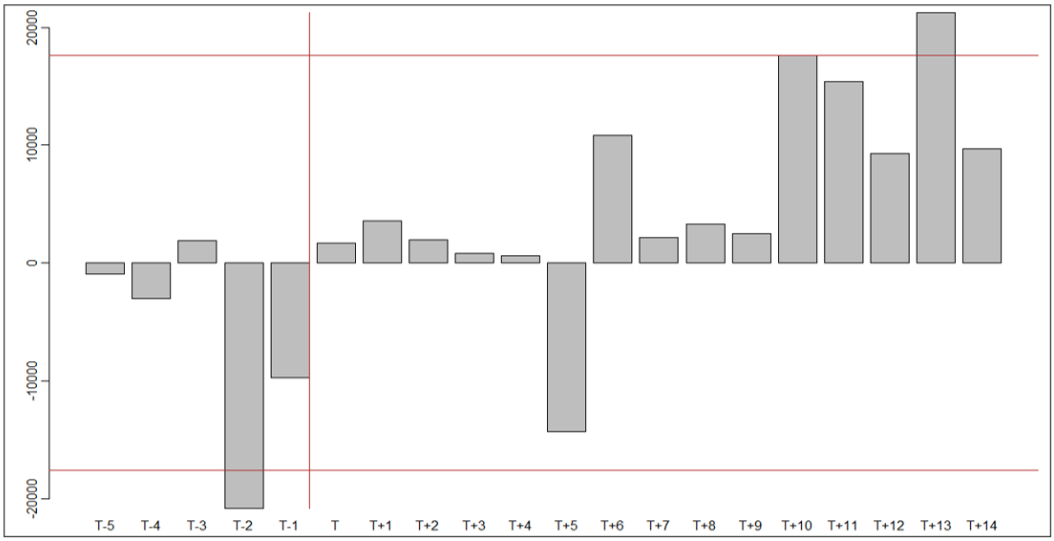
Table 4. The Parameter Significance Test of the Model Candidate $N_{t.0}$

Model Candidate $N_{t.0}$	Parameter Significance					Residual Assumptions	**GoF
	Type	Estimation	SE	t-value	p-value	*White Noise & Normal Dist.	AIC
ARIMA(1,1,0) $(0,1,0)^{12}$	AR 1	-0.622	0.137	-4.53	0.000	√	704.65
ARIMA(0,1,1) $(0,1,0)^{12}$	MA 1	0.746	0.167	-4.46	0.000	√	702.38
ARIMA(1,1,1) $(0,1,0)^{12}$	AR 1 MA 1	-0.292 0.596	0.270 0.291	-1.08 2.05	0.287 0.049	√	702.78
ARIMA(2,1,1) $(0,1,0)^{12}$	AR 1 AR 2 MA 1	-1.553 -0.621 -0.895	0.238 0.168 0.231	-6.53 -3.70 -3.87	0.000 0.001 0.001	√	704.69

* √ Assumption Fulfilled, × Assumption Not Fulfilled
** Goodness of fit

Figure 6. Graph of the Response Function for Forecasting Data $N_{t.0}$



The graph analysis estimates the orders as b_I =10, s_I = 0, and r_I = 0. Parameter significance is tested with hypotheses H_0 : ∅ or θ = 0 (ARIMA model parameters are not significant) and H_1 : ∅ or θ ≠ 0 (ARIMA model parameters are significant), at α = 5%. All parameters of $ARIMA(0,1,1)(0,1,0)_{12}$ and the orders of b_I, s_I, and r_I are significantly impactful, meaning Intervention I's effect on Indonesia's property loan growth is significant at T+10 (October 2020), with a permanent effect as the intervention function follows a Step function. Here, are the estimated parameter results.

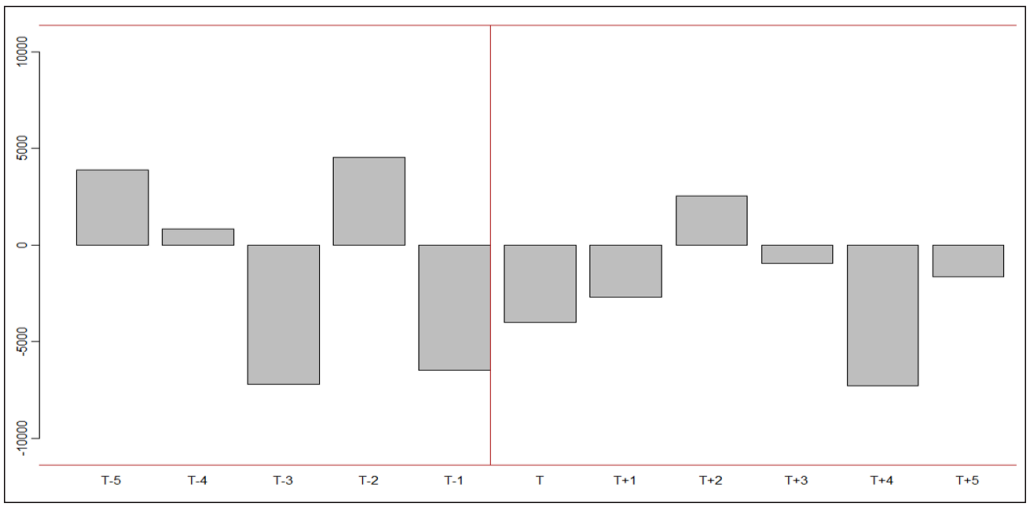
The model indicates no significant changes in property loan growth during the COVID-19 pandemic, from December 2019 to September 2020, compared with the counterfactual forecast. This implies relative stability in property loan growth despite the onset of Intervention I (the pandemic) until a marked increase in October 2020. Contrary to the general economic downturn after the COVID-19 pandemic, property

loans experienced an increase. The post-Intervention I model is then employed to predict data following Intervention II, with a response function graph depicted in Figure 7.

Table 5. The Parameter Significance Test of the Model Candidate $N_{t.0}$

Post-Intervention I Model ($N_{t.0}$)	Parameter Significance					Residual Assumptions	GoF
	Type	Estimation	SE	t-value	p-value	White Noise & Normal Dist.	Type
ARIMA(0.1.1) $(0.1.0)^{12}$ with $b_I = 10.s_i = 0.r_I = 0$	MA 1 (θ_1)	0.77470	0.167	7.39	0.0001	√	805.13
	($\omega_{0.I}$)	11904.8	4734.1	2.51	0.016		

Figure 7. Response Function for Forecasting Data $N_{t.1}$



The response function spans T-5 (five months prior to Intervention II (October 2020), to T + 5, five months following Intervention I (August 2021). The response displayed in Figure 8 implies that post-Intervention II, from March to August 2021, there were no significant changes surpassing the established bounds on Indonesia's property loan growth. This indicates two possible scenarios: first, the LTV/FTV relaxation policy did not significantly enhance loan growth during March-August 2021; second, significant effects of post-Intervention II may emerge after the post-Intervention III period ($T + a.a > 5$). assuming post-Intervention III effects are negligible. For the first scenario, the post-Intervention I model is employed to estimate the post-Intervention III model because of the insignificant effects of post-Intervention II. The forecast results for post-Intervention III are then used to derive the response function $Nt._2$, Thus, the post-Intervention I period spans from December 2019 to August 2021, marking the start of Intervention III.

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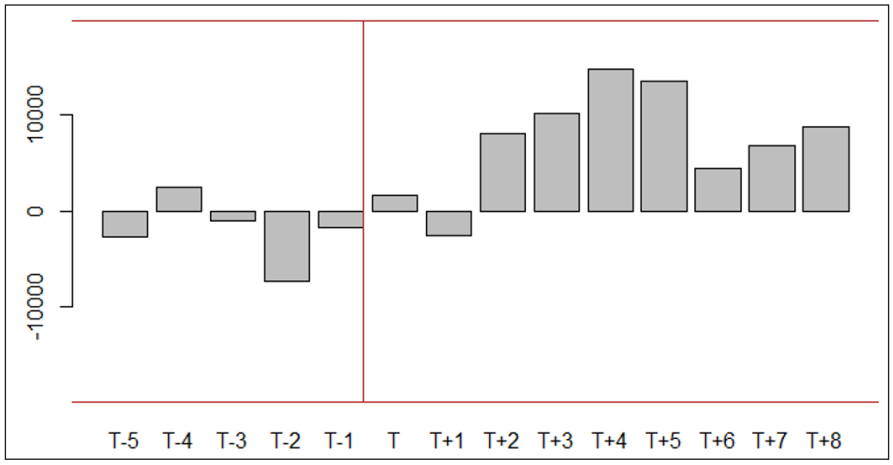
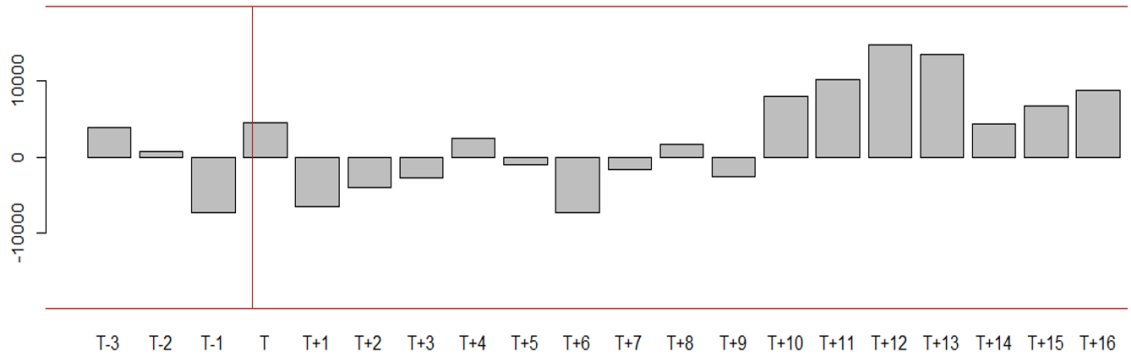
Figure 8. Response Function for Forecasting Data $N_{t.2}$ in the first scenario model



Based on Figure 8, no significant changes were observed in Indonesia's property loan growth post-Intervention III from September 2021 to May 2022. However, a noticeable and consistent spike in the graph from T+2 to T+8 prompts a test of significance for the orders $b_{III} = 2.s_{III} = 0.$ and $r_{III} = 0$ in the model. Subsequent testing and parameter estimation affirm the significant influence of all $ARIMA(0.1.1)(0.1.0)^{12}$ parameters and the specified orders for Interventions I and III, meaning that Intervention I's effect on property loan growth was significant at T+10, and Intervention III's effect was significant at T+2. Both interventions had delayed but permanent effects.

Figure 9. Response Function for Forecasting Data $N_{t.3}$ in the Second Scenario Model



In the second scenario, the post-Intervention I model estimates the post-Intervention II model, assuming Intervention III's insignificance, covering the period from March 2021 to May 2022. Figure 9 presents a response function graph from T-3 three months before Intervention II (December 2020) and until the end of Intervention II (May 2022). The graph shows no significant changes in Indonesia's property loan growth after Intervention II. However, due to the noticeable spikes from T+10 to T+16, the orders b_{II} = 9,10 or 11; s_{II} = 0; and r_{III} = 0 are tested for significance. Testing and parameter estimation reveal no significant impact on any potential orders for b (9, 10, or 11), s, and r in

Intervention II. Consequently, Intervention II's (LTV/FTV relaxation) effect on property loan growth in Indonesia is not felt significantly, regardless of Intervention III's effects. The results of the significance test for the two model scenarios are presented, with the second scenario displaying the model with the lowest AIC value for orders *b, s,* and *r*.

All parameters in the final model were found to be significantly impactful. The effects of Intervention I (COVID-19 cases) became significant from T+10, or ten months after the intervention, in October 2020, and the effects of Intervention III (Time of vaccination's role as a metric for Public Activity Restrictions (PPKM) levels in Java and Bali & Decrease in Deposit Insurance Rate) became significant from T+2 or two months after, in November 2021. Both interventions had permanent effects.

The significant and lasting impact of the COVID-19 on property loan growth in Indonesia, as identified in this study, contrasts with several pre-pandemic studies that suggested that economic downturns typically lead to a reduction in property loans. For example, (Paramitha et al., 2020) found that financial instability or uncertainty generally suppresses loan growth during normal economic conditions. However, the resilience observed in Indonesia's property loan market during the pandemic aligns with findings by (Cui, 2023), who noted that crisis-driven economic policies could stabilize or even stimulate property markets under certain conditions. The observed increase in loan growth ten months after the pandemic's onset also supports theories of delayed economic responses, in which initial shocks are mitigated by subsequent policy interventions, leading to a recovery in lending activities.

Table 6. Parameter Significance Test for Final Model Candidates

Final Model	Parameter Significance					Residual Assumption	GoF
	Type	Estimation	SE	t-value	p-value	White Noise & Normal Dist.	AIC
First Scenario *ARIMA*(0.1.1)(0.1.0)^{12} with	MA 1 (θ_1)	0.777	0.088	8.79	0.0001	×	1102.1
$b_I = 10.s_I = 0.r_I = 0$	($\omega_{0.I}$)	11879.4	3436.9	3.46	0.011		
$b_{III} = 2.s_{III} = 0.r_{III} = 0$	($\omega_{0.III}$)	11646.2	4793.5	2.43	0.0187		
Second Scenario *ARIMA*(0.1.1)(0.1.0)^{12} with	MA 1 (θ_1)	0.777	0.088	8.79	0.0001	×	1103.8
$b_I = 10.s_I = 0.r_I = 0$	($\omega_{0.I}$)	11879.4	3436.9	3.13	0.003		
$b_{II} = 9.s_{II} = 0.r_{II} = 0$	($\omega_{0.II}$)	10088.5	3227.6	2.00	0.051		

Furthermore, the results resonate with the findings of Svobodová and Hedvičáková (2021), who highlighted the role of targeted financial policies in mitigating the economic impact of global crises, particularly in sectors like real estate. This suggests that the Indonesian government's early and ongoing policy measures, such as deposit insurance

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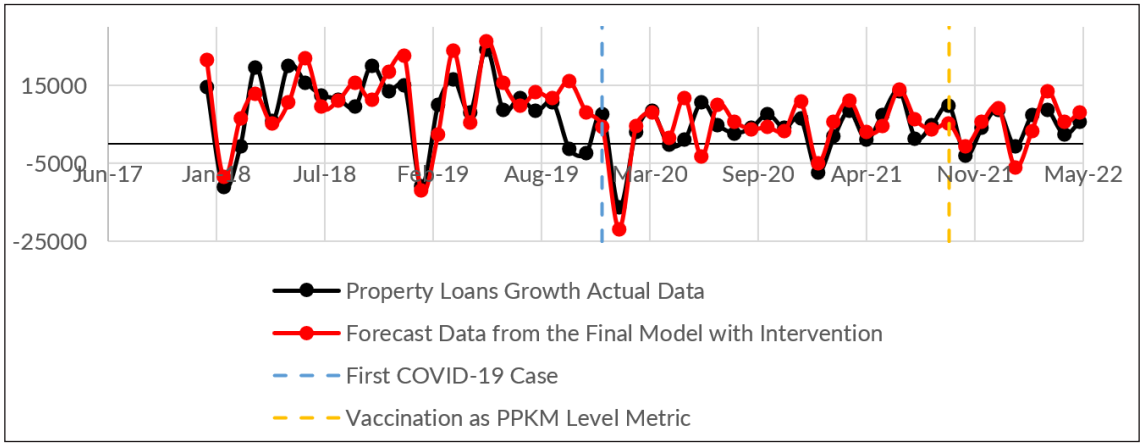
rate adjustments, played a crucial role in maintaining confidence and liquidity in the property loan market, thereby mitigating the expected downturn.

Table 7. Parameter Significance Test of the Final Model

Final Model	Type	Parameter Significance			Residual Assumption	GoF
		White Noise & Normal Dist.	SE	p-value	White Noise & Normal Dist.	AIC
First Scenario *ARIMA*(0.1.[1.7.8]) $(0.1.0)_{12}$ with	MA 1 (θ_1)	0.686	0.106	0.0001	√	1095.61
	MA 1,2 (θ_7)	-0.346	0.139	0.016		
	MA 1,3 (θ_8)	0.447	0.134	0.002		
$b_I = 10.s_I = 0.r_I = 0$	($\omega_{0.I}$)	11256.3	3561.4	0.003		
$b_{III} = 2.s_{III} = 0.r_{III} = 0$	($\omega_{0.III}$)	9773.3	4820.2	0.019		

According to the final model, Interventions I and III have indirect and permanent impacts of Rp 11,256.3 billion and Rp 9,773.3 billion, respectively. This indicates an increase in property loan growth post the COVID-19 pandemic onset in October 2020 of Rp 11,256.3 billion. Additionally, the PPKM policy, with vaccination achievements and the reduction in deposit insurance rates, significantly stimulated property loan growth from November 2021 to Rp 9,773.3 billion.

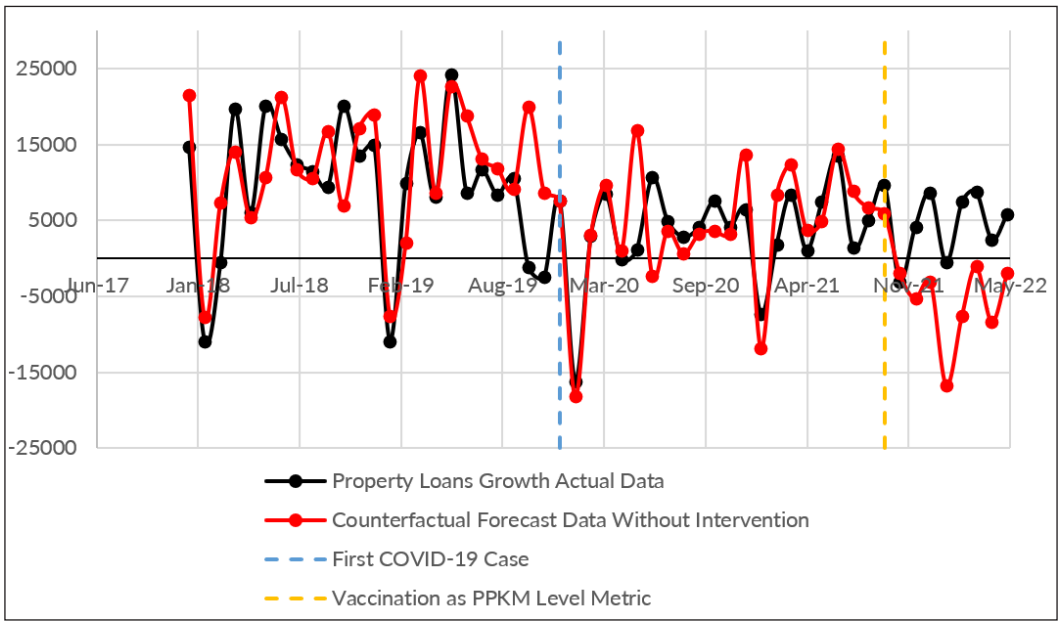
Figure 10. Time Series Plot of Fitted Values of Final Model vs. Actual Data on Indonesia's Property Loan Growth



This study's ARIMA model analysis further confirms the significance of these policy interventions, showing that the effects of the COVID-19 on property loan growth were not only delayed but also sustained over time. The government's proactive measures, such as the reduction in Deposit Insurance Rates, have likely bolstered public confidence, contributing to a recovery in the property loan sector. This resilience contrasts with some

earlier predictions of long-term downturns, underscoring the effectiveness of well-timed policy responses.

Figure 11. Time Series Plot of Counterfactual Forecast vs. Actual Data on Indonesia's Property Loan Growth



The time series plot of the forecasted data assuming no intervention (counterfactual) and actual property loan growth data are presented in Figure 10. Meanwhile, Figure 11 displays a time series plot of the fitted values (estimated results) from the model alongside actual property loan growth data for Indonesia. The data are presented from December 2017 to May 2022. Visually, adding Intervention I (x_1) and III (x_3) variables improve the model, making forecasts more closely resemble actual data. The comparison of these two graphs indicates that Intervention I and III variables have a significant impact.

CONCLUSION

This study examined the impact of COVID-19-related financial policies on Indonesia's property loan market, focusing on LTV/FTV ratio relaxation, vaccination-based public activity restrictions, and changes in deposit insurance rates. The findings reveal that while LTV/FTV relaxation had a limited effect, substantial loan growth occurred following COVID-19 measures, particularly during vaccination-based restrictions and deposit insurance rate reductions. The results highlight that combining financial policies with public health measures can effectively support the property loan market during crises.

Policymakers should consider maintaining this integration, using vaccination achievements as a metric for public restrictions alongside financial interventions like deposit insurance rate cuts to stabilize market confidence. Further research is recommended to explore borrower risk levels and collaboration with property stakeholders, which may

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explain the limited impact of LTV/FTV relaxation. Understanding these factors could provide deeper insights for future policy improvements.

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Uncovering Economic Growth Dynamics: The Role of Idiosyncratic Risk

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ABSTRACT

Research Originality: This study provides a new perspective on the dynamics between foreign direct investment (FDI), idiosyncratic risk, and economic growth in ASEAN countries using structural equation modeling (SEM). It contributes to the literature by highlighting the nuanced role of idiosyncratic risk in shaping regional economic outcomes.

Research Objectives: The study aims to examine the direct and indirect impacts of FDI inflows, idiosyncratic risk, and sectoral variables (manufacturing, agriculture, and services) on economic growth in ASEAN from 2013 to 2023.

Research Methods: The study uses data from the ASEAN Statistical Database and applies SEM to estimate the relationships between these variables.

Empirical Result: The main findings indicate that FDI inflows have minimal impact on idiosyncratic risk, as evidenced by regression coefficients below 0.001 for inward and intra-ASEAN FDI. In contrast, idiosyncratic risk significantly impacts economic growth. The results also reveal that sectoral variables such as manufacturing, agriculture, and services exhibit weaker associations with economic growth.

Implications: This information suggests that policymakers should focus on exploiting idiosyncratic risk to improve economic development, while acknowledging the limited direct impact of FDI on risk management, thereby debating more appropriate strategies to promote sustainable economic growth.

Keywords: foreign direct investment (FDI); idiosyncratic risk; economic activity; economic growth

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INTRODUCTION

Effective risk management is essential for promoting economic growth and stability in ASEAN countries. Foreign Direct Investment (FDI) serves as a crucial driver of economic development in the region, presenting both opportunities and challenges (Yunan, 2023). Understanding the complex interactions between FDI, idiosyncratic risks, economic activity, and economic growth is vital for formulating sound economic policies and strategies (Fajrian et al., 2023; Nugraha & Naylah, 2023; Sari & Yudhistira, 2023). FDI has great importance in shaping the economic risk landscape in ASEAN countries. While it injects capital, technology, and expertise into the economy, it also poses certain risks, especially of a specific nature. Relating to risks specific to each asset or sector. It is important to explore how FDI affects idiosyncratic risks and subsequently impacts economic activity and growth to minimize risks and maximize the benefits of capital flows (Jiao et al., 2024; Shinwari et al., 2024; Ali & Asri, 2019).

This study aims to fill this research gap by examining how FDI affects economic activity and economic growth in the ASEAN context, considering the role of idiosyncratic risk. By delving deeper into these complex relationships, we aim to provide insights that can guide policymakers, investors, and other stakeholders in developing strategies to enhance economic growth and resilience in ASEAN countries in a dynamic global economic context (Kostakis, 2024; Yulianita et al., 2023). Through our empirical analyses and theoretical frameworks, we aim to contribute to the existing knowledge base on economic development and risk management in the ASEAN region. This study is timely in the context of ASEAN economies increasingly integrating deeper into the global market economy and the increasing importance of attracting FDI for sustainable development. By examining the pathways through which FDI affects idiosyncratic risk and its subsequent impact on economic activity and economic growth (Richter et al., 2022; Kanbur et al., 2024). We can identify areas of need for Policy interventions and strategic investments to promote inclusive and sustainable economies in ASEAN countries (Du et al., 2024; Agustina et al., 2023; Santoso & Suman, 2023).

The findings of this study have implications for policymakers, investors, and other stakeholders involved in shaping the economic landscape of ASEAN countries. By understanding FDI drivers, idiosyncratic risk, and financial performance, policymakers can design targeted policies to attract FDI inflows reduce and Minimize risks, and promote economic diversification (Dogah, 2021; Tiwari & Mutascu, 2011; Kaulihowa & Adjasi, 2018; Indra & Ibrahim, 2023). Likewise, investors can make informed decisions about their investment strategies, taking into account the unique risks associated with different industries and sectors in ASEAN countries (Qadan & Shuval, 2021; Liu & Wang, 2021; Samargandi et al., 2022; Zhou & Latorre, 2021; Ayana et al., 2024; Fengju & Wubishet, 2024). Overall, this study contributes to the ongoing discussion on economic development and risk management in ASEAN, providing valuable insights to navigate the complexities of the global economy.

Effective risk management is critical to promoting economic growth and stability in ASEAN countries. Foreign direct investment (FDI) is an important driving force

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for economic development in the region, bringing both opportunities and challenges. Understanding the complex interactions between FDI, idiosyncratic risks, economic activity, and economic growth is essential for formulating sound economic policies and strategies (Asri & Ali, 2019; Ullah et al., 2023).

FDI is of great importance in the context of increasing risks in ASEAN countries. Even as it injects capital, technology, and expertise into the economy, it also poses certain risks, especially idiosyncratic risks, which refer to risks specific to each asset or sector. Individual area. It is vital to explore the pathways through which FDI affects idiosyncratic risks and subsequently affects economic activity and economic growth to minimize risks and maximize the benefits of flows (Gerlach et al., 2015). FDI capital. In this study, we aim to fill this research gap by examining how FDI affects economic activity and economic growth in the ASEAN context and Consider the role of specific risks. By delving deeper into these complex relationships, we aim to provide insights that can inform policymakers, investors, and other stakeholders in developing strategies to enhance economic growth and resilience in ASEAN countries in a dynamic global economic context (Cernev & Fenner, 2020; Dinh et al., 2019; Quaye et al., 2023; Qibthiyyah & Zen, 2023).

Through empirical analysis and theoretical framework, we aim to contribute to the existing knowledge base on economic development and risk management in the ASEAN region. This study is timely regarding ASEAN economies' increasing integration into global markets and the growing importance of attracting FDI for sustainable development. By examining the pathways through which FDI affects idiosyncratic risk and its subsequent impact on economic activity and economic growth, we can identify areas of investment and policy intervention. Strategic investment to promote inclusive and sustainable economic growth in ASEAN countries. The findings of this study have implications for policymakers, investors, and other stakeholders involved in shaping the economic landscape of ASEAN countries (Kostakis, 2024; Tang et al., 2022). By understanding FDI drivers, and idiosyncratic risk and economic performance, policymakers can design targeted policies to attract FDI inflows, mitigate risks, and promote diversity. economicization. Likewise, investors can make more informed decisions about their investment strategies, taking into account the unique risks associated with different industries and sectors in ASEAN countries (Dogah, 2021). Overall, this study contributes to the ongoing discussion on economic development and risk management in ASEAN, providing valuable insights to navigate the complexities of the global economy.

METHODS

The study uses data from the ASEAN Statistical Yearbook (ASY) 2023, providing comprehensive information on various economic variables, including foreign direct investment (FDI) flows, growth rates GDP by sector, employment level, and other related indicators in ASEAN countries.

The SEM model is constructed to examine the relationship between several latent and observed variables, focusing on the impact of Foreign Direct Investment (FDI) and

FDI Intra on Idiosyncratic Risk, and how Idiosyncratic Risk influences Economic Growth and various aspects of Managerial and Operational Performance.

The research model can be structured using the following equations:

1. Idiosyncratic Risk Model: $IR = \beta 1 \cdot FDI_{I}\,nward + \beta 2 \cdot FDI_{I}ntra + \epsilon 1$
2. Managerial Efficiency Model: $MGR = \beta 3 \cdot IR + \epsilon 2$
3. Operational Efficiency Model: $OPR = \beta 4 \cdot IR + \epsilon 3$
4. Economic Growth Model: $E_{G}rowth = \beta 5 \cdot IR + \beta 6 \cdot MGR + \beta 7 \cdot OPR + \epsilon 4$

Each variable included within the examination is operationalized based on its definition and estimation within the ASEAN Measurable Database.

Table 1. Variable, Description, and Data Source

variable	Description and data source
FDI inflows	Net capital inflows from foreign investors into domestic businesses or projects. (ASY) 2023
FDI Intra:	The investment flows that occur between member countries of the Association of Southeast Asian Nations (ASEAN). (ASY) 2023
Sectoral GDP growth rates	Annual percentage change in GDP for specific economic sectors. (ASY) 2023
Idiosyncratic risk	Variability in returns specific to individual assets
Economic Activity	Level of economic output and productivity across different sectors. (ASY) 2023
Economic growth	Typically measured using the gross domestic product (GDP) growth rate, reflecting the annual percentage change in the total value of goods and services produced within a country's borders over a specific period (ASY) 2023

Following model estimation and validation, data analysis is conducted to examine the parameter estimates, regression weights, standardized regression weights, and significance levels of the variables. The direct and indirect effects of FDI on Economic Growth are analyzed, along with the pathways through which these effects occur via idiosyncratic risk and Economic Activity.

RESULT AND DISCUSSION

The regression analysis reveals a statistically significant positive correlation between Idiosyncratic Risk and Economic Growth (E_Growth) within ASEAN countries. This finding suggests that increasing levels of idiosyncratic risk are associated with economic growth in the region. The positive correlation between idiosyncratic risk and economic growth implies several underlying dynamics in the ASEAN economies. Higher levels of idiosyncratic risk can stimulate entrepreneurial activities and innovation, leading to increased economic output and productivity. Idiosyncratic risks specific to individual assets or sectors can motivate businesses to adapt, innovate, and explore new opportunities, contributing to overall economic expansion and development.

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These findings affect policymakers and stakeholders seeking to promote sustainable economic development in ASEAN countries. Recognizing the potential positive correlation between idiosyncratic risks and economic growth highlights the importance of fostering an environment that supports innovation, adaptation, and risk-taking while implementing risk management strategies to minimize negative impacts. Further research is needed to explore the mechanisms underlying the observed correlation between idiosyncratic risk and economic growth. Future research could examine industry-level dynamics, regulatory frameworks, and policy interventions to provide insights into the relationship between idiosyncratic risks and economic outcomes in ASEAN economies.

Table 1. Regression Weights

			Estimate	S.E.	C.R.	P	Label
Idiosyncratic risk	<---	FDI inward	.000	.000	.264	.792	par_1
Idiosyncratic risk	<---	FDIIntra	.000	.000	-.192	.847	par_2
Managerial	<---	Idiosyncratic risk	330.945	332.405	.996	.319	par_8
0perasional	<---	Idiosyncratic risk	-60.928	227.263	-.268	.789	par_9
E_Growth	<---	Idiosyncratic risk	201.287	70.147	2.870	.004	par_3
Prof.Work	<---	Managerial	1.000				
Exc.Work	<---	Managerial	.437	.062	7.027		par_4
ClerkWork	<---	Managerial	.218	.081	2.680	.007	par_5
Production	<---	0perasional	1.000				
Agric	<---	0perasional	.098	1.087	.090	.928	par_6
ServisWork	<---	0perasional	7.052	25.149	.280	.779	par_7
E_Growth	<---	Managerial	-.124	.067	-1.849	.064	par_10
E_Growth	<---	0perasional	-.175	.248	-.704	.481	par_11

The regression weight for idiosyncratic risks with inbound FDI and internal FDI is close to 0 and not statistically significant. This result implies no significant direct link between FDI flows (both within and outside ASEAN) and idiosyncratic risk within ASEAN countries. Regression-weighted analysis of the idiosyncratic risk associated with inward FDI and intra-ASEAN FDI shows consistent results with no significant direct association between FDI inflows (both inward and outward). and within ASEAN) and idiosyncratic risk within ASEAN countries.

These results show that foreign direct investment (FDI) flows into ASEAN countries, whether from external sources (FDI Inward) or from the ASEAN region itself (FDI Intra), do not directly affect the specific level of risk that individuals face—assets or industries in these countries. Idiosyncratic risk, characterized by risks specific to particular assets or sectors, appears to be driven by factors other than FDI inflows, as indicated by the lack of a significant relationship in this analysis. The lack of a direct link between FDI and specific risks highlights the complexity of risk dynamics in ASEAN economies. Other factors, such as regulatory frameworks, industry-specific shocks, technological disruptions, and market conditions, may significantly shape each individual's unique risk profile: property or field.

These findings have implications for policymakers, investors, and stakeholders involved in ASEAN countries' economic development and risk management. Understanding that FDI inflows do not directly impact idiosyncratic risks highlights the importance of comprehensive risk assessment and mitigation strategies that address a range of risk factors beyond IDE. Policymakers may need to consider a multidimensional approach to risk management, covering various aspects of the economic landscape to promote sustainable and stable economic growth in ASEAN countries. Further research is needed to explore the underlying factors of idiosyncratic risk and its relationship with FDI inflows further. Studying additional variables and using alternative analytical techniques can provide insight into the complexities of the ASEAN region's risk management and economic development.

The regression weight for management jobs with idiosyncratic risks is 330. 945, but it lacks statistical significance (p > 0. 05), meaning there is no notable direct relationship between management jobs and idiosyncratic risks. The regression weight for operational jobs with idiosyncratic risks is -60. 928, also lacking statistical significance (p > 0. 05).

This result shows no significant direct relationship between operational work and specific risks. These results highlight the complex and multidimensional nature of specific risks in the economic system. Although management and operations activities play an essential role in organizational performance and decision-making, they do not appear to contribute directly to the variation or intensity of observed idiosyncratic risks. Okay. In different sectors or industries of the ASEAN economy. These results must be interpreted in the broader context of risk management and economic development. The lack of a direct relationship between management, operations, and idiosyncratic risks suggests that other factors or interactions may significantly influence the variation and management of idiosyncratic risks in countries. ASEAN.

Further research is needed to explore these interactions and identify additional factors that may shape the dynamics of idiosyncratic risk in different economic contexts. These findings have implications for policymakers, organizational leaders, and researchers seeking to improve ASEAN countries' risk management practices and economic resilience. Understanding the nuanced relationship between management practices, business processes, and unique risks can inform targeted interventions and strategies to mitigate risk and promote sustainable economic development. Stable across industries. These findings have implications for policymakers, organizational leaders, and researchers seeking to improve ASEAN countries' risk management practices and economic resilience. Understanding the nuanced relationship between management practices, business processes, and individual risks can inform targeted interventions and strategies to mitigate risks and promote economic development is stable in all areas.

The regression weight for Economic Growth with Idiosyncratic Risk is 201.287, which holds statistical significance ($p < 0.05$). This result suggests a positive correlation between idiosyncratic risk and economic growth within ASEAN countries. It implies that heightened levels of idiosyncratic risk may correspond to increased economic growth. Professionals (Prof.Work), Executives (Exc. Work), Clerks (ClerkWork), and Production Workers (Production) exhibit no direct correlation with idiosyncratic risk. The regression

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analysis reveals that the regression weight for Agricultural Workers (Agrc) with Operational Work is 0.098, lacking statistical significance ($p > 0.05$).

This finding suggests that no direct relationship exists between the involvement of agricultural workers and operational work within the context of ASEAN countries. Agricultural activities, an integral part of the rural economy and food production sectors, do not show a significant relationship with operational work as measured in this analysis. The lack of statistical significance suggests that differences in agricultural labor participation do not correspond to notable changes in operational activity in ASEAN economies.

Similarly, the regression weight for service workers (ServisWork) with operational work is 7.052, which also lacks statistical significance ($p > 0.05$). This result indicates no direct relationship between service employee engagement and operations work in ASEAN countries. Based on regression analysis, service-related activities, including hospitality, retail, and professional services, do not significantly affect operational work. The lack of statistical significance suggests that fluctuations in service employee participation do not lead to observable changes in operational activities in the ASEAN economic context.

Furthermore, the regression weight for Economic Growth (E_Growth) with Operational Work is -0.175, lacking statistical significance, indicating no direct relationship between economic growth and operational work. This result suggests that differences in economic growth across ASEAN countries do not have a significant relationship with operational activities as measured in this analysis. The lack of statistical significance implies that changes in the level of economic growth do not correspond to notable changes in governance in the ASEAN economic context. These findings highlight the nuanced and complex economic relations within ASEAN countries.

Although agriculture and service-related activities are essential components of the regional economy, they do not directly connect to operational work as measured in this study. Similarly, differences in economic growth levels do not directly affect operational activities in ASEAN economies. Interpreting these results in the broader context of economic developments and industry dynamics is important. The lack of a direct relationship between agricultural workers, service employees, economic growth, and operational work highlights the multifaceted nature of economic interactions and the various factors that influence operations in ASEAN countries. Further research is needed to explore these relationships in more depth and identify additional factors that may shape operational work and economic dynamics in different sectors and industries of the ASEAN economy.

The regression analysis reveals that the regression weight for Economic Growth with Managerial Work is -0.124, lacking statistical significance ($p > 0.05$). This result shows no notable direct relationship between management and economic growth in ASEAN countries. Management activities, including strategic decision-making and organizational leadership, do not show a statistically significant association with changes in economic growth as measured in this analysis. The lack of statistical significance implies that fluctuations in management job levels do not correspond to observable fluctuations in economic growth in ASEAN economies. Similarly, the regression weight for Economic Growth with Operational Work

is -0.175, also lacking statistical significance ($p > 0.05$), suggesting no significant direct relationship between operational work and economic growth.

This result indicates that operational differences across ASEAN countries do not show a statistically significant association with changes in economic growth as measured in this analysis. The lack of statistical significance implies that operational changes do not correspond to notable changes in economic growth in the ASEAN economic context. These results highlight the complexity of economic dynamics within ASEAN countries. Although management and operations activities are an integral part of economic development and organization, they do not demonstrate a direct link with economic growth as measured in this study. The lack of statistical significance suggests that differences in management and operations job levels may not be the main driver of changes in economic growth in the ASEAN region. Interpreting these results in the broader context of economic trends and industry interactions is important.

The lack of a direct relationship between management work, executive work, and economic growth highlights the multifaceted nature of economic processes and the different factors that influence economic outcomes in different countries. ASEAN countries. Further research is needed to explore these relationships more comprehensively and identify additional factors that may contribute to economic growth dynamics across different sectors and industries in the ASEAN economy.

Understanding idiosyncratic risk is important for investment decisions, business strategies, and overall economic performance in the context of ASEAN countries. Idiosyncratic risks, defined as risks specific to individual assets or sectors, can arise from a variety of sources, such as regulatory changes, supply chain disruptions, and industry shocks specifically (Caglayan et al., 2020; Badshah & Beaumont, 2013). For businesses operating in ASEAN countries, unique risks pose significant challenges, affecting their profitability, competitiveness, and long-term viability. Therefore, analyzing the drivers and consequences of idiosyncratic risks is essential for policymakers, investors, and other stakeholders to promote economic growth and stability in the future.

Previous research has highlighted various factors contributing to unique risks in ASEAN countries and their impact on economic performance. International. Studies have shown that idiosyncratic risk can shape investment decisions by influencing a firm's expected returns and risk perception. Additionally, idiosyncratic risks have been shown to affect company performance and market dynamics, leading to changes in market structure, industry concentration, and competitive behavior. Understanding how idiosyncratic risk operates in ASEAN countries is important to designing effective risk management strategies and policies to minimize its negative impact on economic development (Kumari et al., 2017). By exploring idiosyncratic risk within a theoretical framework of economic development, researchers can illuminate its complexity and implications for promoting sustainable growth and resilience in ASEAN economies.

Economic development in ASEAN countries has witnessed significant progress and transformations in the past decades (Nam et al., 2024; Goutte et al., 2022; Shinwari

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et al., 2024). These countries, including Indonesia, Malaysia, Thailand, the Philippines, Singapore, Vietnam, Brunei, Myanmar, Cambodia, and Laos, have experienced significant growth due to various factors. Among these factors, globalization is central in integrating ASEAN economies into global markets, facilitating trade, investment, and technology transfer. Furthermore, industrialization has promoted structural transformation, shifting the economy from an agricultural sector to a manufacturing and service-oriented sector (Aboagye & Adjei Kwakwa, 2023).

One of the main drivers of economic development in ASEAN countries is the significant flow of foreign direct investment (FDI). FDI has acted as a catalyst for growth by providing capital, technology, management expertise, and market access. These investments have boosted economic activity, especially in the manufacturing, infrastructure, and services sectors. In addition, FDI inflows have contributed to job creation, skills development, and improved productivity, thereby strengthening overall economic performance (Kostakis, 2024).

Urbanization also plays a vital role in the economic development of ASEAN countries. Rapid urbanization leads to a concentration of economic activities in urban centers, driving demand for infrastructure, housing, and services. Urban areas have become hubs of innovation, entrepreneurship, and economic dynamism, attracting domestic and foreign investment. Additionally, urbanization has facilitated the growth of agglomerated economies, where proximity to markets, suppliers, and talent drives productivity and innovation.

The theoretical framework provides valuable insights into the underlying mechanisms determining economic development in ASEAN countries. They help identify the channels through which globalization, industrialization, FDI flows, and urbanization influence economic growth and structural transformation. By understanding these drivers, policymakers and stakeholders can design effective strategies to harness the potential of these factors and promote sustainable and inclusive development. In ASEAN countries (Du et al., 2024).

FDI plays a vital role in the economic growth of ASEAN countries by providing capital, technology, and management skills essential for improving productivity and competitiveness. Theoretical frameworks explore different theories and models that explain why countries attract FDI, how they contribute to economic growth, and the potential challenges associated with FDI inflows, such as dependence and vulnerability to external shocks (Huafang, 2024; Crescenzi et al., 2021; Morana, 2023).

Idiosyncratic risk refers to risks specific to each asset or sector rather than to systematic or whole market. In the context of ASEAN countries, idiosyncratic risks may arise from factors such as regulatory changes, supply chain disruptions, and industry-specific shocks. The theoretical framework that helps conceptualize idiosyncratic risk and its impact on investment decisions, business strategies, and overall economic performance (Triatmanto et al., 2023).

Empirical studies have yielded different results on the relationship between FDI and economic growth in ASEAN countries. While some studies indicate a positive impact of FDI on economic growth, other studies suggest that this relationship may depend on

many different factors such as host country characteristics, FDI, and institutional quality. Theoretical frameworks contextualize these empirical findings and identify potential avenues for future research (Nam et al., 2024; Du et al., 2024).

FDI can affect economic development through many channels, including technology transfer, people investing, capital development, export promotion, and spillover effects. The theoretical framework examines these mechanisms in detail and explains how FDI inflows can lead to increased productivity, industrial modernization, and structural transformation in ASEAN countries.

Idiosyncratic risk refers to risk specific to individual assets or sectors rather than systemic or market-wide risk. In the context of ASEAN countries, idiosyncratic risks may arise from factors such as regulatory changes, supply chain disruptions, and industry-specific shocks. Understanding the nature and characteristics of idiosyncratic risk is essential to assess its impact on investment decisions, business strategies, and overall economic performance (Nath & Brooks, 2015; Soliman & Le Saout, 2024).

There are models and theoretical frameworks for analyzing idiosyncratic risk in the context of ASEAN countries. These frameworks consider factors such as market structure, regulatory environment, and company-specific characteristics to understand the determinants and impacts of idiosyncratic risks. By integrating these factors into the analysis, researchers can better understand the factors that drive unique risks and their impact on economic activity in ASEAN countries (Kostakis, 2024).

Previous research has studied the relationship between idiosyncratic risk and economic activity economy in ASEAN countries. Studies have explored the impact of idiosyncratic risk on investment decisions, corporate performance, and market dynamics, emphasizing the importance of understanding and managing idiosyncratic risk to promote growth and economic stability (Zhu et al., 2016; Nartea et al., 2011; Triatmanto et al., 2023; Huafang, 2024). The theoretical framework helps contextualize these findings and provides a basis for further research.

CONCLUSION

This study provides invaluable insights into the complex interactions between foreign direct investment (FDI), idiosyncratic risks, sectoral GDP, economic activity, and economic growth in ASEAN countries. Several significant findings were discovered using structural equation modeling (SEM) analysis with 2023 ASEAN Statistical Database data. Foreign direct investment (FDI) inflows significantly impact idiosyncratic risks in ASEAN countries, highlighting the importance of understanding the dynamics of risks associated with foreign investment and the need for effective risk management strategies.

The idiosyncratic risk significantly impacts sectoral GDP, economic activity, and economic growth. Therefore, idiosyncratic risk management measures are needed to support economic development and promote growth in different sectors. Furthermore, our study demonstrates the direct and indirect impacts of FDI on sectoral GDP, economic activity, and overall economic growth. By characterizing these impacts, we have better understood how FDI shapes economic variables in the ASEAN context.

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These findings have important implications for policymakers, investors, and other stakeholders in ASEAN countries. Policymakers should focus on attracting and retaining FDI by implementing policies that mitigate associated risks, including improving the regulatory framework, infrastructure, and liquidity. Understanding the risk-return dynamics of FDI in ASEAN countries is essential for investors to make informed investment decisions. Recognizing the impact of idiosyncratic risks on economic variables allows investors to develop strategies to manage and mitigate these risks effectively. Furthermore, the insights from this study can inform future research efforts by exploring the mechanisms by which FDI affects economic development in ASEAN countries, including examining specific sectors or regions to provide more detailed information on the drivers of FDI and their economic impacts.

Future research could examine the role of other factors, such as political stability, institutional quality, and technological innovation, in shaping the relationship between FDI and economic variables. Longitudinal studies on the long-term impact of FDI on economic development in ASEAN countries can provide invaluable insights into the sustainability of growth trajectories. Furthermore, comparative studies examining FDI patterns and their impacts in different regions or economic blocs can provide a broader perspective on the drivers and outcomes of foreign investment. Interdisciplinary research integrating insights from economics, finance, political science, and other fields can provide a comprehensive understanding of the multifaceted nature of FDI and its implications for economic development.

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Export Diversification and Economic Growth of ECOWAS Member States

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ABSTRACT

Research Originality: This research uses the export diversification index data, which has been excluded in previous studies, and most of the previous studies only look at the relationship between ED and GDP, excluding per capita income as the basis for development.

Research Objectives: This paper examines how export diversification (ED) impacts economic growth and per capita income.

Research Methods: The paper achieves its objectives using, panel least technique and co-integration test are used on time series data of 1984-2022 for ECOWAS states.

Empirical Results: The paper shows that the export diversification index has a significant and inverse influence on GDP growth; however, manufacturing value-added shows a weak but positive influence on per capita income growth. Again, the paper reveals the high skewness of the ECOWAS region to primary product export, which could be responsible for the low growth per capita income.

Implications: The finding of this is not the volume of exported products that matters but how dynamic is exported products. The paper, therefore, recommends that ECOWAS countries develop processing capabilities for export that come from endogenous sufficiency.

Keywords:
gravity model; economic integration; trade flows; export diversification

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INTRODUCTION

Developing countries need to diversify their exports to help them overcome export instability or the negative impact of terms of trade in primary products. The process of economic development highlights structural transformation where countries move from producing 'poor-country goods' to 'rich-country goods.' Export diversification does not only play an essential role in this process. However, it shows the differences between countries exporting primary and manufacturing products. Primary product exports are subject to low price and demand fluctuations, as well as suffering from medium to long-term terms of trade declines (Amaghionyeodiwe et al., 2014).

Again, primary products are generally characterized by intense price competitiveness that leads to productivity gains being passed on to consumers rather than producers. The periodic primary products boom has led African countries into a false sense of prosperity, knowing that primary product booms are cyclical and that it is doubtful they will lead African countries to economic development. Africa's over-reliance on exports of primary products with minimal value added aggravated its poverty rate, putting the household and government budget under immense stress. The persistent dependence on primary product export in Africa challenges trade push growth and development.

Theoretically, Economic growth is influenced by structural transformation, where countries shift from producing 'poor-country goods' to 'rich-country goods.' What is needed for structural transformation is the existence of an elastic demand for a country's exports in global export markets without negative terms of trade. In Africa, the domestic demand is deficient, so exports remain one of the tools that significantly help to increase any country's per capita GDP growth rates. Another issue relates to the competitiveness in export products; globalization increases cross-border trade, and countries are exposed to stived competition from global competitiveness, making countries need export diversification. The structural models of economic growth state the need to diversify from primary product exports to dynamic exports to achieve sustainable growth (Olayiwola & Ola-David, 2015).

Endogenous growth models also emphasize the imperativeness of learning by doing in the manufacturing sector for sustained growth; export diversification helps knowledge spillovers for new method production, new management, and marketing practices, potentially benefiting from other industries. Knowledge spillovers help export diversification to produce a set of export products that increases per capita GDP growth (Olayiwola & Ola-David, 2015). Again, Agosin (2017) states that export diversification helps countries outside the margin of the technological frontier increase their comparative advantage by imitating and adapting existing products and technology.

ECOWAS region policies have favored increasing measures to foster primary product exports, neglecting production and manufacturing exports whose prices are higher and more profitable, with high responsiveness to the change in demand income and prices. ECOWAS member state's export performance over the last 17 years with the introduction of trade facilitation has slightly improved, but this falls far below expectations compared

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to the experience of other developing countries even with economic integration (Osakwe & Kilolo, 2018). Worse still, intra-trade among ECOWAS member countries has remained relatively stagnant due to similar product exports (ECOWAS Trade Data, 2022).

There is little empirical literature on the nexus of export diversification and per capita GDP. They use the classical cross-sectional regression, including several measures of export concentration in the growth equation; their study finds that export diversification increases economic growth (Martincus & Go'mez, 2019; Sim & Karim, 2019; Osakwe & Kilolo, 2018). The finding is significant regarding different model specifications and cross-sectional regression, revealing that exports are impacted negatively by an increase in relative prices. They are impacted positively by an increase in global per capita growth, and export tariffs have a negative impact on export performance, although minimal. Among regional blocs, the result indicated that Latin America possessed high-income elasticity and the highest long-run price elasticity. The study concluded that trade liberalization is a primary determinant of export growth for the countries sampled.

Cameron et al. (2021) examined the long-run elasticity of response of its predominantly agricultural primary exports during Uganda's floating exchange rate regime. The study reveals Uganda's exports have a positive significant correlation with relative prices and exchange rate level but correlate negatively with the terms of trade, capacity utilization, and exchange rate variability. A closer examination of individual sub-sectors indicates that the negative response to diversification efforts is only universal for some products. This condition has policy implications; Uganda's export-led growth strategy must recognize the importance of export diversification to take advantage of the differences in supply conditions and responses of each sub-sector. Nevertheless, the evidence reveals that successful export diversification has been associated with increased growth (Ferreira, 2019).

Studies established that trade liberalization policies many Latin American countries adopted improved export performance (Ferreira, 2019; Balza, 2018). Other studies concluded that increasing export performance is mainly from a more realistic and stable real exchange rate, while trade reforms and export diversification had little or no influence. However, low export performance is subject to primary products. The paper examines the ECOWAS region's manufacturing export diversification influence on GDP and GDP per capita from this background. The paper is motivated to examine the export issues from two preparative: the neoclassical trade specialization and international completion theory, where exports originate from global demand and not specialization as against previous studies. The research objective is to examine if increasing the manufacturing value added to primary products positively influences economic growth and, thus, development. Sarin et al. (2020) shows that most research provided robust evidence about positive impact of export diversification on economic growth and mixed results regarding the impact of export instability on economic growth.

The significant fallout from the extant studies reviewed is the contradictory results on manufacturing export diversification's influence on GDP, and the study was deemed significant as it includes export diversification index data, which is excluded in previous

studies. The study is also relevant to scholars and policymakers in the region as it would provide realistic policy recommendations for the trade losses and dwindling foreign earnings of ECOWAS member states resulting from the low-yielding export composition, offering a novel explanation, using the variable of export diversification index data on how trade policies had an impact on export diversification performance. The region is one of the richest endowed and is in a good position for export diversification, but weak capabilities of the region have dwindled this possibility of trade-led growth; also, institutional inadequacies have not helped in this case. Besides that, previous studies have only looked at the relationship between ED and GDP, excluding per capita income as the basis for development. The paper also provides robust empirical evidence of the positive effect of export diversification on per capita income growth. This paper investigates the influence of export diversification on economic growth and per capita income. The paper uses fifteen ECOWAS member states that need structural transformation to move from producing 'poor-country goods' to 'rich-country goods.'

METHODS

Empirical justification of the study objectives, validation of growth induced by increasing manufacturing value added export and its returns to societal development; two models are developed to test each of the hypotheses. For the long-run relationship between growth and increased manufacturing value added (diversification) in the ECOWAS member states, Ferreira (2009) equation adopted is stated as;

$$Y_t = EC_{it}^{\varphi}, ED_{it}^{\beta} \quad (1)$$

Where Y_t is real GDP in period t, ED_{it} is the export diversification index of the ECOWAS region, and EC_{it} Export concentration index.

Transform equation (1) into a log-linear form, is stated as;

$$LogY_t = \alpha + \varphi logEC_{it} + \beta logEDI_t + \upsilon_t \quad (2)$$

Where log is the natural logarithm of the variable and estimated φ, β represents elasticities. The error term υ_t is assumed to be white-noise (random walk) normally and identically distributed.

Subjecting Equation (2) to empirical test, as the model test the diversification-led growth hypothesis for the manufacturing sector in ECOWAS member states

$$H_0: \varphi, \beta = 0$$
$$H_1: \varphi, \beta > 0$$

It expected that φ, β are positive and statistically significant, that is, the diversification-led growth is confirmed.

Testing the country specific diversification leaded growth in the ECOWAS member states, Ferreira (2009) model form of the GMM estimation is deem fit and the empirical validation shall be based on ordinary panel regression.

$$\Delta y_{i,t} = \alpha y_{i,t-1} + X'_{i,t}\beta + \nu_{i,t} \quad (3)$$

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$\Delta y_{i,t}$ is log difference of income per capita in period t, $y_{i,t-1}$ is the log initial income, $X_{i,t}$ is a vector of potential determinants of growth and $V_{i,t}$ is the residual error term.

$$X'_{i,t} = \alpha_1 IVt,\ \alpha_2 AGRt,\ \alpha_3 MFRt,\ \alpha_4 SEVt,\ S\ \alpha_5 Pet \quad (4)$$

IV_t is investment, AGR_t is the share of agricultural value added to GDP, MFR_t is the share of Manufacturing value added to GDP, SEV_t is the share of the services value added to GDP, and SPE_t is the percentage share of primary export.

$$\log y_{i,t} = \alpha_0 + \alpha_1 \log y_{i,t-1} + \alpha_2 \log IV_t + \alpha_3 \log AGR_t + \alpha_4 \log MFR_t + \alpha_5 \log SEV_t + \alpha_6 \log SPE_t + V_t \quad (5)$$

For a good estimation there is need to examine the time series properties of all the variables, the unit root and co-integration test. Testing the null hypothesis of a difference stationarity against the alternative hypothesis of a level stationarity using The Augmented Dickey-fuller (ADF).

If critical values which are all negative and larger (in absolute terms) than ADF statistics; if the null hypothesis cannot be rejected, then Y_t cannot be stationary. It maybe I (1) or I (2) order of integration. The unit root test is important as observed, often time, time series data are non-stationary. With that, residuals of time series data are correlated with their own lagged values, thereby violating OLS assumptions, thus make estimates biased and inconsistent with standard errors.

To obtain the long-run relationship of the variables, the study uses Johansen approach of co-integration test and vector error correction model to test the short-run relationship to guarantee successful correction of errors, the Johansen procedure unlike the Engel and Granger two steps static procedure, allows the simultaneous evaluation of multiple relationships and imposes no prior restrictions on the co-integration space. So, need for indentation of integration order of each time series data provided, the dynamic growth model in equation (1) is rewritten as;

$$LOG(Y) = \alpha_0 + \varphi LOG(ECI) + \beta LOG(EDI)$$

The differenced model is written as;

$$LOG(DY) = \alpha_0 + \varphi LOG(DEDI) + \beta LOG(DECI)$$

The assumption that time series economic variables are stationary, has been argued not be appropriate for most economic variables as most economic variables are integrated in the order one I (1), that is, if a variable is non-stationary at first difference, there is needs to differenced again to become stationary at I (1). When all variables are in the order of I(1) it best to use the Johansen procedure. The theoretical stages involved are as follows.

If critical values which are all negative and larger (in absolute terms) than ADF statistics; if the null hypothesis cannot be rejected, then Yt cannot be stationary. It maybe I (1) or I (2) or higher order of integration. After order of integration is determine, the study estimate the co-integrating vector of the regression equation. The study uses the Johansen procedure since indication of order one I(1) co-integrating vector with appropriate lag to ensure non serial correlation in the convergence of estimated variables.

Since long run series convergence exist, that is, the variables are co-integrated, the study proceeds to examine the error correction, co-integration is a needed condition for error correction model to hold. The ECM model meets the need of integrate short run dynamics with long run equilibrium. For unbiased estimate, all statistical tests of significance needed done including the model diagnostic test. Again, ECM helps to switch to a short run model and allow adjustment for any short run divergence to the long run series convergence. ECM is expected be negative sign and very significant, that is, the short run divergence is been corrected to the long run convergence. Panel least square analytical procedure is for the two model to deal with the effects of the trade composition indicators on per capita income. And the model estimated the country specific period fixed effects. The study uses secondary data for the period of 1984 – 2020 from the fifteen member states of ECOWAS including Benin, Burkina Faso, Cape Verde, Cote D'voire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra-Leone and Togo.

RESULT AND DISCUSSION

The study examined the impact of export diversification and other variables like export concentration index, population, and investment share of GDP on GDP per capita. Econometric analysis achieves the study's objectives with the econometric analysis, and descriptive analysis is used to achieve the second objective. Table 1 reveals the summary statistics of variables used for analysis. All variables are normally distributed at 5% and 1% significance levels, as revealed by the Jarque-Bera test, except GDP, GDPK, IV, and POP. That is a goodness-of-fit measure of departure from normality based on kurtosis and skewness. So, the higher the statistics, the higher the log-likelihood that variables are normally distributed. The dependent variables GDP and GDPK reveal an average growth rate of 11.20 percent in ECOWAS member states and a standard deviation of 0.66 percent. The average income in ECOWAS is member states 5.0 percent of the total income in the ECOWAS region with a standard deviation of 0.548. This result implies that an individual in ECOWAS member states earns about 0.55 percent of total income.

Table 1. Summary Statistics

	LNGDP	LNECI	LNEDI	LNGDPK	LNAGR	LNIV	LNMFR	LNPOP	LNSEV
Mean	11.1951	-0.528142	-0.201177	4.774746	21.22779	2.145194	16.81418	15.40863	18.48557
Median	11.3400	-0.54666	-0.244242	5.697093	20.26007	2.195609	18.57320	15.91946	20.54283
Maximum	11.5999	-0.03150	-0.209557	7.144407	21.72245	3.850617	21.53784	16.77397	22.52166
Minimum	9.77770	-0.77219	-0.307885	4.867534	17.46018	0.146199	16.71203	12.78074	17.72808
Std. Dev.	0.66129	0.18123	0.0250231	0.547988	1.154787	0.535292	1.034166	1.128407	1.136911
Skewness	- 2.96009	- 1.99303	-0.47173	0.42173	-0.496038	0.597984	-0.568209	-1.000460	-0.437288
Kurtosis	10.7888	4.609077	2.865135	2.757227	2.268752	3.840840	3.840840	2.419276	2.658879
Jarque-Bera	57.4020	4.71391	0.584736	10.73521	13.16366	8.952760	6.884268	29.73514	6.352331
Probability	0.00000	0.09470	0.746494	0.004665	0.001385	0.011375	0.031996	0.000000	0.041745

Source: Data processed (2023)

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The average export concentration is -0.52%, with a standard deviation 0.18. The degree of export diversification is -0.20% on average and 0.025 as the standard deviation. ECOWAS GDP value-added on agriculture, manufacturers, and services has an average value of 21.22%, 18.5%, and 18.4%, respectively, with a standard deviation of 1.2%, 1.0%, and 1.1%. The fluctuations experienced in GDP, GDPK, and AGR may be connected to seasonal variations and global demand for primary products. The implication is that over-dependent on primary products by ECOWAS member states makes them more vulnerable to low foreign incomes and instabilities. This result agrees with a previous study where it is acknowledged that a significant challenge facing African countries in the global market is undue concentration on the exportation of primary commodities (Amurgo-Pacheco et al., 2017; Bebczuk & Berrettoni, 2016).

The result of the stationarity test is given below using the ADF and Philip-Perron test. The figures show that each series is stationary at first difference at one percent using ADF and Philip-Perron test. Since the variables are integrated in the same order I(1), there is the need to test for co-integration relationships using the Johansen approach. Johansen's approach is selected because the Engel and Granger two-step procedure conceals information on the coefficients of the explanatory variables in the co-integrating vector, hence making the approach inappropriate in many cases, including this study. The results using this approach are sensitive to the lag length used. The Akaike information criterion selects the lag length to be included in the estimation. Co-integration tests of the models assume quadratic deterministic trends in data. Both trace and maximum eigenvalue test results indicate the existence of a unique co-integrating vector between test variables for the growth model. To show the existence of a co-integrating equation in the model, the result is chosen at the value where the trace statistic is less than the corresponding critical value.

The result differs and is inconsistent with those of Sim and Karim (2019), Martincus and Go'mez (2019), and Balza (2018). The variation is likely due to the heavy over-dependence on primary exports; the positive relation of the concentration index (as an indication of specialization), suggests that ECOWAS has maintained specialization only on a weak spillover generating export, which contrasts the modern international competition theory, that a country cannot solely depend on particular industrial activities but should be more proactive to offset national factor disadvantages in sustaining national competition advantage. The proven impact of such diversity on economic performance was confirmed by previous studies (Agosin, 2017; Amurgo-Pacheco et al., 2017; Bebczuk & Berrettoni, 2016; Mania & Rieber, 2019). In other studies, find that there exists a significant long run cointegrating relationship between overall export diversification and economic growth in Bangladesh (Azam & Azam, 2023). Zhou and Nyandoro (2023) also suggest Zimbabwe should continue to diversify its export to achieve a sustain long-term economic growth.

The analysis indicates that while most variables in the study are normally distributed, the over-reliance of ECOWAS member states on primary product exports renders them vulnerable to economic fluctuations, highlighting the need for diversification to enhance

stability and growth. Furthermore, a co-integrating relationship among the variables suggests that adjustments towards long-term equilibrium occur moderately, emphasizing the importance of addressing short-run disequilibria for sustained economic performance. The estimation attempts to sieve the impact of export concentration on ECOWAS per capita growth considering individual country fixed and period-specific effects. The estimation is carried out to achieve the objective as specified in the study's introduction; a panel least square of 15 ECOWAS states is considered in the analysis.

Table 2. The Empirical Result

Variable	Coefficient	t-stat	sig
C	9.1989	4.3246	0.0000
LNAGR	0.1735*	5.9755	0.0000
LNIV	-0.02411*	-2.3555	0.0198
LNMFR	0.0277	1.3035	0.1925
LNPOP	-1.5676*	-11.115	0.0000
LNSEV	0.8241*	28.4145	0.0000

Source: Data processed (2023)
R^2 = 0.5026, DW = 0.4941, *Significant at 1%, 5% an 10%

It needs to be consistent with the hypothesis, as the study could not confirm a significant impact of manufacturers' value-added on per capita income, which could have arisen from the region's less concentration on manufacturing production and export. The coefficient of the investment share of GDP was negative, signalling that the low capital injection in improving value added in ECOWAS will negatively impact GDP per capita.

Table 3. Cross-Section Fixed Effects

Country	Fixed Effects
Benin	0.071783
Burkina Faso	-0.475606
Cape Verde	0.516745
Cote D'iviore	0.479028
Gambia	-0.723806
Ghana	
Guinea	0.344472
Guinea-Bissau	-0.488858
Liberia	
Mali	0.526614
Niger	0.421581
Nigeria	
Senegal	0.336621
Sierra-Leone	
Togo	0.013668

Source: Data processed (2023)

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From the estimation, the population variable is one of the most potent; the population was more consistent and significant (with a higher negative magnitude). That is, a high population reduces GDP per capita as a result of the low income of some ECOWAS members. The estimated result from the panel least square procedure suggests that the coefficients of agriculture value-added, manufacture value-added, and service value-added are positively related to real per capita income, while investment share of growth and population are negatively related to real per capita income. These results show that the observed variables are statistically significant in explaining the natural per capita income variation, except manufacturing value-added. This result contrasted earlier works of developing economics and is likely due to the weak production capability in the ECOWAS region.

Table 4 reveals the unobserved effects of the independent variables as they relate to individual countries' real per capita income that is not captured by the regression (real per capita income) in the model. It shows the magnitude and degree of real per capita income when the independent variables are assumed constant. This condition indicates that on account of relatively low trade indicators (specified explanatory variables), GDP per capita in the region is affected by some other variables. ECOWAS member states like Burkina Faso, Gambia, and Guinea-Bissau have negative fixed effects (falling real per capita income), which could have resulted from political, governance, or economic instability. The country-fixed effects of Liberia and Sierra Leone could not be obtained because of the unavailability of enough data to estimate the effects. Table 4 reveals the periodic magnitude of the regressand (real per capita income) when all the explanatory variables are held constant; the result of the model shows a declining real per capita income until 2012, when the ECOWAS region real per capita regains and has remained at a relatively constant level.

Table 4. Period Fixed Effects

Country	Fixed Effects
2004	-0.191335
2005	-0.144391
2006	-0.130320
2007	-0.111446
2008	-0.086879
2009	-0.061563
2010	-0.053451
2011	-0.034022
2012	-0.007391
2013	0.019718
2014	0.046801
2015	0.064747
2016	0.080834
2017	0.109908
2018	0.126067
2019	0.012843
2020	0.049813

Source: Data processed (2023)

This result is different with previous research such as Sunaryati (2015) that found uni-directional from GDP to export diversification. Trinh & Thuy (2021) demonstrate that there is a nonlinear relationship between diversification and economic growth. If the diversification is above the threshold, it will boost economic growth. The other side if the diversification is below the threshold, the relationship between market and growth is insignificant.

Aditya and Acharyya (2013) conclude that there is a critical level of export concentration beyond which increasing export specialization leads to higher growth. Below this critical level, diversification of exports matters for gross domestic product (GDP) growth. Growth of high technology exports also contributes to the output growth; the relationship becomes stronger for countries that have share of manufacturing exports in their total exports greater than the world average.

Odularu (2008) state that the traditional strategy of export promotion that focuses on the international marketing of final goods is no longer suitable with the existing condition. The countries must adopt the different routes to diversification that could include resource-based manufacturing and processing of primary products. Government should promote export diversification and investment that can attract direct investment (Matezo et al., 2021). But there is a note for the export diversification. Mora and Olabisi (2023) find that transportation cost impact export diversification in developing countries.

CONCLUSION

This paper examines the influence of export diversification on GDP per capita in ECOWAS member states. This research uses annual data from 1984 to 2020 from 15 ECOWAS member countries. The study revealed that ECOWAS exports heavily focus on primary commodities, particularly agriculture and fuel, accounting for over 90% of the region's exports. The emphasis on primary commodities has hindered intra-regional trade and industrial productivity. Most trade occurs with European and North American countries, leading to value transfer across borders. The study also found that the lack of export diversification and overreliance on agriculture have negatively impacted GDP per capita and economic growth in the region. Despite the potential benefits of export diversification, ECOWAS has not effectively diversified its export basket. The study emphasized the importance of agriculture value-added and service value-added in explaining GDP per capita trends, highlighting the neglect of manufacturing activities in the region. Additionally, the study showed that the population variable significantly negatively impacts GDP per capita, suggesting a potential increase in poverty due to population growth and economic challenges in the region.

The study highlights the critical need for ECOWAS member states to diversify their exports beyond primary products to enhance GDP per capita and foster economic growth. By focusing on manufacturing and value-added exports, the region can improve trade performance, reduce dependency on natural resources, and ultimately address poverty and economic stagnation. The study's findings have policy implications, and the following

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recommendations are suggested. The study emphasizes the importance of shifting focus from raw product exports to manufactured goods to enhance trade performance and economic stability in the region. It advocates for increased intra-trade links and horizontal diversification of primary products to foster industrialization and maximize economic gains for ECOWAS member states.

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Economic Growth and Environmental Quality: A Study on Mineral-Rich Provinces in Indonesia

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ABSTRACT

Research Originality: This research focuses on Indonesia's mineral-rich provinces and offers originality through its comprehensive analysis of the bidirectional relationship between economic growth and environmental quality, using the Environmental Quality Index (EQI).

Research Objectives: This study examines the relationship between economic growth and environmental quality in the Mineral Economy Provinces of Indonesia.

Research Methods: The data used in this research is secondary data from 2015 to 2022. The analysis method employed is the simultaneous equation model using Two Stage Least Squares (2SLS).

Empirical Results: The results show that in model 1, economic growth is significantly influenced by exogenous variables such as the environmental quality index, energy consumption, revenue sharing funds, investment, and population. In model 2, environmental quality is significantly influenced by exogenous variables such as GDP, mining output, energy consumption, and forest. Good environmental quality can enhance economic growth. Conversely, increased Economic growth can degrade environmental quality.

Implications: The study's findings suggest that policymakers in Indonesia's mineral economy provinces should prioritize sustainable development to balance economic growth with environmental preservation.

Keywords:
economic growth; environmental quality index; mineral economy provinces; sustainable development; two stage least squares

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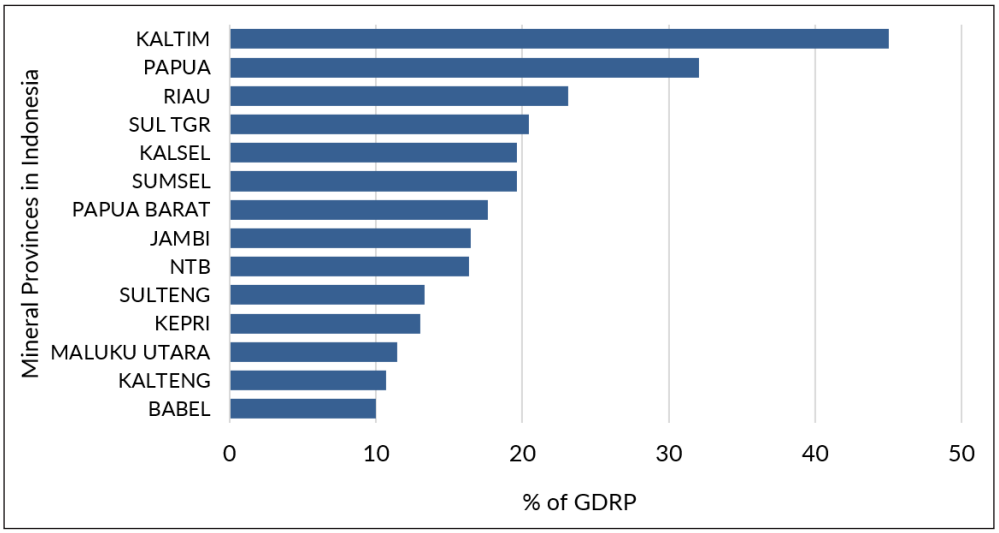
INTRODUCTION

Economic growth driven by the exploitation of mineral resources often has a negative impact on the environment (Huang et al., 2020). Indonesia heavily relies on the mining and quarrying sector, which ranked seventh in national GDP contribution in 2022 (BPS). While this sector supports the economy, such dependence makes it vulnerable to global commodity price fluctuations, affecting economic stability.

Although Indonesia has abundant natural resource wealth, the phenomenon of the Natural Resource Curse shows that countries with natural resource wealth often face challenges in achieving sustainable economic growth (Ridena et al., 2021). The "resource curse" concept suggests that countries rich in natural resources, such as minerals and oil, often face significant economic and political challenges, including unsustainable economic growth, corruption, and inequality (Auty, 1993).

A mineral economy is defined as an economy that generates at least 8% of its Gross Domestic Product (GDP) from the mining sector and derives at least 40% of its foreign exchange earnings from mineral exports. Several provinces in Indonesia have significantly contributed to their economies from the mineral sector. Some provinces in Indonesia with a mineral sector contribution above 8% to their GDP are called "mineral economy provinces". This term encompasses regions that have natural resources, particularly in the mining sector, which significantly impact the economy of those areas (see Figure 1).

Figure 1. Provinces in Indonesia with Mining and Quarrying Sector Contribution to GDRP above 8%



Source: Authors' calculation from Central Bureau of Statistics (BPS) Indonesia

Fourteen provinces in Indonesia are classified as Mineral Economy Provinces, as the mineral sector's contribution to their GDP exceeds 8% (see Figure 1). Referring to the resource curse hypothesis above, regions that rely on mineral resources face challenges in managing the sustainability of their economy and environment. The mining sector in Indonesia faces serious challenges related to sustainable environmental management (Marimuthu et al., 2021). This challenge is crucial for Indonesia in achieving the Sustainable

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Development Goals (SDGs), which emphasize the importance of maintaining a balance between economic development and environmental conservation (Fatimah et al., 2020).

To understand the relationship between economic growth and EQI, previous research has identified various interrelated factors. A study by Malik (2021) on economic growth and its impact on the environment in Turkey concluded a positive causal relationship between economic growth and energy consumption. High energy consumption is required for economic growth, but this increase in energy consumption also contributes to higher CO2 emissions, ultimately leading to environmental degradation. For instance, Bouznit et al. (2023) in Algeria found that increased economic growth leads to higher energy consumption and, in turn, higher CO2 emissions.

The findings of these studies vary depending on the country under analysis. For instance, Acheampong (2018) examined the relationship between energy consumption, economic growth, and carbon emissions in 116 countries. Globally, energy consumption raises GDP, which eventually increases pollution. However, economic growth in Latin America and the Caribbean does not lead to increased pollution. Likewise, energy consumption negatively impacts carbon emissions in Africa, Latin America, and the Caribbean.

Studies by Khan et al. (2021) and Ghorashi and Rad (2017) identified a bidirectional relationship between economic growth and environmental degradation. In contrast, (Lateef et al., 2021) found a unidirectional relationship. Lateef et al. (2021) researched the causal impact of carbon emissions in SAARC (South Asian Association for Regional Cooperation) countries on foreign direct investment (FDI), economic growth, and other economic factors. The results showed a unidirectional relationship between carbon emissions and economic growth.

While there are similarities in the variables examined, this research distinguishes itself through its choice of subjects, study period, and variable variations. The primary aim of this approach is to provide a more thorough and nuanced understanding of the phenomenon under investigation. Additionally, environmental studies often use CO2 gas emissions as a measurement, other indicators such as water pollution, deforestation, habitat destruction, and biodiversity loss are also important (Ahmad et al., 2020; Lateef et al., 2021; Soukiazis et al., 2017). Consequently, selecting the Environmental Quality Index can provide a more comprehensive view of the complex environmental challenges. This method offers a richer perspective than focusing on a single indicator like CO2 emissions alone.

Based on the arguments above, this research is exciting. It deserves to be studied more deeply to uncover the intricate relationship between economic growth, environmental quality, and the mining sector's role in Indonesia. Given the mineral sector's significant contribution to several provinces' GDP, understanding the implications of this dependence on both the economy and the environment is crucial. This study aims to address the gaps in the existing literature by focusing specifically on the Indonesian context, where the dynamics of the resource curse, environmental degradation, and economic development are particularly pronounced.

This research explores the complex relationship between economic growth, environmental quality, and the mining sector in Indonesia, focusing on provinces where the mineral sector significantly contributes to GDP. By employing the Environmental Quality Index (EQI) and a simultaneous equation model using Two Stage Least Squares (2SLS), the study will analyze the bidirectional relationship between economic growth and environmental quality, considering factors like Revenue Sharing Fund, investment, population, GDRP mining, forest area, and energy consumption. The research seeks to fill gaps in the existing literature and provide valuable insights for policymakers, helping to balance economic growth and environmental sustainability in Indonesia's resource-rich regions, ultimately supporting the country's efforts to achieve its Sustainable Development Goals (SDGs).

METHODS

The data in this article uses secondary data obtained from the Indonesian Central Bureau of Statistics and the Ministry of Environment for the period 2015–2022 in Indonesia. The data include the Environmental Quality Index, GDRP, investment, population, mining output, forest, revenue sharing fund and energy consumption. This study employs two-stage least squares (TSLS) analysis to address several issues commonly encountered in regression models, such as heteroscedasticity, multicollinearity, auto-correlation, and endogeneity of economic and environmental. Unlike single equation models, simultaneous equation models, including TSLS, consider the interactions between multiple equations, allowing for a more comprehensive analysis. There are two equations in which, GDRP and EQI are the endogenous variables. The two-equation system is as follows:

$$Y_{it} = \beta_0 + \beta_1 EQI_{it} + \beta_2 EC_{it} + \beta_3 RSF_{it} + \beta_4 Pop_{it} + \beta_5 Inv_{it} + e_2 \quad (1)$$

$$EQI_{it} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 EC_{it} + \alpha_3 Mng_{it} + \alpha_4 Fr_{it} + e_1 \quad (2)$$

Description:

EQI = Environmental Quality Index; Y = Gross Domestic Regional Product; RSF = Revenue Sharing Fund; INV= Investment; POP = Population; Mng = GDRP mining; FR = Forest; EC = Energy Consumption.

The previous equations (Equations 1 and 2) will be transformed into their reduced form. The purpose of the reduced form is to identify the endogenous and exogenous variables in the model to be analysed. The reduced form equations are obtained as follows:

$$Y_{it} = \pi_0 + \pi_1 Mng_{it} + \pi_2 Fr + \pi_3 EC_{it} + \pi_4 RSF_{it} + \pi_5 Pop_{it} + \pi_5 Inv_{it} + v_{it} \quad (3)$$

$$EQI_{it} = \pi_0 + \pi_1 RSF_{it} + \pi_2 Pop_{it} + \pi_3 Inv_{it} + \pi_4 EC_{it} + \pi_5 Mng_{it} + \pi_6 Fr_{it} + v_{it} \quad (4)$$

The order condition is a criterion used to determine whether an equation in a simultaneous equations model is identifiable. The order condition involves comparing the number of exogenous variables excluded from an equation to the total number of equations in the model.

Based on the identification test above, all of the equations are indicated to be overidentified. Therefore, to estimate the parameters of the given equations, the Two-Stage

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Least Squares (2SLS) method should be used. The rank condition is another important criterion used to determine whether an equation in a simultaneous equations model is identifiable. While the order condition is necessary for identification, it is not sufficient by itself. The rank condition provides a more stringent test to ensure that the model is identified.

Table 1. Order Condition Model 1 (Y) and 2 (EQI)

	K	k	M	K-k>M-1	Result
Eq. Y	6	4	2	2 > 1	Over identified
Eq. EQI	6	3	2	3 > 1	Over identified

Source: Author's Calculation Results

Table 2. Rank Condition

C	EQI	Y	EC	Mng	Fr	DBH	Pop	Inv
α_0	-1	α_1	α_2	α_3	α_4	0	0	0
β_0	β_1	-1	β_2	0	0	β_3	β_4	β_5

Source: Author's Calculation Results

In the equation model (1) and (2) a 2x2 matrix A and B is obtained with a non-zero determinant,

$$|A| = \begin{vmatrix} 0 & 0 \\ \beta_3 & \beta_4 \end{vmatrix} \neq 0$$

$$|B| = \begin{vmatrix} \alpha_3 & \alpha_4 \\ 0 & 0 \end{vmatrix} \neq 0$$

Thus, the equation models (1) and (2) meet the order condition and can be estimated using Two-Stage Least Squares (2SLS).

RESULTS AND DISCUSSION

The unit root testing for panel data on the variables in this research model was conducted using the Augmented Dickey-Fuller (ADF), Levin, Lin Chu (LLC), and Im Pesaran Shin (IPS) tests. The detailed results of the unit root testing shown in Table 3. Table 3 shows unit root testing. Statistically, all variables used in this study have been proven to be stationary (not containing unit roots).

Table 3. Stationarity Test

Variabel	LLC	IPS	ADF
Statistic	-71.0150	-10.9189	280.431
Probability	0.0000	0.0000	0.0062

Source: Author's Calculation Results

The purpose of the cointegration test in this study is to determine the long-term equilibrium between the variables in the model. The criterion for the cointegration test is that if the probability value is less than 0.05 or 0.1, it can be concluded that the

null hypothesis is statistically rejected, which means that the variables are cointegrated.

Based on Table 4 of the cointegration test for the first model (Y), it shows that the p-value is less than 0.05. Therefore, it can be concluded that the null hypothesis is statistically rejected. This indicates that there is a long-term equilibrium relationship among the variables within the Y model. Similarly, observations from the cointegration tests on the second model (EQI) show that the obtained p-values also reject the null hypothesis. Therefore, it can be concluded that there is a long-term equilibrium relationship among the variables within the second and third models.

Table 4. Cointegration Test

	Panel PP-Statistic	Prob.	Panel ADF-Statistic	Prob.
Model 1 (Y)	-5.591498	0.0000	-4.186475	0.0000
Model 2 (EQI)	-7.473148	0.0000	-2.439704	0.0073

Source: Author's Calculation Results

The Hausman test evaluates whether the endogenous variables in the simultaneous equation model of Y and EQI are truly endogenous or exogenous. Using the F-statistic from the Hausman test, the null hypothesis is rejected, indicating that Y and EQI are indeed endogenous variables. The exogeneity test for the Y model and EQI model shows an F-test value 320.4403 and 24.10306. Therefore, the null hypothesis is rejected, indicating that Y and EQI is an endogenous variable in the simultaneous equation system.

Table 5. Exogeneity Test

Model	Variabel	F-statistik	*Prob.*
Y	C IKLHF EC RSF INV POP	320.4403	0.000000***
IKLH	C PDRBF EC MNG PD	24.10306	0.000000***

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.
Source: Author's Calculation Results

The identification analysis using the order condition and rank condition reveals that the structural equation models for economic and environmental factors are over-identified. This means that all these structural equation models can proceed using the two-stage least squares (TSLS) approach. The empirical results for the simultaneous equations model shown in Table 6. The results of Model 1 (Y) demonstrate a highly significant R-squared value of 0.919454, indicating that 91.94% of the variation in the economic

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growth (Y) can be explained by the exogenous variables: Environmental Quality Index (EQI), Revenue Sharing Fund (RSF), investment (INV), population (POP) and energy consumption (EC). This high explanatory highlights the strong interconnections between these factors and economic growth. Based on the t-statistic probabilities, it is evident that Y is significantly influenced by the environmental quality index (EQI), revenue sharing funds (RSF), population, and investment.

The estimation results of the EQI model are quite good, as indicated by the R-squared coefficient of 0.474388. This high R-squared value suggests that the variation in the independent variables in the model can explain 47.43% of the variation in the dependent variable. Based on the t-statistic probabilities, it is evident that EQI is significantly influenced by the economic growth (Y), GDP from mining (MNG), and forest (FR).

Table 6. Two-Stage Least Squares Estimation Result

	Model 1 (Y)	Model 2 (EQI)
Constant	4.972247***	121.8989***
Gross Domestic Regional Bruto (Y)		-5.855326**
Environmental Quality Index (EQI)	0.012694***	
Revenue Sharing Fund (RSF)	0.301265***	
Investment (INV)	0.472758***	
Population (POP)	0.192543***	
GDP mining (Mng)		-0.418888***
Energy Consumption (EC)	0.164624	3.197656
Forest		5.679621***
$^{R}2$	0.919454	0.474388

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.
Source: Author's Calculation Results

The estimation results indicate that environmental quality in the Mineral Economy Provinces can drive economic growth, consistent with the findings of Acheampong (2018) and Ghorashi & Rad (2017). This condition is evident from the average EQI score, which increased from 71.17 in 2017 to 75.42 in 2022, alongside economic growth from 4.6 percent to 7.3 percent. Economic growth in this region is highly influenced by environmental sustainability because most of the Mineral Economy Provinces are not industrial areas, making the mining, agriculture, plantation, and tourism sectors the primary sources of regional income.

The estimation results show that energy consumption does not significantly impact economic growth; even though electricity consumption in the Mineral Economy Provinces has increased, economic growth remains fluctuating. This condition is mainly due to the infrastructure limitations in Indonesia's central and eastern regions, which restrict electricity consumption. Additionally, the economic structure of the Mineral Economy

Provinces is dominated by non-industrial sectors that require less electricity compared to industrial sectors, making electricity consumption a less crucial factor in determining economic growth.

Revenue Sharing Funds (RSF) have a positive impact on economic growth. This finding is consistent with the research by Omodero (2019). The average RSF in the Mineral Economy Provinces increased from 3.05 billion in 2017 to 7.57 billion in 2022, alongside a rise in average economic growth from 4.6 percent to 7.3 percent. Through RSF, local governments can finance infrastructure development such as roads, bridges, and other public facilities. This infrastructure boosts productivity and economic activity in the region, making effective management of RSF a critical factor in supporting regional economic development and contributing to increased Gross Domestic Regional Product (GDRP).

The results of the estimation indicate that investment can encourage economic growth (Omri et al., 2014; Abdouli & Hammami, 2020; Khan et al., 2019; Lateef et al., 2021; and Malik, 2021). Investment is a critical driver of economic growth as it boosts production capital, increasing the capacity for goods and services. Investment also creates jobs, providing employment opportunities that reduce poverty and improve living standards. Additionally, investment fosters technological innovation by funding research and development, creating new technologies and more efficient production processes. This technological advancement can further enhance productivity and sustainability, contributing to long-term economic growth and development.

The Mineral Economy Provinces have a relatively low population density, with the total population increasing from 48 million in 2017 to 56 million in 2022. In this model, the population variable significantly and positively impacts economic growth. This result is evident as the population in the Mineral Economy Provinces shows a yearly increasing trend, accompanied by economic growth. Population growth can boost economic growth, aligning with Adam Smith's classical growth theory, which suggests that an increasing population enhances the labor force. With more people working, total economic output rises, contributing to economic growth. According to Keynesian market demand theory, a growing population means a higher demand for goods and services, which stimulates increased production and investment.

The average economic growth in the Mineral Economy Provinces from 2017 to 2022 is 2.39% per year, with varying growth trends. In this model, the economic growth variable has a significant and negative impact, indicating that economic growth contributes to a decline in environmental quality. Economic growth contributes to the decline in environmental quality (Malik, 2021; Abdouli & Hammami, 2020; Khan et al., 2019; Lateef et al., 2021). According to the theory of externalities, one party's production or consumption activities can impose costs or harm on third parties who are not involved in those activities. For example, mining waste can contaminate local water sources and soil, negatively affecting drinking water quality and damaging aquatic ecosystems. The mining process, which produces dust and harmful gas emissions, can cause respiratory diseases among nearby communities.

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Theoretically, energy consumption negatively affects environmental quality, but in this model, energy consumption does not significantly impact environmental quality. Previous studies, such as those by Azlina et al. (2014) and Salahuddin et al. (2015), have found similar results, indicating that electricity consumption in developing countries and GCC nations does not significantly affect environmental degradation or CO2 emissions. In the Mineral Economy Provinces, increased electricity consumption only sometimes has a negative effect on environmental quality due to relatively low electricity consumption, extensive forest areas, and few coal-fired power plants (PLTUs), which help maintain good air quality.

Mining in the Mineral Economy Province contributes to a decline in the environmental quality of the Mineral Economy Province. These findings are consistent with the research of Jurakulov (2023), Jamin et al. (2023), and Li et al. (2024), which examined the relationship between mining and environmental degradation. Mining often requires extensive land clearing, leading to habitat loss for flora and fauna. Waste, including heavy metals like mercury, arsenic, and cadmium, contaminates nearby water sources, damaging ecosystems. Additionally, mining generates dust and harmful gas emissions and causes severe soil degradation and erosion, rendering land infertile. Despite its economic benefits, mining substantially negatively impacts the environment and public health.

Indonesia's forest area is approximately 125.76 million hectares, covering 62.97% of the country's land area. Regression results indicate that forest area has a statistically positive effect on environmental quality. A reduction in forest area also leads to a decline in environmental quality. This result is evident as the forest area from 2017 to 2022 in the Mineral Economy Provinces did not experience significant changes, and the Environmental Quality Index (EQI) remained stable during this period. Forest area significantly impacts environmental quality because it is one of the indicators in the EQI, alongside air, water, and soil quality. Forests directly reduce air pollution, as noted in the study by (Azwardi et al., 2021) Azwardi et al. (2021), since forests act as carbon sinks and air pollutant filters, contributing to air quality. This condition is reflected in the Air Quality Index (AQI) in the Mineral Economy Provinces, which ranges from 80 to 90, indicating that air quality remains well-maintained.

CONCLUSION

This model significantly influences economic growth through the environmental quality index, revenue-sharing funds, investment, and population. All these factors substantially enhance economic growth as each plays a crucial role in driving economic activity and productivity. Sustainable environments prevent the depletion of natural resources crucial for the economy while revenue-sharing funds enable infrastructure development that enhances logistical efficiency and local economic capacity. Investment increases production capital, creates jobs, and promotes technological innovation, while population growth provides a more significant labor force and expands market demand.

In the environmental quality index (EQI) model, the Environmental Quality Index (EQI) is significantly influenced by Gross Regional Domestic Product (Y), mining output,

and forest. Forest area enhances EQI by serving as a carbon sink, boosting biodiversity, controlling soil erosion, and regulating the hydrological cycle, all crucial for maintaining environmental quality. GDRB, while contributing to economic growth, often reduces EQI because rapid economic growth can lead to excessive natural resource exploitation, increased pollution, and environmental degradation. Mining output also lowers EQI because mining activities often result in deforestation, water and soil pollution, and harmful gas emissions that damage ecosystems and public health. Therefore, while GDRB and mining are essential for economic growth, they negatively impact environmental quality if not properly managed.

The research findings reveal that a good environment can boost economic growth, while economic growth can deteriorate environmental quality. Therefore, in the future, to enhance economic growth while maintaining the environment, the government needs to formulate sustainable policies, such as improving forests through reforestation programs and protecting forests from illegal activities. Moreover, sustainable mining practices and land restoration of former mining sites are crucial. Strict regulations and monitoring of environmental violations must be strengthened, with incentives for environmentally friendly practices and penalties for violators. Finally, investment in green technologies, such as renewable energy and energy efficiency, should be encouraged.

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Interaction of Climate Change and Green Stocks on Economic Growth in ASEAN-5

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ABSTRACT

Research Originality: This study presents a new interaction of climate change in moderating the effect of green stocks, exchange rates, and net exports on economic growth in ASEAN-5 countries.

Research Objectives: This study aims to analyze the interaction of climate change on green stocks, exchange rates, and net exports on economic growth in ASEAN-5 countries.

Research Methods: This study used quarterly panel data from ASEAN-5 countries, 2016-2022, and selected a fixed effects model as the best model. The moderated regression analysis (MRA) approach supports this research.

Empirical Results: The results showed that green stocks, exchange rates, and net exports positively affect economic growth in ASEAN-5 countries. The interaction of climate change on green stocks and exchange rates has a negative effect on economic growth. However, the interaction of climate change on net exports positively affects economic growth in ASEAN-5 countries. It represents that climate change can weaken the effect of green stocks and exchange rates on economic growth. Meanwhile, climate change can strengthen the effect of net exports on economic growth in ASEAN-5 countries.

Implications: This study implies that the government needs to increase investment in green stocks to support financing that can mitigate climate change and develop net exports to increase economic growth toward a green economy.

Keywords:

green stocks; exchange rate; net exports; climate change; economic growth

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INTRODUCTION

Economic growth is considered an indicator that can measure the success of a country's development. The indicator measures how much people's economic activity creates income in a certain period (Hanifah, 2022). The capital induces economic growth by facilitating resources for increased productivity. The development of technology and information can also increase productivity, thus allowing the world economy to enter the era of globalization (Pradhan et al., 2017). The significant decline in economic growth due to the pandemic positively impacts the digital economy in Southeast Asia. Changes can also influence economic growth in each country in terms of natural conditions (Ottmar et al., 2014). As the cycle of economic growth and technological advancement improves living standards, the demand for natural resources and energy increases. However, as long as energy comes from fossil fuels that produce carbon emissions, the concentration of carbon dioxide in the atmosphere and other greenhouse gases will increase, and climate damage will worsen (Rezai et al., 2018).

Each ASEAN country carries out many economic activities to increase economic growth. The start of economic activity, in the form of investment, is an essential supporting factor in improving the production process (Skärin et al., 2022). Investment is also an aspect to encourage long-term economic growth (Aničić et al., 2020). As part of the capital market, the stock market mobilizes funds to meet the private sector's investment needs. It helps countries achieve the Sustainable Development Goals by 2030.

This research focuses on these 5 ASEAN countries because they have a stock index that includes green stocks from environmentally friendly publicly listed companies and are among the best-performing stocks amid the global crisis (CNBC Indonesia, 2021). The five ASEAN countries (Indonesia, Thailand, Vietnam, Singapore, and Malaysia) have rapidly growing ESG (environmental, Social, and Good Governance) based green stocks that affect economic growth in ASEAN-5 countries. Many foreign investors have invested significant amounts in companies in ASEAN-5 countries. It integrates the world's capital markets so that these activities can increase economic growth. Figure 1 shows the economic growth in ASEAN-5 countries from 2011 to 2022.

Based on Figure 1, economic growth is one of the crucial indicators that every country should consider (Zhu et al., 2022). The highest peak of economic growth was in 2012, and the trend of economic growth decreased the following year. Based on World Bank data, ASEAN-5's economic growth experienced a fluctuating trend from 2011 to 2022. The economic growth decreased due to significant climate change and the global crisis due to the COVID-19 pandemic in 2020, resulting in negative economic growth of -3.3 % (Asian Development Bank, 2020). In Figure 1, it can be seen that the five ASEAN countries experienced a drastic economic decline to minus. Climate change also seriously affects ASEAN's economic growth (Naeem et al., 2021).

Climate change occurs due to increased carbon dioxide (Co2), disrupting economic activity (Singh et al., 2023). Developing countries are more vulnerable to the impacts of climate change due to the shifting role of agriculture and natural resources in the

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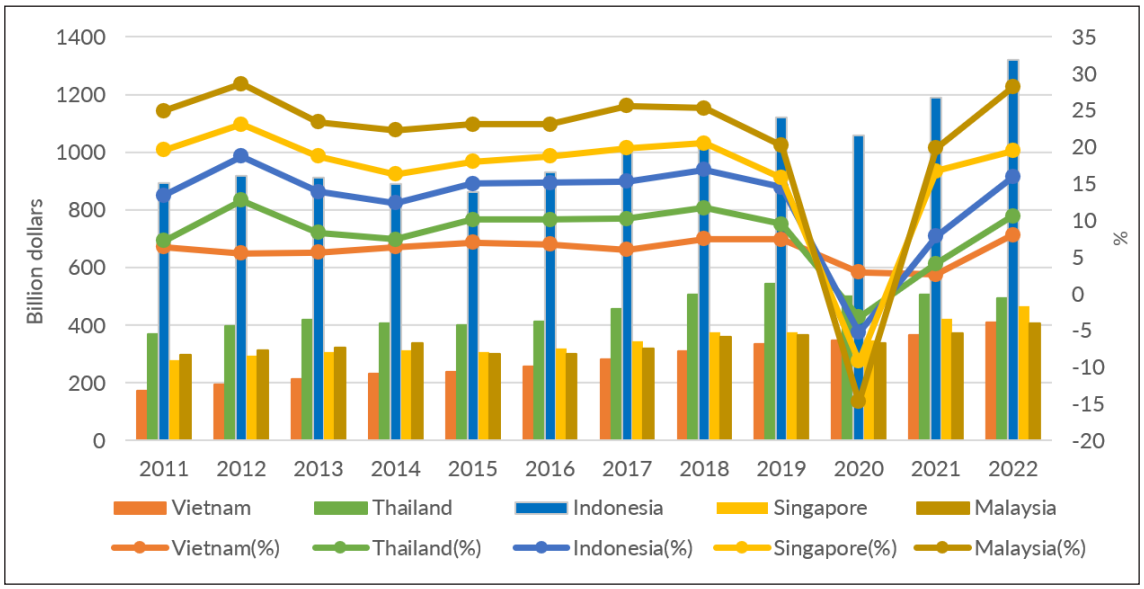
economy (Sakuntala et al., 2022). Economic growth in ASEAN-5 countries can increase with good capitalization amid unstable natural conditions. Capitalization is obtained through green stock markets that encourage a low-carbon economy. However, government efforts to encourage the development of green industries through green investment in ASEAN-5 countries are working. The main barrier to green investment is the high cost of financing to develop the industry (Suriani et al., 2023). Several aspects become obstacles to implementing the green industry, including the domestic industry, which still needs to catch up in research and technology, and the machines used still need to be more efficient, resulting in a lot of waste and high pollution. Costly financing is needed to transition to green industry development; limited human resources and green industry incentives are needed. Transitioning to a low-carbon economy requires significant financial funding to several environmentally friendly sectors. As a result, climate change can directly affect the stock price indices of ASEAN-5 countries in the long run.

Figure 1. Gross Domestic Product (in Billion Dollars) and GDP Growth (in %) of ASEAN-5 Countries for the Period 2011-2022



The Paris Agreement in December 2015 committed governments worldwide to work together to preserve and protect the earth from the catastrophic impacts of climate change (Kussul et al., 2020). Developing countries are more vulnerable to the impacts of climate change due to the shifting role of agriculture and natural resources in the economy (Sakuntala et al., 2022). Over decades, ongoing climate change will decrease profitability and investment enough to reduce output to sustainable levels where emissions and climate change stabilize (Rezai et al., 2018). Based on the ASEAN-5 stock exchanges, the development of green stocks in these five ASEAN countries has increased significantly. Green stocks have an average increase in shares in 2021. Climate change is highest in 2019 in all five ASEAN countries. The development of green stocks has been able to catch up with each country's composite stock price index. Climate change has evidence

of unidirectional causality, from economic growth to renewable energy consumption in the short term (Kalkuhl & Wenz, 2020).

However, the performance of the green stock index shows a trend of high volatility. According to Chen (2012), low-carbon economic transformation can be realized through the green economy. The key to achieving a low-carbon economy is using every transaction with green finance (Otek Ntsama et al., 2021). Some of these events explain that green assets are also sensitive to shocks from abroad and within the country (Pauliuk & Müller, 2014). Empirical results from mentioned that the volatility of stock price indices in emerging markets is higher than in more developed markets. It suggests that green stocks can increase productivity, efficiency, and innovation across all sectors of the economy (Sakuntala et al., 2022).

It is not only investment in the form of stocks that can affect the economic growth of ASEAN-5 countries. Exchange rate movements can also affect economic growth (Mahmoodi & Mahmoodi, 2016). Exchange rates are important for economic growth but depend on the country's economic development level (Obansa et al., 2013). A strengthening exchange rate indicates that performance in the money market is improving. Fluctuations in the exchange rate affect foreign investment, the amount of imports and exports, and the ability to repay foreign debt. Exchange rate movements also influence the increase in people's purchasing power and employment (Suriani et al., 2021). If the exchange rate weakens, it will increase the price of goods, so purchasing power and unemployment will decrease (Hien et al., 2020).

This exchange rate instability will result in lower economic growth (Olamide et al., 2022). Meanwhile, for industrialized countries with complete markets and more stable financial markets, real and financial shocks can be better managed so that economic growth rates are less dependent on the choice of exchange rate regime (AbuDalu, 2014). However, a more flexible exchange rate regime may allow the economy to make the necessary adjustments more quickly. On the other hand, a more flexible regime is weakly associated with slightly higher growth rates (Ilzetzki et al., 2021). Therefore, exchange rate movements play an essential role in describing the economic conditions of each ASEAN-5 country. It also makes economic growth unstable to minus in 2020. Therefore, it is necessary to intervene so that economic activity can increase economic growth in the five ASEAN countries.

Economic growth can be increased through trade between countries. ASEAN-5 countries a country that adheres to an open economy system (Keiko Hubbansyah & Wurdaningsih, 2019). Conduct trade activities between countries to meet their needs. Net exports are a measure of the achievement of effective trade. Changes in the value of net exports also impact economic growth (Pangestin et al., 2021). Economic activities in international trade are carried out to improve the economy. Each country needs and complements each other. Moreover, the ASEAN-5 countries have cooperated closely since 1967, when the Bangkok Declaration was authorized. This cooperative relationship is carried out in various forms, including trade between ASEAN-5 countries. International trade assessed by net exports continues to experience significant ups and

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downs, so any increase in the value of net exports can increase economic growth (Arteaga et al., 2020).

Import-export activities in ASEAN-5 countries have increased and decreased. In 2020, the value of net exports experienced a significant decline due to the global crisis. During the crisis, the purchasing power of European countries and the United States, the main export destinations for ASEAN-5 member countries, generally decreased. When a crisis occurs, to reduce losses on the trade balance, it is necessary to diversify export products and destination countries (Amir et al., 2020). Increased geographical spread intensity and frequency due to extreme weather conditions (Hochman et al., 2022). This climate change risks international trade, such as infrastructure and transportation. These climate changes originate outside the economic and financial system but impact the smooth flow of trade (Singh et al., 2023). Reducing climate change risk is hampered by the need for large capital costs in the renewable energy economy (Liu & Lai, 2021). The cost of capital is obtained from green stocks whose investment activities provide opportunities to promote sustainable economic growth. In addition, the exchange rate and international trade, as seen from net exports, have decreased in 2020 and are very low compared to countries worldwide.

The problems of economic growth in ASEAN-5 can be seen from the problems that occur at this time and the results of several previous studies discuss about climate change like Hardi et al. (2023) through greenhouse studies with FMOLS modeling and DOLS. Research by Nasir et al. (2019) shows the results of economic growth, financial development and FDI lead to increased environmental degradation. While research Sakuntala et al. (2022), monetary policy and global uncertainty affect green stocks using the ADRL model. Research by Ntsama et al. (2021), Ning et al. (2023), Naeem et al. (2021), and Zhao et al. (2022) analyzes the various climate change challenges that can be addressed through green bond financing. Research Martini (2021), The lack of a globally accepted taxonomy of a sustainable economy has led to a decline in green investment. Furthermore, research Abudalu (2014) and Zhu et al. (2022) stated that the exchange rate and net exports affect economic growth. In addition, to the best of the researchers' knowledge, none of the previous studies found climate change as a moderating influence of green stocks, exchange rates, and net exports on economic growth in ASEAN-5 countries, using panel data regression with moderation models. Therefore, this study has a novelty that aims to fill the gap in the previous literature and wants to prove how much influence green stocks, exchange rates, and net exports have on economic growth in ASEAN-5 countries with green stocks.

Based on the description of these problems, it can be concluded that research that combines green stocks, exchange rates, net exports, and climate change has never been conducted. Climate change can disrupt the balance of the economy. There is a need for new policies in the economy so that economic growth does not decline dramatically due to natural factors. Technological development can open up investment opportunities to encourage sustainable economic growth through green stocks, exchange rates, and net exports. It is urgent to research what policies are appropriate to suppress the interaction of climate change impacts on the influence of green stocks, exchange rates, and net exports

on economic growth. This research wants to prove empirically that green investment through green stocks has a crucial role in developing environmentally friendly technology to increase sustainable economic growth and prevent environmental damage.

METHODS

This research uses quantitative analysis with secondary data from quarterly and panel data from five ASEAN countries from 2016-2022. The data used secondary data from each country's World Bank and the Stock Exchange. Stock data for Indonesia (SRI-KEHATI Index), Thailand (SETI Index), Vietnam (VNSI Index), Singapore (iEdge SG ESG Leaders Index), and Malaysia (FTSE4 good Index).

The scope of this study includes the dependent variable, economic growth, while the independent variables consist of green stocks, exchange rates, and net exports. The relationship between the independent and dependent variables is moderated by climate change. Climate change can lead to climate variability, where significant variations in weather variables and their frequency impact economic growth. This is why researchers chose climate change variables as interventions in this study. Climate change is proxied to carbon emissions. Indonesia, Thailand, Vietnam, Singapore, and Malaysia are the five ASEAN countries that are the object of research because these five countries have growing green stocks and are based on ESG (Environment, Social, and Good governance).

The data analysis method in the research is the data regression analysis method. Data regression on regression techniques that use each panel data. The purpose of panel data analysis is to identify differences in characteristics between individuals in several periods studied (Zhao et al., 2017). The advantage of panel data regression is that the results are better than regressions using cross-intercept or time series data (Kim et al., 2016). The regression model equation (see equation 1) can be formulated in the following model:

$$Y_{it} = \alpha_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_{it} \quad (1)$$

To explain the variables to be studied, it can be written as follows:

$$GDP_{it} = \alpha_0 + \beta_1 \log(GS)_{it} + \beta_2 ER_{it} + \beta_3 NE_{it} \ \varepsilon_{it} \quad (2)$$

Where *GDP* is the value of gross domestic product, *GS* is the value of green stock, ER is the value of the exchange rate, NE is the value of net export, β_1 is constant; ε_t is Error Correction Term.

The data in this study, green stocks, are converted in logarithm form to interpret the parameters appropriately. The use of logarithms in this study is to reduce excessive data fluctuations when analyzing and using panel data regression, the first step is to determine which model is best for the data analysis. The best model selection in the panel data regression test consists of three elections.

The interaction test, also called Moderated Regression Analysis (MRA), is a unique application of linear multiple regression where the regression equation contains an element of interaction (multiplication of two or more independent variables). Moderating variables affect the direct relationship between the independent and dependent variables (Namazi &

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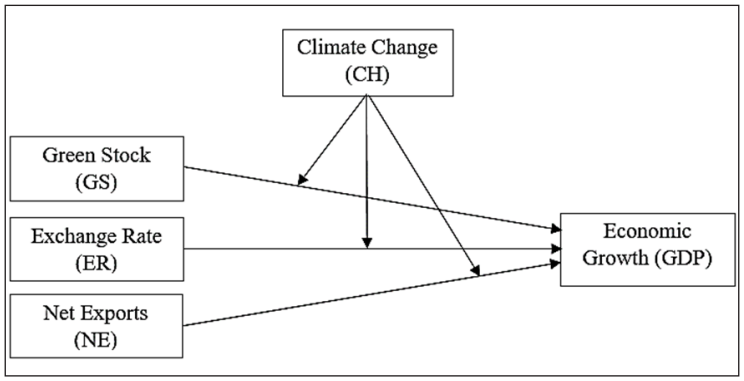
Namazi, 2016). This influence can strengthen or weaken the direct relationship between the independent and dependent variables. Moderating variables can also cause the nature or relationship between the independent and dependent variables to be positive or negative. The research framework for discussing the moderation effect is as follows:

Figure 2. Research Framework



Similarly, the consistency of intervention effects across subgroups supports generalizing interventions as to whether these moderating variables can strengthen or weaken the interaction between the independent and dependent variables in a study. However, the statistical visualization differs from how it is conceptualized in the model graphically as it includes interaction terms depicted by X*Z (Katircioğlu & Taşpinar, 2017).

The following is a moderation model equation that will be used in the panel data regression approach with the equation that is:

$$Y_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \beta_3 X_{it} * Z_{it} + \varepsilon_{it} \quad (3)$$

To explain the variables of economic growth, green stocks, exchange rate, and net exports moderated by climate change (Equation 3) in this study as follows:

$$GDP_{it} = \alpha_0 + \beta_1 GS_{it} + \beta_2 ER_{it} + \beta_3 NE_{it} + \beta_4 CH_{it} + \beta_5 CH * GS_{it} + \beta_6 CH * ER_{it} + \beta_7 CH * NE_{it} + \varepsilon_{it} \quad (4)$$

A classic assumption test is needed to get consistent estimation results. A regression model is usually called a perfect model if it has a model that can meet a BLUE (Best Linear Estimator) criterion. To achieve these criteria, it must fulfill each Classical Assumption test.

RESULTS AND DISCUSSION

The results of this study are based on data analysis carried out using panel data regression analysis methods and interaction tests. Partial research results show that green stocks, exchange rates, and net exports positively and significantly affect economic growth in ASEAN-5. The climate change interaction test results on green stocks and exchange rates negatively and significantly affect economic growth in ASEAN-5 countries. Meanwhile, the climate change interaction test on net exports has a positive and significant effect on economic growth in ASEAN-5 countries.

The results of this study show that climate change has a major impact on the economy. It is important to reduce the impact of climate change with effective financing so that natural factors cannot disrupt the balance of the economy. Climate change adaptation is inevitable, especially in developing countries where the adaptation deficit is often larger than in developed countries. Reducing the impact of climate change damages on financial asset prices and financial positions can stabilize exchange rates and add value to net exports through a sustainable economy. Sustainable economic growth is costly to finance, so green equity investment can help with government spending. Therefore, there is a need for new economic policies so that economic growth does not decline dramatically due to natural factors. The following are some of the testing stages in this study.

Descriptive statistics are used to explain or present an overview of the characteristics of a series of data without drawing general conclusions. Descriptive statistics are only related to describing or providing information about data and the state of the phenomenon; in other words, they only see an overview of the data obtained. Descriptive statistics in this study are present in the form of average, middle data, maximum data, minimum data, standard deviation, and number of observations for each variable. This study uses real GDP variables, green stocks, exchange rates, net exports, and climate change. This study uses data from 2016-2022 in quarterly form. The following are the results of descriptive statistical tests in Table 1 for this study.

Table 1. Descriptive Statistics

	Log(GDP)	GS	ER	NE	CH
Mean	132.3154	856.5092	7445.837	86.01700	69.03464
Median	100.3684	830.2600	32.88000	71.18500	63.83000
Maximum	342.1875	1776.260	23855.00	222.9820	152.0185
Minimum	64.27500	284.8700	1.310700	41.22531	9.814453
Std. Dev.	74.44062	445.6413	9561.105	44.95216	40.48040
Observations	140	140	140	140	140

Based on Table 1, the results of descriptive statistics show that the amount of data used in this study with each variable amounted to 140 observations. The descriptive statistical analysis results mean (average) economic growth using real GDP per quarter of 132,315 billion. The results of descriptive statistical analysis of green stocks in 140 data samples. Green stocks have an average data value (mean) of 856,509 points. This green stock was developed to provide additional funds to encourage a sustainable economy—green stocks as green financing to reduce climate change that can worsen economic conditions in ASEAN-5 countries. Exchange rates in the five ASEAN countries have an average of 7445.837 (LCU) per US dollar. According to the data, exchange rates continue to appreciate and depreciate against the US dollar. Exchange rate conditions are very important to pay attention to to stabilize economic growth.

In this study, international trade uses the net export indicator. The high and low amount of net exports depends on the economic needs of a country and the economic

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policies implemented to increase economic growth. Climate change is an unbalanced natural condition due to global warming that occurs. The descriptive statistical analysis results of climate change have an average of 69.0346 thousand metrics per ton. This climate change greatly disrupts any economic activity that runs inefficiently. Therefore, there is a need for green financing to suppress these climate changes so that sustainable economic growth can be achieved. Overall, the standard deviation calculation is smaller than the average data value, indicating that the data is evenly distributed.

The best model selection in panel data is tested with three estimation approaches: the Common Effect Model, Fixed Effect Model, and Random Effect Model. The results of the CEM, FEM, and REM tests to determine the best technique of the three estimates, the Chow test, Hausman test, and Lagrange multiplier test, were conducted.

Table 2. Best Model Test Results

	Test	Prob.	Description
Chow Test	Prob. Cross-section F	0.0000***	Selected FEM
Hausman Test	Prob. Cross-section Random	0.0000***	Selected FEM
Lagrange Multiplier Test	Prob. Breusch-Pagan cross-section	0.0000***	Selected REM

Note: Significance at α 1%(***).

Based on Table 2, the tests carried out include the Chow, Hausman, and Lagrange multiplier tests. The FEM model was selected twice, the REM model was selected only once, and the CEM model was not selected as the best model. Therefore, it can be concluded that the FEM model was chosen as the best model for interpreting panel data regression in this study.

Panel data regression estimation is used to analyze this study and provide information. This panel data regression is conducted to examine 5 ASEAN countries that have green stocks for sustainable economic financing. This study wants to analyze and see the effect of green stocks, exchange rates, and net exports on economic growth in ASEAN-5 countries. The best model selected in Table 2 showed that the Chow Test, Hausman Test, and Lagrange Multiplier Test is the fixed effect model (FEM). Hence, the panel data regression test results are shown in Table 3 and will analysis in this discussion just for the FEM result.

The estimation results in Table 3 show that green stocks positively and significantly influence economic growth in ASEAN-5 countries. Green stocks have a regression coefficient of 11.6911 and a probability of 0.0189 <0.05. This shows that green stocks are essential in increasing economic growth in ASEAN-5 countries. Green stocks are developed to provide additional funds to encourage a sustainable economy. Green stocks are green financing to reduce climate change that can worsen economic conditions in ASEAN-5 countries. This study's results align with Asid et al. (2014) and Martini (2021), which show that investment can increase economic growth.

In addition, Table 3 shows that the exchange rate has a positive and significant effect on economic growth. These results show that the exchange rate increases by 1

LCU per US dollar, which can increase economic growth by 0.0171 billion dollars. A stable exchange rate will increase the economy. In line with research, Abudalu (2014) and Zhu et al. (2022) show that exchange rates can affect the economy. This means that the exchange rate is very influential on economic activity (Olamide et al., 2022).

Table 3. Panel Data Regression Estimation Results

Variable	CEM	FEM	REM
C	92.8551	-125.0795	92.8551
	(0.0093)***	(0.0004)***	(0.0000)***
Log(GS)	-26.9766	11.6911	-26.9766
	(0.0000)***	(0.0189)**	(0.0000)***
ER	-0.0024	0.017055	-0.00243
	(0.0000)***	(0.0000)***	(0.0000)***
NE	0.8481	0.6174	0.8481
	(0.0000)***	(0.0000)***	(0.0000)***
R-Squared	0.920983	0.983937	0.920983
Adj. R-Squared	0.918642	0.983085	0.918642
F-stat	393.3756	1155.076	393.3756

Note: Significance at 1%(***), 5%(**).

Meanwhile, net exports positively and significantly affect economic growth in ASEAN-5 countries. International trade makes countries interact with each other to meet their needs so that these activities can increase economic growth (Seto, 2022). The value of net exports can decrease due to environmental damage, which can impact the economy (Febriyatari et al., 2019). The coefficient of the independent variable partially illustrates a significant effect on the dependent variable. Each variable has an important role in economic growth in each country. Green stocks, exchange rates, and net exports positively and significantly affect economic growth in ASEAN-5 countries.

The result of estimating that green stocks support the theory of economic growth that emphasizes growth theory, which emphasizes increasing technological innovation, is also supported by Nasir et al. (2019) and Pertiwi et al. (2020) explained that foreign investment affects the economy of ASEAN countries. Foreign investment affects the economies of ASEAN countries. The existence of technological innovation technology in the form of a green stock market based on ESG to make companies producing goods and services still pay attention to the economy of ASEAN countries. Companies that produce goods and services still pay attention to environmental balance. Economic growth in ASEAN-5 countries can improve by paying attention to environmental sustainability so that the productivity of natural resources is also not disturbed. If resources do not work efficiently, the economy in ASEAN-5 countries can worsen. ASEAN-5 countries.

This suggests the importance of a sustainable economy in enhancing economic growth. Mitigating climate change requires significant financial resources. Climate change can strain the economy and reduce foreign exchange reserves, especially in developing

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countries. Investments through green stocks can be used to help government finances. In addition, climate change also impacts exchange rates. An economy's vulnerability to climate change reduces investor confidence, leading to a decline in the exchange rate. A country investing in green technology and renewable energy gains a competitive advantage. This can attract foreign investment, strengthen the exchange rate, and increase international trade so that the country's net exports increase.

The interaction test (Moderated Regression Analysis/MRA) was conducted in this study to test and analyze the role of climate change in moderating the effect of green stocks, exchange rates, and net exports on economic growth in ASEAN-5 countries. The effect of climate change can strengthen or weaken the direct relationship between the independent and dependent variables.

The results of the interaction test conducted using climate change as a moderating variable can be seen in Table 4. Partially, the interaction test results show that green stocks (GS), exchange rates (ER), net exports (NE), climate change (CH), the interaction of climate change on green stocks, exchange rates, and net exports have a significant effect on economic growth in ASEAN-5 countries. Climate change as a moderating variable has a coefficient of 1.564 with a probability of 0.00 <0.05, stating that climate change positively and significantly affects economic growth in ASEAN-5. The importance of appropriate policies for more inclusive economic and financial development and sustainable foreign direct investment that does not impact the environment (Nasir et al., 2019)this paper attempts to shed light on the ecological consequences (CO2 emission. Contrary to research, Shahbaz et al. (2018)financial development, economic growth, energy consumption and energy research innovations in influencing CO2 emissions function. In this endeavour, we employ the novel SOR (Shahbaz et al. 2017 showed that economic growth and CO2 emissions have an inverse relationship, validating the environmental Kuznets curve (EKC).

Green stocks have a positive and significant effect on economic growth. Meanwhile, when climate change interacts with green stocks, the coefficient is -77.3574, and the probability is 0.001 <0.05. These results explain that the interaction between climate change and green stocks has a negative and significant effect. This interprets the importance of green financing through green stocks to increase economic growth. Research Pertiwi et al. (2020) state that financial risk reflected in the monetary economy can affect foreign investment in ASEAN countries. Research by Otek et al. (2021), Ning et al. (2023), Naeem et al. (2021), and Zhao et al. (2022) analyzed various climate change challenges that can be addressed through green bond financing.

It is also interpreted that climate change can weaken the effect of green stocks on economic growth. Climate change can disrupt the movement of green stocks, impacting economic growth. Research by Nasir et al. (2019) shows that economic growth, financial development, and FDI lead to increased environmental degradation. In comparison, research by Sakuntala et al. (2022), monetary policy and global uncertainty affect green stocks using the ADRL model. Hammoudeh et al. (2020) examined the time-varying causal relationship between green financing and conventional US financing, showing the critical role of green financing for the environment.

Table 4. Interaction Test Results (MRA)

Variable	coefficient	std. Error	t-Statistics	Prob.
C	215.8756	93.29414	2.313924	0.0223**
Log(GS)	71.82542	23.45886	3.061761	0.0027***
ER	0.017231	0.002783	6.191697	0.0000***
NE	0.185390	0.058040	3.194208	0.0018***
CH	1.564014	0.303384	5.155234	0.0000***
Log(CH*GS)	-77.35742	22.90375	-3.377499	0.0010***
CH*ER	-8.270555	1.720555	-4.801542	0.0000***
CH*NE	0.014659	0.001171	12.52020	0.0000***

Note: Significance at 1%(***), 5%(**).

Furthermore, in this estimation, the exchange rate has a significant positive effect on economic growth. In line with Research, Yensu et al. (2022) found a causal relationship between exchange rates and economic growth in nine European countries. When there is a moderating variable of climate change, the exchange rate has a negative and significant effect. This means that the moderating variable of climate change weakens the effect of exchange rates on economic growth in ASEAN-5. The emergence of climate change will cause exchange rates in the five ASEAN countries to weaken due to a decrease in currency value.

This condition will worsen the economy in ASEAN-5 countries. Research by Ribeiro et al. (2020) found that the causality relationship between exchange rates and economic growth is opposite or negative. If there is a disturbance from the environment, it will also impact the exchange rate's stability. The results of the interaction test in Table 4 show that net exports have a positive and significant effect. When there is an interaction between climate change and net exports, the coefficient is 0.01465, and the probability is 0.00 <0.005.

The interaction between climate change and net exports interprets that climate change can strengthen the effect of net exports on economic growth. Increased economic growth occurs during climate change because the international trade process increases (Arteaga et al., 2020). When each country tries to suppress climate change but must meet the survival needs, countries that do not supply raw materials due to extreme climate change will have international trade to increase the value of net exports (Dritsaki & Stiakakis, 2014). When net exports increase, ASEAN-5 countries' economic growth continues to increase. Trade positively impacts economic growth in developed and developing countries (Were, 2015). Research results Shahbaz et al. (2013) showed that the South African economy can maintain economic growth by controlling the environment from damage through efficient energy use. Therefore, climate change is very disruptive to the economic system.

The results of this study are based on data analysis that has been carried out using panel data regression analysis methods and interaction tests. Each variable interacts with

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each other so that the growth of non-performing loans can be controlled. This represents the ability of investors to invest their capital through the capital market, which is not only influenced by the global crisis. Climate change in the environment also affects the stock market in ASEAN-5 countries (Oloko et al., 2022). These changes stem from rising temperatures and greenhouse gas emissions, leading to rising sea levels (Perry, 2016). Exchange rates and net exports can also affect the economy (Aminda et al., 2023) If the exchange rate and net exports are disturbed by environmental factors, this can have a major impact on climate change, which influences and contributes to economic growth. Addressing climate change issues through green innovation and investment can improve the competitiveness of net exports, while a stable exchange rate will support trade sector growth. Integrated and sustainable policies are essential to maximize the potential for sustainable economic growth.

The results of this study's partial estimation and interaction test show that green stocks, exchange rates, and net exports positively and significantly affect economic growth in ASEAN-5 countries. The results of the interaction effect (moderation) of climate change on green stocks, exchange rates, and net exports also significantly affect economic growth in ASEAN-5 countries. The climate change condition causes the independent variable's role to weaken its influence on the dependent variable. Climate change is a major problem in the balance of environmental ecosystems that can affect economic growth in each country.

CONCLUSION

Based on the research conducted to determine the interaction of climate change on the effect of green stocks, exchange rates, and net exports on economic growth in ASEAN-5. Partial results showed that green stocks, exchange rates, and net exports positively and significantly affect economic growth in ASEAN-5. The climate change moderation test results on green stocks and exchange rates have a negative and significant effect on economic growth in ASEAN-5 countries. This indicates that the role of climate change can weaken the interaction relationship between green stocks and exchange rates on economic growth in ASEAN-5 countries. Meanwhile, the moderation test of climate change on net exports has a positive and significant effect on economic growth in ASEAN-5 countries. It shows that the role of climate change can strengthen the interaction relationship between net exports and economic growth in ASEAN-5 countries.

The conclusion from this study's results states that climate change's role is very influential on economic growth. Climate change can trigger innovation and investment in environmentally friendly technology to improve the economy. The existence of financing through investment in green stocks as sustainability in ESG-based economic activities. In addition, there is support from exchange rates and net exports that can quickly increase economic growth in ASEAN-5. However, it is important to remember that the negative impacts of climate change can also threaten economic stability, so effective mitigation and adaptation measures are necessary to maximize the potential for future economic growth. Every company should adopt sustainable practices to reduce energy costs and

improve efficiency. In addition, awareness of the impacts of climate change encourages governments and the private sector to invest in green infrastructure, create new jobs and improve economic competitiveness.

As a stock market monitor, the ASEAN-5 stock exchange market should focus on and enhance green stocks' development to create a sustainable economy. An economy that prioritizes environmental sustainability. As monetary policy controllers, central banks must be wise in making decisions to control exchange rate stability. Also, governments of ASEAN-5 countries must be able to maintain macroeconomic flexibility such as investment, exchange rates, net exports, and climate change, which are very important in resisting external and internal shocks in the economy. Policy recommendations for the government can strengthen nationally determined contribution (NDC) targets to align with the Paris Agreement, ecosystem restoration, and green infrastructure development so that climate change cannot disrupt the balance of the economy.

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Stunting and Baby's Milk: Evidence from Indonesia

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ABSTRACT

Research Originality: This study uniquely examines the relationship between baby milk consumption and stunting rates in Indonesia using a two-stage least squares (2SLS) approach. It fills a gap in understanding why Indonesian consumers prefer sweetened condensed milk over baby formula, despite the increasing prevalence of stunting, offering new insights into the economic and educational factors influencing milk consumption.

Research Objectives: To investigate the factors that influence baby milk consumption in Indonesia, such as milk prices, education levels, and population size. Also, to assess the impact of baby milk consumption on stunting rates among Indonesian children.

Research Methods: The research uses an econometric approach, specifically two-stage least squares (2SLS) regression, analyzing data from 2005 to 2022.

Empirical Results: The results indicate that baby milk consumption is significantly affected by milk prices, education levels, and population size. Interestingly, the study finds that higher consumption of baby milk is correlated with an increase in stunting rates.

Implications: The findings suggest a need for greater parental awareness regarding the nutritional value of baby milk and potential policy interventions to regulate milk quality. Additionally, the results highlight the importance of educational campaigns to improve milk consumption behaviors and further research on the nutritional content of available baby milk products to address the stunting problem effectively.

Keywords:
stunting; baby nutrition; public health; nutritional interventions

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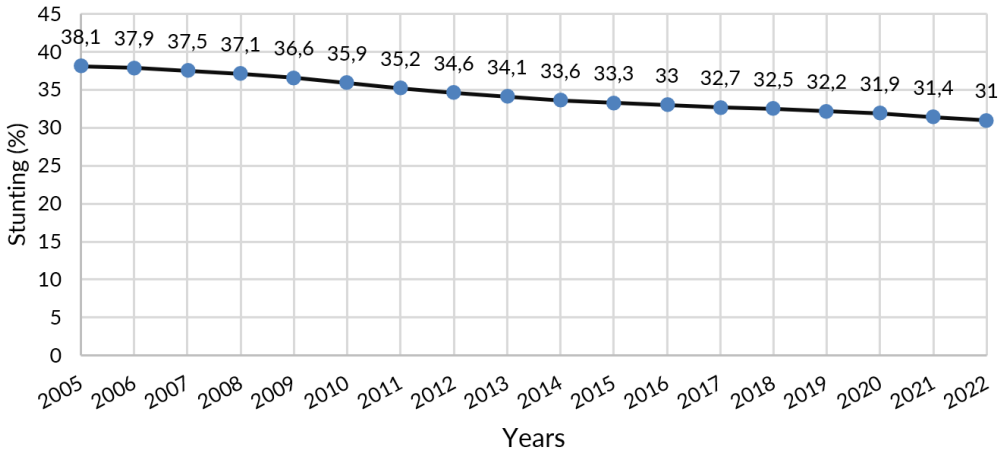
INTRODUCTION

Stunting in children under five is characterized by inadequate height for age, falling below -2 standard deviations from the median of the World Health Organization (WHO) child growth standards (WHO, 2014). This condition has short-term and long-term consequences, including a heightened risk of illness and death in the short-term, while in the long-term stunting could hinder cognitive development and learning abilities, increased susceptibility to infections and non-communicable diseases in later life, and diminished economic productivity (Stewart et al., 2013). The reduction of child stunting is the foremost among the six Global Nutrition Targets set for 2025 by the WHO, and it is a crucial measure in the second Sustainable Development Goal aimed at eradicating hunger (United Nations, 2016). Stunting has been one of the most faced problems in many developing countries, especially in Indonesia. To address this issue, Indonesia's government constructed a plan called "Rancangan Pembangunan Jangka Menengah Nasional 2020 – 2024" (RPJMN) or National Medium-Term Development Plan (Sekretariat Kabinet Republik Indonesia, 2020). But, when referring to data from the World Development Indicators (WDI) (see Figure 1), Indonesia in 2022 recorded the level of stunting by 31% which is still far when compared to the target plan.

Figure 1. Indonesia's Stunting Prevalence (%) (2005 – 2022)



Sources: World Development Indicators (2023)

Overall cause of occurrence stunting can be caused by a lack of nutritional intake and nutrients given for a long time, such as before and after pregnancy (Beal et al., 2018). Knowledge of parenting that is still lacking is also one of the influences of occurrence stunting. Stunting could be tackled by increasing the intake of vitamins, minerals, and protein (Headey et al., 2018). The period between 6 to 24 months is crucial for child development, with the highest incidence of stunting observed during this time. In this phase, children require substantial nutrient intake. However, evidence suggests that the quality and quantity of food consumed by children are often inadequate, particularly following the cessation of exclusive breastfeeding (UNICEF, 2015). Once a baby reaches

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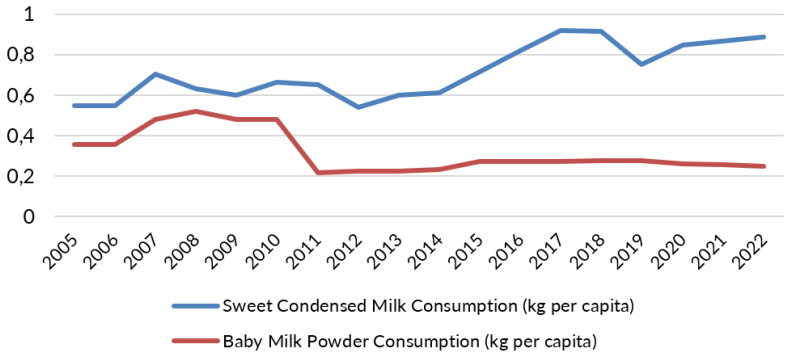
the age of 12 months, breastmilk alone can only meet approximately one-third of the baby's energy requirements (Fikawati et al., 2014). There is also a study that found that toddlers with inadequate protein intake were almost to become stunted compared to children with adequate protein intake (Fikawati et al., 2019, 2021). Therefore, regarding the status of breastfeeding for children, they should eat an adequate amount of animal protein such as eggs, poultry, fish and milk must be eaten as often as possible.

Headey et al. (2018) explained that the consumption of foods sourced from animals has a significant influence on the occurrence of stunting in children. Research has indicated that among various sources of animal protein, milk is one of the most frequently consumed by children daily (Arini et al., 2022). This is because milk is an animal source that contains energy, proteins, amino acids and micronutrients that can stimulate growth compared from other animal-based protein (Haile & Headey, 2023; Semba et al., 2016) in which dairy such as milk is rich in a range of nutrients and hypothesized to improve child growth. Some studies suggest that milk can be beneficial in treating malnutrition (one of many causes of stunting) after birth by improving recovery, nutritional status, and growth (Michaelsen, 2013; Michaelsen et al., 2011), although it may take longer to achieve good nutrition status compared to standard protocols settled by WHO (Fidele et al., 2022). This means milk itself could tackling stunting for children after-birth.

Milk from animal sourced however is not an ideal dietary for children under 2 years because it can causes many digestive problems (Daher et al., 2001). To solve these problems, many companies produce a formulated milk exclusive for baby ranging from 0 – 64 months as a complementary supplementation during a mandatory breastfeeding range (0 – 24 months) up to post breastfeeding (24 – 64 months). However, recently in Indonesia people tend to give their baby more milk products in the form of sweetened condensed milk rather than baby's milk powder for under five children (Juffrie et al., 2020). In fact, sweetened condensed milk is only a complement to the presentation of food or drinks. Not to mention that sweetened condensed milk does not have good nutritional content and mostly contains a lot of sugars. This is evidenced in Figure 2, it can be seen that in the last 17 years the consumption of sweetened condensed milk is higher in Indonesia than the consumption for baby's milk powder.

Figure 2. Consumption of Sweetened Condensed Milk vs. Consumption of Baby Milk Powder



Sources: Central Bureau of Statistics (2023)

In addition to the increased consumption of sweetened condensed milk, the consumption of baby milk powder actually decreased dramatically starting from 2010. Although the term of consumption is general for Indonesia, but this fact proves that many people may still give their toddlers sweetened condensed milk instead of using baby's milk powder. Altough Central Bureau of Statistics indirectly stated that although they also listed baby milk powder as one of several important food ingredients, they also mark sweet condensed milk as one of several important food ingredients which is not good for main consumption due to its lack of nutrients.

Therefore, given the assumption that milk is a crucial factor in preventing stunting, this research addresses the existing gap in the literature by examining the specific factors influencing baby milk consumption in Indonesia and assessing its impact on stunting rates. Previous studies have focused on the benefits of milk consumption and its general impact on child nutrition, but none have explored why Indonesian families often choose sweetened condensed milk over baby milk products, despite the increasing prevalence of stunting. This study offers a novel contribution by using a two-stage least squares (2SLS) regression approach to analyze the effects of baby milk consumption on stunting rates, accounting for unique economic and cultural factors in Indonesia. Specifically, there are two objectives of this research. First, to identify and analyze the key determinants of baby milk consumption, including price, education, and population size; Second, to assess the role of baby milk consumption in reducing stunting among children in Indonesia. These findings are expected to provide critical insights for policymakers and stakeholders aiming to improve child health and nutrition through targeted interventions.

METHODS

The method used in this study is to use econometric techniques two stage least squares (2SLS). Two stage least squares is generally the same as ordinary least squares (OLS) where used in regression analysis extensively, because it is intuitively interesting and mathematically much simpler than the method of maximum likelihood (Gujarati and Porter, 2009). But two stage least squares requires two linear models of a single equation, so it must regress twice.

In measuring milk prices, author use data on the average price of milk powder for toddlers. Then, to measure income we use Indonesia's per capita income data. Furthermore, the population is measured by the number of people in Indonesia. Finally, we measure the level of education by looking at the average length of schooling. The data used are from the period 2005 to 2022, the selection period is based on the availability of the latest data. Table 1 explain about the data summary.

The framework in this study is based on demand theory where demand can be influenced by the price of the goods themselves, then there are non-price factors, namely income and population (Mankiw, 2012). This is reinforced by several previous studies that milk consumption is influenced most significantly by the price of milk itself, per

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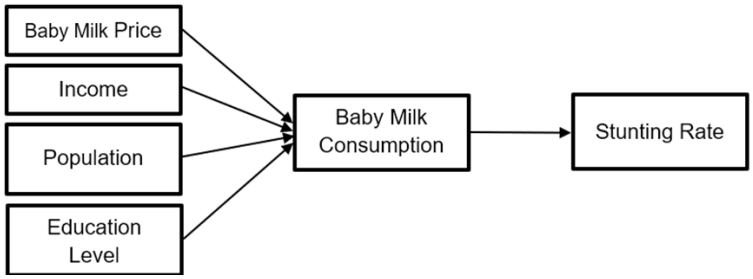
capita income, population and education level (Gulseven, 2018; Handayani et al., 2023; Langi et al., 2024; Tjitrajaya, 2022).

Table 1. Data Summary

No.	Variable Name	Source
1	Indonesian Baby Milk Powder Consumption per Capita per Year (Kg)	Indonesian Central Bureau of Statistics
2	Indonesia's Population Data	World Bank (2023)
3	Stunting Rate in Indonesia	World Development Indicators (2023)
4	Average Price of Baby Milk Powder in Indonesia	Indonesian Central Bureau of Statistics
7	Average Length of School (Years)	Indonesian Central Bureau of Statistics
8	Indonesia's per Capita Income	World Development Indicators (2023)

To achieve the research aims, authors construct a research framework (see Figure 3) to obtain the two stages least squares models.

Figure 3. Research Framework



Source: Authors

According to economic theory, namely demand theory, prices have an important role in influencing demand, especially the demand for baby's milk. An increase in the price of baby's milk will make the demand for baby's milk fall, and conversely if the price of baby's milk falls it will increase the demand for baby's milk, assuming all things are fixed (Mankiw, 2012). In measuring the price, authors use the price of baby's milk itself. Furthermore, income also affects the purchasing power of baby's milk which in this case affects milk consumption. The higher a person's income, the higher the purchasing power of milk so that baby's milk consumption is higher and vice versa. Then there are other factors that affect milk consumption, namely the population, where according to economic theory an increase in population will increase the amount of consumption of daily necessities including milk. Finally, the level of education affects the consumption of milk (Handayani et al., 2023), because high education will affect the choice of consumption in consuming healthy foods and drinks such as giving their children a dense nutrient food like milk.

Thus based on the research framework, 2 linear models were formed related to factors that affect milk consumption, namely:

$$lnBabyMilk_t = \beta_1 + \beta_2 lnY_t + \beta_3 lnPBM_t + \beta_6 lnPop_t + \beta_7 lnSch_t + \varepsilon_t \quad (1)$$

Where, BabyMilk represents the level of consumption of Indonesian baby's milk powder. Then, β_1 is the coefficient of the dependent variable, Y_t is Indonesia's per capita income, PBM is a representation of the average baby's milk price in Indonesia, Pop is the total population of Indonesia, Sch is the average length of schooling, and lastly ε is an error term. Furthermore, to see the relationship between milk consumption and stunting rates in Indonesia, the following model was formed:

$$lnStunting_t = \beta_1 + \beta_2 lnBabyMilk_t + \varepsilon_t \quad (2)$$

Where the Stunting variable represents the stunting rate in Indonesia, β_1 is the coefficient of the dependent variable, BabyMilk is the consumption of Indonesian baby's milk powder and ε_t is an error term. Both models will use variables in the form of natural logarithms so that the interpretation process can easily be done by looking at the elasticity in the relationship of each variables.

RESULTS AND DISCUSSION

Based on the regression results (see Table 2), we found that the significant factors influencing baby milk consumption in Indonesia are baby milk price, the length of schooling, and the size of the Indonesian population. Specifically, baby milk's price has a negative effect on consumption, where a 1% increase in baby milk price could lower baby milk consumption by 1.86%. This highlights the sensitivity of consumers to price changes, suggesting that affordability plays a crucial role in milk purchasing decisions, particularly for low-income families. Also this might be one of the reasons why Indonesia's family choose sweetened condensed milk to feed their babies rather than baby milk itself. In Indonesia, sweetened condensed milk relatively has low price than other type of milks.

On the other hand, there is a positive relationship between the average length of schooling and milk consumption. The results indicate that the higher a person's educational attainment, the more likely they are to invest in baby milk for their children, with a 1% increase in the length of schooling leading to an 8.6% increase in milk consumption. Education appears to play a critical role in shaping awareness of child nutrition and the importance of milk as part of a balanced diet, making it one of the most significant factors influencing baby milk consumption in a positive way.

Furthermore, our findings reveal that population size has a negative relationship with baby milk consumption. Specifically, as Indonesia's population grows, baby milk consumption decreases by 21.6%, an unexpected outcome. This suggests that rising population pressures, particularly in densely populated areas, may limit access to or affordability of baby milk due to strained economic resources. Larger family sizes may also lead parents to prioritize other staple goods, such as rice and eggs, over milk. Additionally, cultural preferences and limited access to quality baby milk products in rural or lower-income areas might exacerbate this trend. The decline in baby milk consumption with increasing population could reflect deeper socio-economic challenges, including income

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inequality and uneven distribution of public health education, which further compound the issue of inadequate milk consumption. Addressing these factors is crucial to ensuring that increased population growth does not continue to negatively impact child nutrition and public health outcomes.

Table 2. Regression Results

Dependent Variable: Baby Milk Consumption		
Independent Variable	**Coefficient**	**Prob.**
Constant	369.5693	0.0000*
Income (lnY)	0.832187	0.7157
Baby Milk Price (lnPBM)	-1.865033	0.0010*
Population (lnPop)	-21.47903	0.0165**
School (lnSch)	8.664887	0.0000*
R-squared = 0.898341		

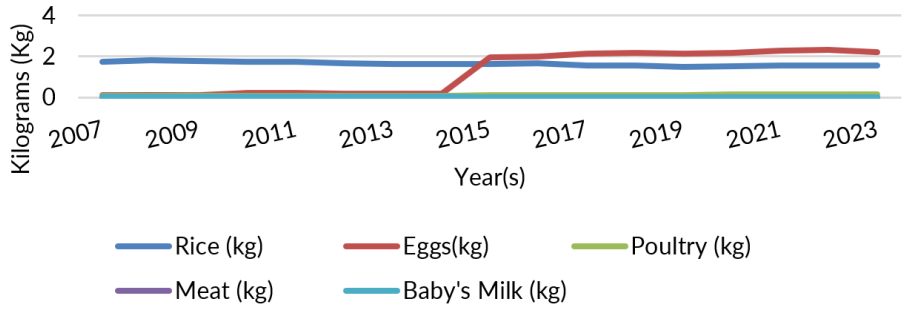
Note:*Significant at α = 1%, ** Significant at α = 5%

In this section, we will try to explain the results of regression that have been processed. Based on our regression results, income is not a significant factor in affecting milk consumption. In fact, according to Firdaus et al, (2024) and Prato (1973) that people's income also plays a significant role in terms of influencing milk consumption. This happens, because in author's opinion that the Indonesian people themselves can actually afford to buy milk, because the price of milk can still be achieved economically. However, Indonesian people still lack awareness in consuming milk especially for their baby. Alwis et al. (2009) mentioned that education is one of the mostet al important factors when talking about milk consumption awareness. Because, someone who has a higher education then he will realize the importance of healthy food choices, where milk will certainly be one of the considerations in him in consumption. Even Gulseven (2018) also found that people whose education level is college, tend to buy milk 2 times higher when compared to people who do not go to college. Therefore, the higher a person's education, the higher his awareness of drinking milk, also being said the higher the education the more his awareness towards to his toddler to give a baby milk instead of sweet condensed milk to replace breast milk feeding.

This level of education in Indonesia also explains the negative correlation between the population and milk consumption. According to demand theory, an increase in population should increase demand for goods/services (Mankiw, 2012). However, population growth in Indonesia actually reduces baby milk consumption. This means that Indonesian people still lack awareness in giving their toddlers a baby milk.

Based on figure 4, if milk in general has been realized for consumption, milk should have become a basic necessity item consumed such as rice and eggs which both has the highest consumption rate in Indonesia. Moreover, the consumption of other nutrition dense foods such as poultry and meat are also low compared to rice and eggs.

Figure 4. Average Per Capita Consumption of Several Important Food Ingredients Per Week



Source: Central Bureau of Statistics (2023)

Important basic goods certainly reflect the preferences of the Indonesian people in consumption, which as the population increases, it certainly increases the amount of demand for these basic goods. However, as already mentioned, the increase in the number of Indonesian population actually reduces national milk consumption due to lack of awareness. This paradox suggests that while population growth traditionally leads to higher demand for staple goods, the relatively low consumption of baby milk indicates a deeper issue. It may reflect cultural preferences, economic constraints, or a lack of trust in the nutritional value of baby milk products. Moreover, widespread misinformation and the affordability of less nutritious alternatives, such as sweetened condensed milk, further compound the issue. Without targeted education and policy efforts to shift consumer behavior and perceptions, the trend of declining baby milk consumption amid population growth could undermine public health initiatives aimed at reducing stunting in Indonesia (Rahn et al., 2017). For example, in Rwanda, government policies and programs have significantly contributed to the growth of the dairy sector, improving nutrition and income for rural households. Programs like "Girinka" have enhanced access to dairy products and improved milk quality and productivity (Habiyaremye et al., 2021). Community-based interventions, including educational interventions, multiple interventions, and changing purchase patterns, also can effectively increase dairy consumption in healthy populations (Nikniaz et al., 2020).

Table 3. Regression Results of Stunting Rate

Dependent Variable: Stunting Rate		
Independent Variable	**Coefficient**	**Prob.**
Constant	2.636894	0.0000*
Baby Milk Consumption (lnBabyMilk)	0.157157	0.0017*
R-squared = 0.471381		

Note: *Significant at α = 1%
Source: Author's calculation result

Based on the regression results (see table 3), milk consumption is significant in influencing stunting rates, but its correlations are positive which means an increase of baby

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milk consumption by 1% could increase stunting rate by 0.15%. This is an abnormal result from the regression. Since there is no other evidence from studies to strengthening this result, author has several arguments. First, this may occur due to the nutritional content formulated in baby milk not meeting the needs of developing toddlers. Further research may be needed to assess the formulation of baby milk powder. Second, this may be an evidence that tackling stunting through the baby's milk alone is not enough therefore a rich nutrient dietary is needed. Many significant factors also plays a role as the determinants of stunting (directly or indirectly) such as the characteristics of the parent and child, parental roles, the child's supervision, and the household's Socio-Economic Status (SES) (Tjitrajaya, 2022). Complementary foods besides milk also needed in order reducing the stunting rates in Indonesia such as foods that contain energy, protein, fat, carbohydrates, zinc, and iron. If those nutrients are not fulfilled it will cause stunting (Abdilahi et al., 2024; Langi et al., 2024; Suratri et al., 2023).

Based on all those results we can state that Indonesian people still lack awareness of drinking milk, of course, people will ignore dairy products in consumption. As a result, they also do not instill awareness of drinking milk to their children from an early age and it could also be that mothers are less aware to drink complementary milk during pregnancy. When the family environment is less aware of consuming protein, especially milk, children under five are affected by stunting. Then, the regression results also explain the lack of inclusion of dairy products in the stunting reduction program which is a government priority in the 2020-2024 National Medium-Term Development Plan (RPJMN).

Lack of milk consumption awareness will certainly interfere with the road plan Sustainable Development Goals (SDGs), where one of the goals is no hunger. According to meta data summary of Indonesia's SDGs indicators, compiled by the Ministry of National Development Planning/Bappenas, stunting including one of the indicators to measure the success of the second goal of the SDGs. In detail, to achieve the second goal of the SDGs is that by 2030 it must eliminate all forms of malnutrition, including by 2025 achieving internationally agreed targets for short and thin children under the age of 5 years, and meeting the nutritional needs of adolescent girls, pregnant and lactating mothers, as well as seniors. In this case stunting is one of the indicators to determine the success of the second goal of the SDGs (United Nations, 2016).

In response to this, the Indonesian government drafted National Medium-Term Development Plan (RPJMN) 2020 – 2024, where one of the plans is to reduce the number stunting up to 14% by 2024. However, in fact, it turns out that in 2022 alone, according to the Central Statistics Agency, Indonesia still recorded numbers (Sekretariat Kabinet Republik Indonesia, 2020) stunting by 24.4%. It can be seen that Indonesia still has 3 more years to close the gap of around 10% in meeting the 2020-2024 RPJMN.

CONCLUSION

In conclusion, this study aimed to investigate the causes of low milk consumption in Indonesia and assess the impact of baby milk consumption on stunting rates among children. The findings indicate that the increasing population in Indonesia negatively impacts milk consumption, revealing a significant gap in public awareness regarding the importance of milk as a staple dietary component. Higher educational attainment was found to positively influence milk consumption, suggesting that individuals with greater awareness of nutritional benefits are more likely to provide milk as a substitute for breast milk. Additionally, while income per capita and baby milk prices do not significantly affect overall consumption, the lack of awareness among the population remains a critical barrier. The study also establishes a significant positive relationship between baby milk consumption and stunting rates, indicating that inadequate nutritional options in the baby milk market contribute to this pressing public health issue.

To address these challenges, targeted awareness campaigns and educational initiatives are essential to enhance milk consumption, particularly among families with young children. Policymakers should leverage social media and community engagement strategies to promote the nutritional benefits of milk and its role in preventing stunting. Effective strategies include community-based interventions, framing policies to emphasize consumer choice, and implementing comprehensive programs, such as those in Rwanda, that enhance access to and quality of dairy products. By prioritizing these recommendations, the government can effectively work towards reducing stunting and improving public health outcomes in alignment with the National Medium-Term Development Plan (RPJMN) 2020 – 2024 and the Sustainable Development Goals (SDGs).

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Program Keluarga Harapan and Senior Secondary Out-of-School Rates

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ABSTRACT

Research Originality: The novelty of this study lies in its use of a combined approach of probit analysis and propensity score matching to evaluate the impact of the *Program Keluarga Harapan* (PKH) on reducing out-of-school rates at the senior high school level, specifically before and after the COVID-19 pandemic.

Research Objectives: The study aims to empirically assess the effectiveness of PKH in enhancing educational outcomes to break the cycle of poverty.

Research Methods: The study also utilizes recent data from 2019 and 2022, reflecting the increased financial support of up to IDR 10 million per family per year. The analysis was conducted in two stages: first, on the overall sample of students from eastern Indonesia and other regions, and second, on a subsample of students in eastern Indonesia.

Empirical Results: The results indicate that PKH was more effective in 2022, with a 2.3% reduction in the overall sample and a 1.4% reduction in the eastern Indonesian subsample in preventing students from dropping out of school compared to 2019.

Implications: The study suggests that PKH can effectively support educational participation and reduce out-of-school rates, supplementing primary programs like PIP (*Program Indonesia Pintar*).

Keywords:
education; *program keluarga harapan* (PKH); out-of-school children rate; marginal effect; propensity score matching

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INTRODUCTION

Goal 4 of the Sustainable Development Goals (SDGs) emphasizes universal access to equitable and quality primary and secondary education, ensuring all children have equal opportunities to learn and succeed in their educational pursuits. To achieve this goal, every child must complete their education without dropping out. Due to the global consensus in agreement with Goal 4, the out-of-school rate of school-age children is expected to decrease. However, according to data from the United Nations Educational, Scientific and Cultural Organization (UNESCO), education remains in a state of emergency, as indicated by the high non-attendance rate in recent years. In 2022, UNESCO reported that 244 million children were out of school worldwide.

Indonesia also needs more out-of-school children. Data from the Central Bureau of Statistics' Education Statistics show that the number of out-of-school children in Indonesia remains relatively high, with the country experiencing an increase in 2022, especially at the senior high school level. The prevalence of out-of-school children at the senior high school level 2022 increased to 22.52% from 21.47% in 2021. This figure surpasses those of primary and junior high school levels. In other words, the proportion of 16 to 18-year-olds in Indonesia who do not complete their senior high school education is approximately 22 per 100 children.

The Central Bureau of Statistics' Education Statistics data also show that eastern Indonesia, known as *Kawasan Timur Indonesia*, is primarily responsible for the rise in the number of children not attending senior high school or its equivalent. This uptick in out-of-school children occurred despite a boost in the education budget from 2019 to 2022. Data from the Ministry of Finance show that from 2019 to 2022, the education budget increased from IDR 460.3 trillion in 2019 to IDR 473.7 trillion in 2020, IDR 479.6 trillion in 2021, and IDR 574.9 trillion in 2022.

There is a positive correlation between education level and the out-of-school rate, and this relationship shows an increasing trend; essentially, the higher the education level, the higher the out-of-school rate. Although children may complete primary school, secondary education is usually a burden for people experiencing poverty due to additional costs and educational facilities far from where they live (Baird et al., 2013). This data indicates that children in senior high school require more money than those in primary or junior high school. The increased costs associated with schooling directly impact the educational opportunities available to individuals within a household. When a family suffers economic hardships, it inevitably disrupts some aspects of their lives, including educational opportunities.

The widening disparity in access to higher levels of education among economic groups is reflected in the poor's notably low school enrollment rate compared to the non-poor, resulting in the increasing out-of-school rate. Children from low-income families still face the challenge of completing 12 years of primary education. In their study, Granado et al. (2007) find a wide gap between the educational attainment of poor and rich groups at the junior and senior secondary school levels, with children from low-

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income families being 20% less likely to attend junior secondary school compared to children from wealthy families. In addition, Suryadarma (2006) found that children living in rural areas have lower access to junior secondary school education. Other studies find that poverty is closely associated with children dropping out of school. Adelman and Szekely (2017) find a negative correlation between school enrollment in Central America and factors such as poverty, unemployment of the head of the household, and children being the primary breadwinners. In line with the previous two studies, Takahashi (2011) also finds that children living in neighborhoods that are more affluent and have a high proportion of children enrolled in school are more likely to attend school.

To overcome Indonesia's high out-of-school rates, the national government must play an active role in ensuring that the entire population has equal access to education for the entire population. One solution is to alleviate poverty, thus giving low-income families better access to higher education. The Indonesian government has implemented various fiscal policies to address this problem because productive government spending and direct contact with the public interest will stimulate the economy (Fiscal Policy Agency, 2012). One government intervention is cash transfer programs. The additional income provided by cash transfer programs, both conditional and unconditional, allows households to increase investment in education. By reducing the relative price of education, conditional cash transfers for school enrollment can increase investment in education and reduce child labor when households are not credit-constrained (de Hoop & Rosati, 2014).

One such cash assistance program is the *program Keluarga Harapan* (PKH), implemented in 2007. The PKH is a conditional cash transfer (CCT) program that alleviates poverty. This program was initially implemented in Mexico and Brazil and has since been widely adopted by other countries as a social assistance strategy (Rawlings & Rubio, 2005). In Indonesia, the PKH budget, which has prerequisites for its disbursement, including the fulfillment of educational aspects such as school attendance, increased from IDR 32.65 trillion (10 million KPM) in 2019 to IDR 37.4 trillion (10 million KPM) in 2020. The budget slightly decreased in 2021 to IDR 28.7 trillion (10 million KPM) and remained the same in 2022 at IDR 28.7 trillion (10 million KPM) (Ministry of Social Affairs, 2019). Although the PKH budget decreased from 2019 to 2021 before stabilizing in 2022, the number of out-of-school children increased in 2022.

The PKH policy assumes that increasing children's school enrollment will reduce out-of-school rates because school-age children from beneficiary families must enroll and maintain a certain level of school attendance to receive the CCT. In this case, the increase in parents' income from PKH assistance, accompanied by the prerequisite of school enrollment and attendance of children, is expected to increase school enrollment. This view is supported by Hartarto and Wardani (2023), who state that from a policy perspective, the program can change parents' aspirations for their children to get higher education. By addressing the education issue, the hope is that children from low-income households can escape the poverty they may have inherited from their parents. Therefore, the cash transfer program is vital in advancing children'schildren's education and welfare (Hidayatina & Ozzane, 2019).

CCT programs have attracted the attention of researchers who want to evaluate government policies that explicitly and implicitly affect educational outcomes. Baird et al. (2013) evaluate 75 studies on cash transfers and find that CCT and unconditional cash transfer (UCT) programs significantly affect school enrollment. They determined that children from households in the CCT group have a greater chance of being enrolled in school than those from households in the UCT group, with no statistically significant difference found between the groups. Galiani and McEwan (2013) and Saavedra andGarcía (2012) also find that CCT programs effectively increase school enrollment and attendance. In line with previous studies, Glewwe and Kassouf (2012), Janvry et al. (2012), Edmonds and Schady (2012), and Brauw and Hoddinott (2011) find that CCT programs can increase school enrollment and reduce dropout rates.

In Indonesia, several studies examine the effect of the PKH on educational outcomes. Yulianti et al. (2015) determine that implementing the PKH effectively reduced school dropout rates. However, it is different from previous research by Alatas et al. (2011), who found that the PKH can increase the duration of school attendance for PKH-beneficiary children. However, it does not increase children's participation in the education system or retain them in it. Likewise, Lee and Hwang (2016) found that the PKH did not significantly increase school enrollment. Furthermore, the financial returns of PKH children attending school are lower than those of non-PKH children in the short and medium term. However, in the long term, the economic returns are greater than those of non-PKH children.

The PKH can also influence educational attainment. Several studies have shown that the PKH can improve beneficiary children'schildren's attendance rates and academic achievement (Cahyadi et al., 2020; Wasim et al., 2019). Thus, the literature shows that cash transfers have varying impacts on educational outcomes in different countries. In Indonesia, research on the PKH and academic outcomes is limited. The impact of the PKH on educational outcomes has yet to be examined using the probit analysis method coupled with the propensity score matching (PSM) method. The PSM method can minimize the potential bias in standard regression methods, thereby increasing the accuracy of research results. Therefore, the novelty of this research comes from the research method and the use of educational outcomes (out-of-school rates) as a measure of the impact of the PKH. This study also uses relatively recent data from 2019 and 2022, which is sufficient to evaluate the effectiveness of the PKH more than a decade since the program's implementation in 2007. MicroSave Consulting (2019), in the Operational Assessment and Impact Evaluation Report of the PKH, the amount of assistance has been increased to a maximum of IDR 10 million per family per year with a non-flat scheme so that the amount of assistance varies depending on the conditions of beneficiaries, referred as *Keluarga Penerima Manfaat* (KPM).

As the PKH includes an educational participation conditionality in its disbursement, this study empirically examines and analyzes the program's impact on educational output in Indonesia. From a policy perspective, this study aims to determine two things: (1) whether there is indeed a relationship between participation in the PKH and the out-of-

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school rate at the senior high school level and (2) whether PKH assistance has the potential to reduce the out-of-school rate at the senior high school level, especially in eastern Indonesia. The results of this study can guide decision-makers in formulating policies to strengthen social protection programs that are beneficial for children's education.

METHODS

This study uses individual-level data sourced from *Survei Sosial Ekonomi Nasional* (SUSENAS) and Basic Education data. For analysis, this study uses the PSM method to determine the impact of the PKH on school out-of-school rates by comparing individuals in households that receive PKH assistance as a treatment group with individuals in households that do not receive PKH assistance as a comparison (control). This study employs PSM combined with difference-in-differences, based on research from Hartarto and Wardani (2023). A probit regression, which considers the PSM model's weight, is later conducted to analyze data. This study employs a probit regression, a type of logistic regression, as it is designed for binary outcomes with a dependent variable that can take on two values: 0 and 1. The binary nature of values 0 and 1 can reflect probability. This study examines the probability of children in a household not attending or dropping out of school.

The PSM method was introduced by Rosenbaum and Rubin in 1983. Propensity refers to the probability of receiving a treatment (or both). This method of analysis uses propensity scores to match treated and untreated individuals. Propensity score refers to the probability of an individual not receiving treatment when the individual has received treatment. Propensity scores are estimated and used to reduce the impact of potential confounders. The quantitative approach determines the impact of a policy or program by examining the treatment group. This is done by calculating the average value of the treatment effect, otherwise called the average treatment effect on the treated (ATT). The formula for ATT is as follows:

$$ATT = (Y_1 - Y_0 \mid D = 1) = E(Y_1 \mid D = 1) - E(Y_0 \mid D = 0)$$

where Y_1 is the dependent variable (PKH) after treatment, Y_0 is the dependent variable when not getting treatment, D=1 is the treatment group, and D=0 is the control group.

When comparing what would have happened if the group had not received the treatment (counterfactual), it may be challenging to determine the expected value for the treatment group using the formula above. In this case, the expected value is PKH or E(Y0|D=1) because the treatment group has already received it. Experts recognize that even when regression adjustments are applied, bias from potential confounding can cause problems in concluding observational studies. When evaluating impact using only conventional analytical tools, adjustments for bias must be accounted for and are difficult to carry out (Hullsiek & Louis, 2002).

To overcome this problem, it is essential to use an analysis method that can effectively reduce bias by appropriately adjusting the covariates in both groups. To minimize bias, there must be a comparison group that does not receive the treatment

(also known as the control group) with the same characteristics as the treatment group. PSM can effectively reduce bias, thus improving the accuracy of estimating a program's impact on outcomes (Hullsiek & Louis, 2002). PSM is advantageous over regression-based methods because it is a non-parametric approach that avoids specifying the relationship between characteristics and outcomes. Another advantage of this method is that it focuses on issues of common support, thus ensuring that comparisons of incidences of non-attendance between individuals receiving and not receiving PKH assistance are only made if both groups of individuals share the same characteristics.

This study PSM as its multivariate analysis method to assess the impact of the PKH on the educational outcome of dropping out of school. The logistic regression analysis results determine that the covariate variables included in the matching stage significantly impact PKH enrollment. These covariates in the PSM model will be excluded from the observations if the logistic regression analysis results show no impact on the main independent variable, PKH enrollment.

First, we calculate the propensity scores for the treatment group (recipients of PKH assistance) and the control group (non-recipients of PKH assistance) by performing a logistic regression on the covariates. This regression analysis is conducted to assess the impact of confounding variables on PKH enrollment among individual households in Indonesia, both before and after matching. It matches the propensity score of each respondent in the treatment group with the closest control group score. After obtaining the logistic regression analysis results on the covariate variables, the covariate variables that do not significantly affect the main independent variable (PKH enrollment) can be eliminated. The covariate variables that significantly affect PKH enrollment will be used to test the impact of the PKH on school out-of-school rates through the PSM method.

Next, we match the covariate variables. This matching ensures that the covariate variables in the study are matched between the treatment group (recipients of PKH) and the control group (non-recipients of PKH). Following research by Hartarto and Wardani (2023), we first determine the most appropriate matching algorithm among several. Matching algorithms vary in the allocation of weights to adjust the relative distance between treated and untreated individuals when matched. Thus, the choice of a matching algorithm can significantly affect the accuracy of the estimation results (Hartarto & Wardani, 2023). We use matching algorithms such as nearest neighbor, caliper, radius, and kernel to assess the robustness of the estimation results.

The matching analysis generates the ATT value, which shows the average value of the outcome variable, namely the incidence of not attending school, after matching. The difference in out-of-school rates before and after matching will be compared with out-of-school rates before and after matching with the PKH enrollment variable as the main independent variable. There is a successful matching process if propensity score overlap between treatment and control groups. This stage aims to strengthen the interpretation and assess whether the matching in the PSM method is appropriate by looking at the distribution between the treatment and control groups. The last step tests the matching quality by comparing the distribution of covariate X before and after matching. The

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standardized difference calculation is used for each covariate X before and after matching. The percentage of bias reduction can determine the accuracy of the matching result.

PSM is used to create identical comparison groups by considering the propensity score of a variable or set of variables. In this method, the caliper is used to ensure balance between the matched groups. The caliper determines the maximum tolerance of difference in propensity score between two individuals in the comparison group. When nearest neighbor, caliper, radius, and kernel algorithms are employed to find matches, a caliper value is required to limit the maximum difference allowed between matching propensity pairs. The method to determine the caliper value may differ based on the preference and characteristics of the data used.

This study also conducts a probit regression to ensure the robustness of the model. The probit regression in this study uses the weight of the best algorithm among the four algorithms to reduce bias in the PSM method of each sample group. In their studies, Hidayanti and Ozzane (2019) and Yulianti (2015) also use probit regressions to analyze educational assistance on educational outcomes. Our data sample consists of individuals aged 16 to 21 at the senior high school or equivalent education level. In addition to estimating the parameter β, this study also estimates the marginal effect, namely, if β changes, how does it affect the probability of not attending school (Yi = 1) or attending school (Yi = 0)? The empirical model in this study is conducted at the senior high school education level based on the research model of Yulianti (2015).

The probit model improves for several reasons after PSM weights are applied. First, there is the reduction of selection bias. PSM helps to balance the distribution of covariate characteristics between the treatment and control groups; thus, the estimation results of the probit model become more valid and unbiased by the initial differences that exist before treatment. Second, using PSM weights, each observation in the probit model is assigned a weight based on how representative it is in the context of treatment or control. The weight can improve the treatment effect estimation by prioritizing more representative observations, thus improving the accuracy and reliability of the probit model estimation results. Third, PSM helps ensure that the study results are more generalizable to a broader population, as they reflect a more balanced and representative population. These factors enhance the probit model's effectiveness in capturing the causal relationship between the treatment and the observed outcome.

This study employs the incidence of not attending school as its dependent variable and PKH enrollment as its independent variable. The control variables are gender, age, education of the household head, number of household members, per capita expenditure, PIP, BPNT (*Bantuan Pangan Non Tunai*), school availability, urban or rural status, and the teacher–student ratio at the senior high school level. In this study, senior high school refers to senior general secondary school (SMA) and senior vocational secondary school (SMK) in Indonesia. This study assesses how the PKH affects the likelihood of non-attendance of school for those aged 16 to 21 at the senior secondary level by analyzing it as a function of PKH and control variables (X).

This study uses two sample sets: the full sample individual dataset and the subsample individual dataset. The full sample individual dataset includes individuals aged 16 to 21 at the senior high school level of education. This dataset includes recipients and non-recipients of PKH benefits. This dataset also includes individuals who are from eastern Indonesia and those who are not from eastern Indonesia. We use this dataset to analyze and answer the first research question of whether PKH assistance can reduce the incidence of not attending school among senior high school-aged children.

The second dataset takes the individuals from eastern Indonesia as the subsample. Eastern Indonesia includes the islands of Kalimantan, Sulawesi, Maluku, Nusa Tenggara, and Papua as defined by Presidential Regulation No. 2 of 2015 on the National Medium-Term Development Plan 2015-2019, Book I of the National Development Agenda, which states that western Indonesia includes Sumatra, Java, and Bali, while all other regions are considered eastern Indonesia. This subsample dataset consists of individuals from eastern Indonesia who are at the senior high school education level and are categorized into two groups: those who receive PKH benefits and those who do not. We use this dataset to analyze and answer the second research question of whether PKH assistance has the potential to reduce out-of-school rates in eastern Indonesia.

RESULTS AND DISCUSSION

The PSM analysis of the impact of PKH enrollment on the out-of-school rate at the senior high school level indicates that there is a difference in the out-of-school rate between individuals who receive PKH assistance and those who do not, but it is in the wrong direction. After matching the observed covariates, we find that PKH enrollment significantly reduces the out-of-school rate at the senior high school level, especially in the full sample in 2019 and the full sample and subsample in 2022. Table 1 reports the results from the PSM and common support analyses.

Table 1. Tabulation of PSM Results

Years (ATT)	Nearest neighbor		Caliper		Radius		Kernel	
	Diff (S.E.)	T-stat	Diff (S.E.)	T-stat	Diff (S.E.)	T-stat	Diff (S.E.)	T-stat
2019 (full sample)	−0.033*** (0.006)	5.36	−0.030*** (0.005)	5.48	−0.030*** (0.004)	6.60	−0.029*** (0.004)	6.67
2019 (subsample)	−0.009 (0.009)	0.98	−0.002 (0.008)	0.31	−0.005 (0.007)	0.79	−0.005 (0.006)	0.79
2022 (full sample)	−0.027*** (0.005)	4.94	−0.030*** (0.005)	6.24	−0.035*** (0.004)	8.52	−0.034*** (0.004)	8.69
2022 (subsample)	−0.015* (0.008)	1.84	−0.019** (0.007)	2.51	−0.022*** (0.006)	3.47	−0.024*** (0.006)	3.86

For the full sample for 2019, the nearest neighbor, caliper, and kernel matching algorithms in the PSM process allow all covariates to get a matching pair or total common

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support of 106,893, consisting of 85,441 individuals who did not receive PKH assistance and 21,452 individuals who did. All covariates are on support, meaning no respondents are discarded (off support), in the matching process except for in the radius algorithm, where 15 individuals are off support but not significant. In the 2019 subsample, the nearest neighbor, caliper, and kernel matching algorithms in the PSM process allow all covariates to get a matching pair or total common support of 45,082, consisting of 35,837 individuals who did not receive PKH assistance and 9,245 individuals who did. All covariates are on support except for in the radius algorithm, where 167 individuals are off support but not significant.

Table 2. The Common Support

Full sample 2019
(a)

Common Support	NN		Caliper		Radius		Kernel	
	On Support	Off Support	On Support	Off Support	On Support	Off Support	On Support	Off Support
Treatment	21,452	0	21,452	0	21,437	15	21,452	0
Control	85,441	0	85,441	0	85,441	0	85,441	0
Total	106,893	0	106,893	0	106,878	15	106,893	0

Subsample 2019
(b)

Common Support	NN		Caliper		Radius		Kernel	
	On Support	Off Support	On Support	Off Support	On Support	Off Support	On Support	Off Support
Treatment	9,245	0	9,245	0	9,078	167	9,245	0
Control	35,837	0	35,837	0	35,837	0	35,837	0
Total	45,082	0	45,082	0	44,915	167	45,082	0

Full sample 2022
(c)

Common Support	NN		Caliper		Radius		Kernel	
	On Support	Off Support	On Support	Off Support	On Support	Off Support	On Support	Off Support
Treatment	27,935	0	27,934	1	27,910	25	27,934	1
Control	84,469	0	84,469	0	84,469	0	84,469	0
Total	112,404	0	112,403	1	112,379	25	112,403	1

Subsample 2022
(d)

Common Support	NN		Caliper		Radius		Kernel	
	On Support	Off Support	On Support	Off Support	On Support	Off Support	On Support	Off Support
Treatment	12,617	0	12,617	0	12,520	97	12,617	0
Control	34,355	0	34,355	0	34,355	0	34,355	0
Total	46,972	0	46,972	0	46,875	97	46,972	0

In the full sample for 2022, the nearest neighbor matching algorithm in the PSM process allows all covariates to get a matching pair or total common support of 112,404, consisting of 84,469 individuals who did not receive PKH assistance and 27,935 individuals who did. Most covariates are on support. However, in the caliper, radius, and kernel algorithms 1, 25, and 1 individual(s), respectively, are off support but not significant. In the 2022 subsample, the nearest neighbor, caliper, and kernel matching algorithms in the PSM process allow all covariates to get a matching pair or total common support of 46,972, consisting of 34,355 individuals who did not receive PKH assistance and 12,617 individuals who did. All covariates are on support except for in the radius algorithm, where 97 individuals are off support; however, this number is not significant.

Table 3 Matching Quality Test

Full sample 2019
(a)

Algorithm	Before Matching (%)		After Matching (%)		Reduction in Bias (%)	
	MeanBias	MedBias	MeanBias	MedBias	MeanBias	MedBias
Nearest neighbor	35.4	25.9	5.0	5.9	85.9	77.2
Caliper	35.4	25.9	5.2	5.9	85.3	77.2
Radius	35.4	25.9	5.5	5.9	84.5	77.2
Kernel	35.4	25.9	5.7	6.1	83.9	76.4

Subsample 2019
(b)

Algorithm	Before Matching (%)		After Matching (%)		Reduction in Bias (%)	
	MeanBias	MedBias	MeanBias	MedBias	MeanBias	MedBias
Nearest neighbor	36.1	34.6	3.9	4.3	89.2	87.6
Caliper	36.1	34.6	3.6	4.4	90.0	87.3
Radius	36.1	34.6	3.7	4	89.8	88.4
Kernel	36.1	34.6	3.2	3.5	91.1	89.9

Full sample 2022
(c)

Algorithm	Before Matching (%)		After Matching (%)		Reduction in Bias (%)	
	MeanBias	MedBias	MeanBias	MedBias	MeanBias	MedBias
Nearest neighbor	31.6	17.4	2.3	2.3	92.7	86.8
Caliper	31.6	17.4	2.2	1.7	93.0	90.2
Radius	31.6	17.4	2.4	1.4	92.4	92.0
Kernel	31.6	17.4	2.3	1.4	92.7	92.0

Subsample 2022
(d)

Algorithm	Before Matching (%)		After Matching (%)		Reduction in Bias (%)	
	MeanBias	MedBias	MeanBias	MedBias	MeanBias	MedBias
Nearest neighbor	32.5	16.8	2.2	1.4	93.2	91.7
Caliper	32.5	16.8	2.2	1.2	93.2	92.9
Radius	32.5	16.8	1.9	1.4	94.2	91.7
Kernel	32.5	16.8	2.1	1.8	93.5	89.3

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Therefore, the PSM results for the four algorithms in the four sample groups exceed the satisfactory threshold. After obtaining the results of the four algorithms and sample groups, a quality matching test is conducted. This test is based on the results of bias reduction in the analysis conducted by matching propensity scores. Table 3 outlines the details of the bias reduction of each algorithm based on the results of the four matching algorithms.

In the 2019 full sample, the nearest neighbor algorithm has the highest bias reduction, with a decrease of 85.9% in mean bias and 77.2% in median (med) bias. However, in the 2019 subsample, the kernel algorithm has the largest bias reduction, with a decrease of 91.1% in mean bias and 89.9% in median bias. In the full sample for 2022, the kernel algorithm also produced the highest bias reduction of 92.7% in mean bias and 92% in median bias. In the 2022 subsample, the radius algorithm produced the largest decrease in bias, with a decline of 94.2% in mean bias and 91.7% in median bias.

Based on the matching results in Table 3, the algorithm that produces the highest bias reduction compared to other algorithms, the weights in the algorithm, will be used in probit logistic regression to ensure the robustness of the model. Table 4 reports the estimation results measuring the effect of the PKH on out-of-school rates. The findings on the full sample show that the PKH is negatively associated with the probability of individuals not attending senior high school with a statistically significant relationship. In other words, the PKH effectively reduces the probability of children leaving secondary school.

The estimation results show that children from households that received PKH assistance had a 1.9% lower probability of not attending senior high school than those from families that did not receive PKH assistance at the senior high school level in 2019. In the eastern Indonesian subsample, the PKH is positively associated with a 0.2% increased risk of individuals not attending senior high school. However, this relationship is not statistically significant, implying that the PKH failed to reduce the probability of children not attending senior high school in eastern Indonesia in 2019. A comparison of the results from the full sample with those from the subsample in eastern Indonesia show that the PKH has a more pronounced impact in reducing the probability of a student dropping out of school in the overall sample.

Table 4 also shows that for the full sample in 2022, the PKH is statistically negatively associated with the probability of individuals discontinuing their education at the senior high school level, and this relationship is statistically significant. Therefore, the PKH has a moderately effective impact in reducing the out-of-school rate at the senior high school level. The estimation results show that children from households receiving PKH assistance have a 2.3% lower probability of not attending senior high school than those from families not receiving PKH assistance at the senior high school level.

Table 4. Probit Estimation Results

Variable	Full Sample Marginal Effect in 2019	Subsample Marginal Effect in 2019	Full Sample Marginal Effect in 2022	Subsample Marginal Effect in 2022
PKH	−0.019***	0.002	−0.023***	−0.014**
	(0.005)	(0.005)	(0.003)	(0.006)
PIP	−0.308***	−0.305***	−0.284***	−0.265***
	(0.007)	(0.009)	(0.008)	(0.015)
BPNT	0.042***	0.045***	0.033***	0.034***
	(0.006)	(0.010)	(0.003)	(0.006)
Gender	0.020***	0.021***	0.022***	0.021***
	(0.005)	(0.005)	(0.003)	(0.006)
Educational degree	−0.058***	−0.057***	−0.058***	−0.058***
	(0.001)	(0.001)	(0.000)	(0.001)
Expenditure per capita	−0.019***	−0.014***	−0.045***	−0.022***
	(0.005)	(0.005)	(0.004)	(0.006)
Age of the household head	−0.001***	−0.001***	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Education of the household head	−0.010***	−0.009***	−0.001***	−0.001***
	(0.001)	(0.001)	(0.000)	(0.000)
The number of household members	0.001	0.001	−0.003***	−0.001
	(0.002)	(0.001)	(0.001)	(0.002)
Urban and rural areas	−0.023***	−0.012*	−0.034***	−0.038***
	(0.005)	(0.007)	(0.004)	(0.007)
The number of high schools / vocational schools	0.025***	0.013***	0.018***	−0.001
	(0.003)	(0.004)	(0.002)	(0.004)
Student to teacher ratio of senior high school	0.045***	0.011	0.065***	0.038***
	(0.011)	(0.012)	(0.009)	(0.013)
Eastern Indonesia	−0.010*		0.007*	
	(0.005)		(0.004)	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The findings from the analysis of the eastern Indonesia subsample in Table 4 show that the PKH lowers the probability of children not attending senior high school by 1.4%. This relationship is statistically significant at the 5% level, which means that the impact of the PKH on reducing the out-of-school rates for senior high schools in eastern Indonesia is effective but still lower than the overall sample in the same year. A comparison of the results from the full sample with those from the subsample of students in eastern Indonesia shows that the PKH has a more substantial and more effective influence in reducing the probability of dropping out of school in the full sample at the 1% significance level.

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The results of this study contradict those from previous studies that indicate CCT programs such as PKH do not significantly impact educational outcomes such as school enrollment and non-enrollment rates (Alatas et al. 2011; Lee & Hwang 2016). In their studies, Alatas et al. (2011) and Lee and Hwang (2016) conclude that the PKH does not increase school enrollment rates; in the context of these studies, school participation rate, dropout rate, and out-of-school rate are interrelated educational outcomes. A high rate of school enrollment will reduce the number of children who drop out of school and contribute to reducing the number of children who are not in school. The reverse is true as well. In this study, we show that the PKH policy was quite effective in reducing the out-of-school rate. The difference in results could be due to previous studies having only evaluated the PKH in its early period of adoption and not using PSM for analysis. The use of PSM in this study minimized potential bias, thus resulting in more precise conclusions.

A comparison of the results of the full sample and subsample probit in Table 4 shows that in 2022, the PKH has a greater effect in reducing the likelihood of children dropping out at senior high school level with a magnitude of 2.3% and 1.4%, respectively. However, when compared to the magnitude from other studies based on relatively similar programs in Latin America, these results are still relatively low. Research on CCT programs in Latin America shows significant reductions in out-of-school children are prevalent in case studies of programs such as Progresa/Oportunidades in Mexico and Bolsa Familia in Brazil. Schultz (2004) shows that Progresa/Oportunidades significantly increased school enrollment and reduced dropout rates among children from low-income families. Schultz notes that school enrollment rates increased by approximately 8%–10% for children of secondary school age. Bolsa Familia in Brazil has shown similar results. Glewwe and Kassouf (2012) find that Bolsa Familia contributed significantly to increasing school enrollment and reducing dropout rates. The program increased enrollment by approximately 5.5% in grades 1–4 and 6.5% in grades 5–8.

Bolsa Familia targets eligible beneficiaries of its services with high accuracy. This is achieved through geographic and means-testing mechanisms under the unified family registry (Cadastro Único), with 73% of transfers going to the poorest quintile and accumulated to 94% to the first and second poorest quintile. This achievement ranks Bolsa Familia first in targeting accuracy among other transfer programs in Latin American countries and among the top six transfer programs in developing countries (Lindert et al., 2007). A similar program in Mexico, Prospera (formerly Oportunidades and Progresa), also has an effective compliance, or commitment, verification mechanism where verification is done through reports from schools. Fiszbein et al. (2009) reveal that the compliance verification process, conducted every two months, starts with the education service provider or school responsible for filling in the compliance information form. The form is then returned to the coordinating agency at the state level and forwarded to the coordinating agency at the national level. There is a specific agency responsible for listing the beneficiaries and the amount to be paid each period.

The low impact of the PKH in Indonesia on the number of out-of-school children, especially at the high school/vocational level, compared to the achievements in Latin American countries may be due to several factors. Coverage and targeting limitations may reduce the effectiveness of the PKH in Indonesia. These limitations can make assistance unavailable to families who need it. If the program is not well-targeted or does not cover all children who are vulnerable to dropping out of school, then the impact on the number of out-of-school children will be less than optimal. Yulianti et al. (2015) assert that one of the main problems found in implementing social protection programs is related to targeting recipients. Targeting is necessary because the available funds are limited; however, it is difficult to accurately identify target households (Yulianti et al., 2015). There are two types of mis-targeting: inclusion errors and exclusion errors. In addition, weak supervision means that there is no feedback to increase programs' effectiveness. The commitment verification process is crucial to ensure the effectiveness of the PKH as it relates to the fulfillment of KPM obligations. PKH facilitators collect data on beneficiary compliance with health and education conditions by visiting local health centers or schools (MicroSave Consulting, 2019). However, the manual nature of the process creates the potential for human error.

CONCLUSION

Based on the results of the probit logistic regression analysis using the weights from the best algorithm in the PSM analysis, the findings from the overall sample estimation show that the PKH can significantly reduce the probability of children not attending senior high school/vocational school education in the overall sample in both 2019 and 2022. In 2022, the PKH significantly reduced the probability of children not attending high school in the subsample, while in 2019, it failed to do so in eastern Indonesia. In 2019, the overall sample showed a significant negative relationship between the PKH and out-of-school rates, while this was not observed in the smaller subsample. However, in 2022, the PKH had a stronger and more significant impact on reducing out-of-school rates in both the overall sample and the subsample, with the overall sample showing a higher level of statistical significance. The 2022 estimates indicate that the PKH was more effective in decreasing the likelihood of children not attending senior high school than in 2019.

It is crucial to maintain the education requirement of the PKH to encourage education participation and reduce the number of out-of-school children. Improving the quality of the PKH's monitoring and evaluation methods is also critical to maintain the program's relevancy. The national government should work with local governments, particularly provinces, to ensure data accuracy and build an integrated database. Digitalization of verification through mobile applications is necessary to reduce human error. The PKH also needs to expand its coverage to reach more students in need and improve the standard of education services, especially in eastern Indonesia. Data integration between the central and lower-level governments is essential to minimize targeting errors.

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Depreciation and Trade Balance: An Exploration of the J-Curve Phenomenon in Indonesia

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ABSTRACT

Research Originality: Global economic uncertainty has increased in recent years, leading to an appreciation of the US dollar relative to most global currencies, including the Indonesian rupiah. The novelty of this study is the inclusion of natural resource commodity price index variables, given the importance of these commodities in Indonesia's balance of trade.

Research Objectives: This study aims to examine the effect of rupiah exchange rate depreciation on Indonesia's trade balance.

Research Methods: This study uses a Vector Error Correction Model (VECM) to analyze Indonesia's balance of trade from January 2015 to December 2023, examining the potential J-Curve phenomenon resulting from the depreciation of the Indonesian rupiah.

Empirical Result: Findings from the impulse response analysis suggest that the J-Curve phenomenon is present in Indonesia's balance of trade as a result of the rupiah's depreciation. The results of this study also confirm the positive effect of increasing natural resource commodity prices on Indonesia's trade balance.

Implications: The implication of these findings is that exchange rate depreciation can improve Indonesia's trade balance only when natural resource commodity prices are rising. Conversely, if commodity prices decline, maintaining the stability of the rupiah exchange rate becomes crucial.

Keywords:
depreciation; j-curve; natural resource commodities; trade balance

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INTRODUCTION

A series of significant events in recent years starting from the United States-China trade war(Sukar & Ahmed, 2019; Li et al., 2020; Nong, 2021), which was followed by the cold war in technology (Chen et al., 2023; Zhang & Zhu, 2023), the COVID-19 pandemic (Hayakawa & Mukunoki, 2021; McKibbin & Fernando, 2023; Egger et al., 2023), the Russia-Ukraine war (Mariotti, 2022; Steinbach, 2023; Izzeldin et al., 2023), the Israel-Palestine conflict (Cui & Maghyereh, 2024; Lin et al., 2024) have an impact on increasing global uncertainty. A series of these events have caused international trade policies taken by major countries to tend to be inward-looking. The tariff increase implemented by the United States during the 2018 trade war with China and the UK's exit from the European Union (Brexit) has fueled momentum against globalization. This momentum has sparked concerns about the impact of increasing trade protectionism (Jiang et al., 2023). As a result, the trend of deglobalization in international trade is increasing. The effects of this deglobalization can reduce the volume of world trade, which then has an impact on reducing global economic growth.

Global economic uncertainty impacts exchange rate depreciation in many countries, especially emerging markets (Abid, 2020). Increasing global uncertainty accompanied by rising prices of food, energy, and natural resource commodities has increased inflation in various parts of the world. With high inflation, many central banks in developed countries have raised their benchmark interest rates, including the United States' central bank and the Federal Reserve. The policy taken by the Federal Reserve has an impact on strengthening the US dollar against other countries' currencies. Caballero et al. (2017) explained that the strengthening of the US dollar occurred due to global economic uncertainty and limited safe-haven assets. Thus, the discourse on de-dollarization in recent years as an effort to reduce dependence on the US dollar has yet to make significant progress, especially amidst China's slowing economic growth.

The exchange rate is an essential determinant of a country's trade balance (Truong & Van Vo, 2023). The exchange rate can be used as an economic policy tool to manage and improve the trade balance deficit(Dogru et al., 2019). Exchange rate depreciation can increase international competitiveness in international trade (Bahmani-Oskooee & Kanitpong, 2018). The domestic currency exchange rate depreciation against trading partners' currencies or foreign currencies causes export goods to become cheaper. This condition may ultimately result in heightened demand for the country's exports.

Conversely, imported goods will become expensive for domestic consumers, which is expected to reduce demand for imported goods (Kamugisha & Assoua, 2020). A country's trade balance is expected to improve after depreciation. This condition is because export and import orders or purchase contracts were negotiated before the depreciation occurred (Arize et al., 2017).

The traditional approach to investigating the impact of depreciation on a country's trade balance is based on the Marshall-Lerner condition. It is called Marshall-Lerner because it is based on the theory of price elasticity of demand proposed by Alfred

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Marshall and Abba P. Lerner. This theory proposes that a nation can strengthen its trade balance in the long run by depreciating its currency(Bahmani-Oskooee, 1985). The Marshall-Lerner condition suggests that a country's trade balance will likely improve when its currency depreciates. This condition occurs when the combined elasticity of demand for exports and imports exceeds one (Bahmani et al., 2013). However, many economists argue that the conditions outlined by the Marshall-Lerner theory are usually only met in the long run, not in the short run. This conditio is because demand tends to be more elastic in the long run(Truong & Van Vo, 2023). As a result, although a depreciation of the domestic currency may cause a worsening of the trade balance in the short run, it is expected to improve in the long run. This phenomenon is referred to as the J-curve effect in international trade theory (Magee, 1973; Bahmani-Oskooee, 1985; Bahmani-Oskooee & Fariditavana, 2016; Ari et al., 2019; Mwito et al., 2021; Madura, 2021; Xu et al., 2022; Truong & Van Vo, 2023).

Figure 1. The Rupiah Exchange Rate Against the US Dollar

Source: Bank Indonesia

Based on Figure 1, the movement of the Indonesian rupiah rate against the US dollar has experienced a downward trend. This data raises the question: Can the depreciation of the Indonesian rupiah improve Indonesia's trade balance? Several empirical studies provide evidence that currency depreciation leads to an enhancement in the trade balance. Bosupeng et al. (2024) found that a depreciation in the exchange rate positively influences the trade balance of developing countries but is ineffective on the trade balance of developed countries. Likewise, Truong and Van Vo (2023) discovered that the depreciation of the exchange rate contributes to the long-term improvement of Vietnam's trade balance. However, such depreciation negatively impacts Vietnam's trade balance in the short term. his implies that the depreciation of the Vietnamese dong results in a J-curve effect on the country's trade balance. Bahmani-Oskooee and Kanitpong (2018) used the ARDL method to examine the influence of exchange rates on Thailand's trade balance with fifteen trading partners. Their findings indicate that the baht depreciation will likely enhance Thailand's trade balance with countries such as Canada, Germany, Indonesia,

South Korea, Malaysia, Singapore, and the United States. However, the impact of exchange rate fluctuations is inconsistent across Thailand's two largest trading partners, China and Japan. In particular, while the baht's depreciation adversely affects the trade balance with China in the long run, it has little to no significant effect on Japan.

Several studies indicate that exchange rate depreciation does not positively impact the trade balance. Bao et al. (2023) examined India's trade balance with the European Union using the Nonlinear Autoregressive Distributed Lag (NARDL) approach. The results indicated that rupee depreciation did not affect India's trade balance, suggesting that devaluation is an ineffective strategy for improving India's trade balance with the European Union. Using the Time Series Multivariate Forecasting technique, Dzanan and Masih (2017) investigated the impact of exchange rate depreciation on the trade balance of developed countries, including Norway. The results showed that exchange rate depreciation did not affect Norway's trade balance in the long term. Likewise, Gobbi & Lucarelli (2022) found empirical evidence that the Pound Sterling's depreciation only positively affected four of the thirty primary British industries in the long run. The depreciation of the Pound Sterling negatively affected science-based industries in the UK in the long run.

The primary aim of this study is to assess the impact of the rupiah's depreciation on Indonesia's trade balance. This study's novelty lies in using natural resource commodity price index variables. In previous studies, the natural resource commodity price index variable was not involved in the relationship between exchange rate depreciation and the trade balance. In the context of the Indonesian economy, natural resource commodities have contributed significantly to Indonesia's export performance. The price of natural resource commodities has increased in recent years, which can help improve Indonesia's trade balance. Therefore, the natural resource commodity index variable is included in the research model. In addition, the research period is a period of increasing global economic uncertainty. High global economic uncertainty causes inward-looking trade policies to be implemented by various countries, especially large countries. Therefore, the trade policy uncertainty index is used as a proxy for international trade policy uncertainty.

METHODS

The study examines monthly time series data from January 2015 to December 2023. The research variables include Indonesia's trade balance, rupiah exchange rate, global trade policy uncertainty index, Indonesian industrial production index, and natural resource commodity price index.

This study uses the Vector Error Correction Model (VECM). This model analyzes the dynamic relationship between cointegrated non-stationary time series data (Khurshid, 2023). This study uses VECM to analyze the short-term dynamics and long-term relationship between exchange rate depreciation and the trade balance. VECM is formed through various stages (Ren et al., 2020; Shao et al., 2021). The first step involves conducting a unit root test to assess the stationarity of each variable's data. The Augmented Dickey-Fuller (ADF) method is used in the data stationarity test. The results of the

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ADF t-statistic value indicated by the unit root test are compared with the MacKinnon critical value to see the stationarity of the data studied. If the ADF t-statistic exceeds the MacKinnon critical value, it can be concluded that the data is stationary, signifying the absence of a unit root.

Second, determining the optimal lag length. One of the conditions that must be considered in estimation using VECM is the condition for determining the lag length to be used. Determining the optimal lag length in this study uses information criteria that refer to the Schwarz Information Criterion (SIC) value. Determining this lag length is important for use in cointegration tests. The Johansen maximum likelihood method is the most widely used method in cointegration tests.

Table 1. Research Variables

Variable	Definition	source
Indonesia Trade Balance	The ratio between the value of exports and the value of imports of Indonesia	www.bps.go.id
Rupiah Exchange Rate	Nominal exchange rate of Indonesian rupiah	www.bi.go.id
Global Trade Policy Uncertainty	a monthly index that measures the combined frequency of occurrence of the terms trade policy and uncertainty in major newspapers.	www.policyuncertainty.com
Indonesian Industrial Production Index	a measure of the monthly change, in real terms, in total output of large and medium-sized non-oil manufacturing firms.	www.bi.go.id
Natural Resource Commodity Price Index	Index of all commodity prices except gold	www.imf.org

Source: processed from various sources

Third, based on the previous tests, the model is then developed to examine both short-term and long-term relationships among the variables, using the VECM as follows:

$$LnTB_t = a_0 + \sum_{j=1}^{k} \alpha_1 \, DLnTB_{t-j} + \sum_{j=1}^{k} \alpha_2 \, DLnER_{t-j} + \sum_{j=1}^{k} \alpha_3 \, DLnTPU_{t-j} + \sum_{j=1}^{k} \alpha_4 \, DLnIPI_{t-j} + \sum_{j=1}^{k} \alpha_5 \, DLnCOM_{t-j} + \mu_{1t} \quad (1)$$

Where based on the equation above, LnTB represents the natural logarithm of Indonesia's trade balance, LnER denotes the natural logarithm of the nominal rupiah exchange rate, LnTPU refers to the natural logarithm of global trade policy uncertainty, LnIPI signifies the natural logarithm of the Indonesian Industrial Production Index, and LnCOM indicates the natural logarithm of the natural resource commodity price index. Additionally, D represents the first difference of the data, k denotes the maximum lag length, j refers to the lag, α represents the regression coefficient, and μ denotes the error term.

Fourth, the impulse response function is built to see the influence of endogenous variables' responses to shocks on other endogenous variables in the model. The impulse response function analysis can monitor how endogenous variables respond within the

VAR model. The impulse response function illustrates the direction of the relationship and the extent of influence among endogenous variables. Consequently, a shock to a variable incorporating new information will impact both that variable and others within the VAR system. Additionally, impulse response function analysis allows tracking the effects of a variable's shock over multiple future periods. The analysis then uses variance decomposition to describe the relative importance of each variable in the VECM due to the shock or how strong the composition of the role of a particular variable is to other variables. Thus, variance decomposition seeks to estimate the percentage contribution of each variable's variance attributed to fluctuations in a specific variable.

RESULTS AND DISCUSSION

The unit root test is an important step in the formation of VECM. This test prevents the use of non-stationary data in the model. The findings of the unit root test, performed using the Augmented Dickey-Fuller (ADF) test, are shown in Table 2. In the level data, the variables LnTB, LnTPU, and LnCOM are not stationary, so they must continue the data stationarity test on the first difference. All variables on the first difference indicate that the data is stationary.

Table 2. Unit Root Test

Variable	Level			First Difference		
	ADF tatistic	Critical Value	Prob.	ADF Statistic	Critical Value	Prob.
LnTB	-2.830614	-3.453179	0.1899	-12.16292	-3.453179	0.0000
LnER	-4.698920	-3.452358	0.0012	-9.307110	-3.453179	0.0000
LnTPU	-3.292240	-3.452358	0.0731	-13.83928	-3.452764	0.0000
LnIPI	-5.963733	-3.452358	0.0000	-10.49396	-3.453179	0.0000
LnCOM	-2.320083	-3.452764	0.4193	-7.036473	-3.452764	0.0000

Source: data processed

Determining the right lag length is the next step before conducting cointegration tests and estimation in VECM. The criteria for determining lag length include the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Criterion (HQ). In this study, the Schwarz Information Criterion (SC) was utilized, with lag 1 being chosen as indicated in Table 3.

Once the optimal lag is established, the data is tested for cointegration to verify the number of cointegration relationships present. The results of the cointegration test are shown in Table 4. Table 4 shows that there is one cointegration relationship, as indicated by the trace statistic of 84.94881, which exceeds the critical value of 76.97277 at the 95% confidence level. Overall, the results of the Johansen Cointegration Test indicate a long-term relationship among the five variables included in the model.

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Table 3. Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	335.0498	NA	9.35e-10	-6.600996	-6.470737	-6.548278
1	645.1174	582.9272	3.13e-12	-12.30235	-11.52080*	-11.98604*
2	672.9288	49.50425*	2.97e-12*	-12.35858*	-10.92573	-11.77868
3	685.6194	21.32025	3.83e-12	-12.11239	-10.02825	-11.26890
4	698.3298	20.08244	4.99e-12	-11.86660	-9.131168	-10.75952
5	710.7747	18.41842	6.60e-12	-11.61549	-8.228773	-10.24483
6	725.0549	19.70669	8.55e-12	-11.40110	-7.363085	-9.766842
7	736.6970	14.90186	1.19e-11	-11.13394	-6.444634	-9.236093
8	752.7991	19.00044	1.55e-11	-10.95598	-5.615383	-8.794545

Source: data processed

Table 4. Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.270041	84.94881	76.97277	0.0108
At most 1	0.232405	51.58353	54.07904	0.0820
At most 2	0.138176	23.54730	35.19275	0.4922
At most 3	0.061161	7.784655	20.26184	0.8415
At most 4	0.010275	1.094812	9.164546	0.9388

Source: Data processed

Based on Table 5, in the long term, the DlnER variable has a negative effect on the DLnTB variable. Likewise, the DLnTPU variable has a positive and significant effect. However, the DLnIPI and DlnCom variables do not significantly affect DLnTB in the long term. Thus, the depreciation of the rupiah exchange rate in the long term can improve Indonesia's trade balance.

Table 5. Estimates of Trade Balance Equation (Long Run)

Variable	Coefficient	Standard Error	t-statistics
DLnER	-1.167334	0.31452	-3.71146*
DLnTPU	0.112882	0.02626	4.29888*
DLnIPI	0.036988	0.27345	0.13527
DLnCOM	-0.012111	0.06854	-0.17669

Significance Level: * 0.05

Meanwhile, based on Table 6, all variables, namely DLnER, DLnTPU, DLnIPI, and DLnCOM, do not significantly affect the DLnTB variable in the short term. This means that the short-term depreciation of the rupiah exchange rate does not improve Indonesia's balance of trade.

An essential next step in VECM is the model stability test, which is crucial to validate the results of the impulse response and variance decomposition analyses. Based on

Table 7, the VECM model that has been formed has been stable, as seen from the AR root value below one, so it is valid enough to carry out the following analysis process, namely impulse response and variance decomposition.

Table 6. Estimates of Trade Balance Equation (Short Run)

Variable	Coefficient	Standard Error	t-statistics
DLnER	0.006841	0.03174	0.21554
DLnTPU	0.760791	0.41286	1.84274
DLnIPI	-0.042322	0.07215	-0.58662
DLnCOM	-0.032142	0.06596	-0.48726

Significance Level: * 0.05

Figure 2 shows the impulse response of Indonesia's balance of trade to shocks from the depreciation of the Indonesian rupiah, global trade policy uncertainty, Indonesia's industrial production index, and the natural resource commodity price index. The depreciation of the Indonesian rupiah in the initial period had a negative impact on Indonesia's balance of trade. In the subsequent period, Indonesia's trade balance fell by 0.0069% due to the effects of the rupiah's depreciation. In the third period, Indonesia's balance of trade responded positively to the depreciation of the Indonesian rupiah, increasing by 0.0061%. By the sixth period, the positive response of Indonesia's balance of trade had risen to 0.011%. Overall, the impulse response analysis results indicate that the depreciation of the Indonesian rupiah has a positive impact on the balance of trade in the long term. The depreciation negatively affected Indonesia's balance of trade, but this effect improved over time, leading to a positive impact in subsequent periods. Consequently, the relationship between the depreciation of the Indonesian rupiah and Indonesia's trade balance follows a J-curve pattern.

Table 7. Modulus

Root		Modulus
0.983316		0.983316
0.866154		0.866154
0.799666		0.799666
0.673273		0.673273
0.423461	- 0.253659i	0.493621
0.423461	+ 0.253659i	0.493621
-0.442139		0.442139
-0.241039	- 0.209961i	0.319662
-0.241039	+ 0.209961i	0.319662
-0.096027		0.096027

Source: data processed

The shock in the industrial production index and natural resource commodity prices positively impacted Indonesia's trade balance. In the sixth period, Indonesia's trade balance

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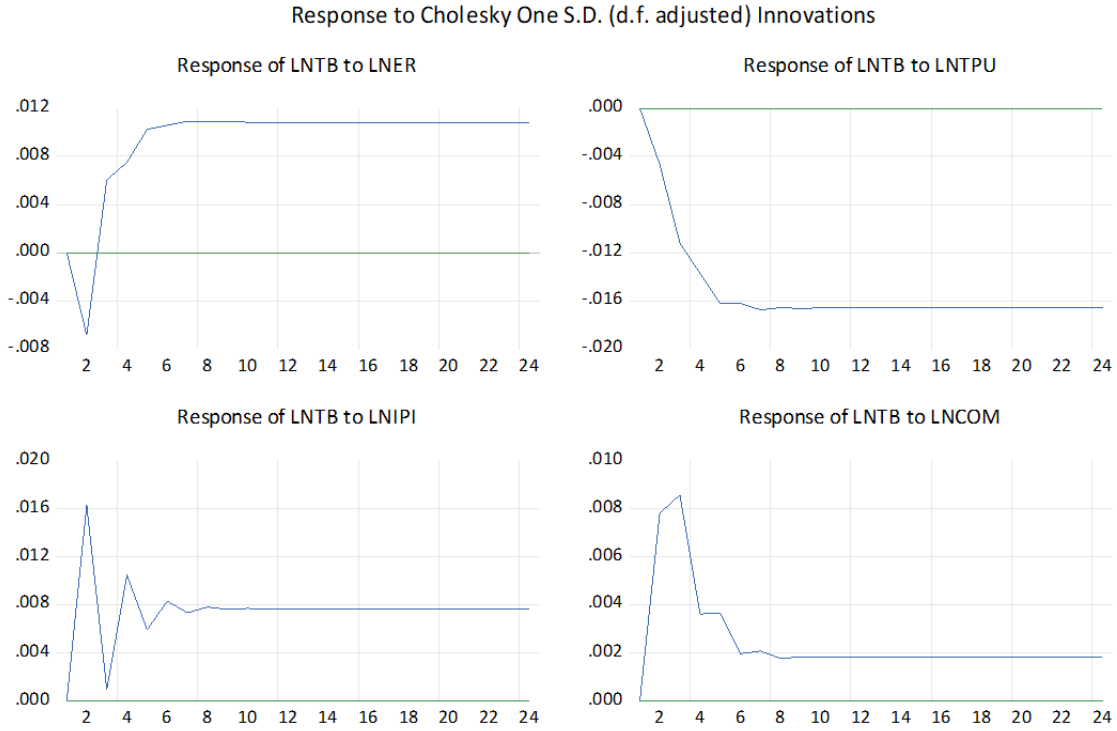
responded positively to the industrial production index and natural resource commodity price shocks by 0.0083% and 0.0019%, respectively. In contrast, the increase in global trade policy uncertainty negatively affected Indonesia's trade balance by 0.016% in the sixth period.

The variance decomposition of the research model is shown in Table 8. Variance decomposition seeks to estimate the percentage contribution of each variable's variance due to changes in specific variables. Typically, the most significant shock influencing the variance of each variable originates from the variable itself. As shown in Table 8, the contribution of variance to the Indonesian trade balance variable continues to decline until the end of the research period (period 24) but remains the most dominant. In the 12th period, the contribution of variance to the Indonesian trade balance variable decreased to 72.96% from 92.09% in the third period. By the end of the period, the contribution of variance to the Indonesian trade balance variable is 65.63%.

Figure 2. Impulse Response of Trade Balance



Source: data processed

The shock effect that contributes the most to Indonesia's balance of trade is the variation in the global trade policy uncertainty variable. In the 12th period, the contribution of this variable was 14.82%, a significant increase from 1.85% in the third period. By the end of the 24th period, the contribution of global trade policy uncertainty to Indonesia's balance of trade rose to 19.91%. The second, third, and fourth largest shock effects were attributed to the Indonesian rupiah variable, the Indonesian industrial production index, and the price of natural resource commodities, with contributions at the end of the period of 8.47%, 5.22%, and 0.77%, respectively.

The increasing global economic uncertainty in recent years has caused most world currencies to depreciate (Abid, 2020). The increasing demand for US dollars amid global uncertainty has caused the US dollar to strengthen against almost all world currencies (Kido, 2018). The Indonesian rupiah at the end of March 2024 depreciated by 5.25% (year on year). The same thing happened to currencies in various Asian countries. The Malaysian Ringgit exchange rate was recorded to have depreciated by 7.24%, the Thailand Bath depreciated by 6.93%, the Singapore Dollar depreciated by 1.55%, the Indian Rupee depreciated by 1.41%, the Chinese Renminbi depreciated by 5.18%, the Japanese Yen depreciated by 13.31%, and the South Korean Won depreciated by 3.29% (International Financial Statistics, 2024).

Table 8. Variance Decomposition of LnTB

Period	LnTB	LnER	LnTPU	LnIPI	LnCOM
3	92.09448	1.049444	1.849139	3.326848	1.680092
6	82.89730	3.283340	7.918694	4.392484	1.508186
9	76.81755	5.118459	12.15138	4.658444	1.254166
12	72.96462	6.273392	14.82159	4.853755	1.086644
15	70.29301	7.073296	16.67529	4.987512	0.970887
18	68.32774	7.661669	18.03877	5.086064	0.885757
21	66.82138	8.112661	19.08387	5.161587	0.820506
24	65.63001	8.469347	19.91043	5.221318	0.768899

Source: data processed

Based on Figure 2, the results of the impulse response analysis indicate that the depreciation of the Indonesian rupiah had a negative impact on Indonesia's balance of trade in the early periods, followed by a positive impact in subsequent periods. Thus, in the short term, the rupiah depreciation negatively affects Indonesia's trade balance. However, in the long term, the depreciation of the rupiah positively impacts the balance of trade. Consequently, the relationship between the depreciation of the rupiah and Indonesia's trade balance formed a J-curve pattern. The results of this study are in line with (Bahmani-Oskooee & Kanitpong, 2018; Doojav, 2018; Bao & Le, 2021; Truong & Van Vo, 2023; Bosupeng et al., 2024).

Our study regarding the impact of exchange rate depreciation on the trade balance contradicts the study conducted by Bao et al. (2023), which shows that rupee depreciation does not affect India's trade balance with the European Union. Likewise, the findings of Gobbi & Lucarelli (2022) show that the weakening of the Pound sterling in general has no significant effect on the UK's trade balance from the industrial sector. The findings of Ali et al. (2018) show the same thing: there is no J-Curve pattern in the relationship between exchange rate depreciation and Pakistan's trade balance. This condition is because the need for imported goods in Pakistan is very high.

Indonesia's trade balance performance in recent years has experienced a surplus. Indonesia's trade balance has experienced a consecutive surplus trend for 50 consecutive months from May 2020 to June 2024 (BPS-Statistics Indonesia, 2024). Indonesia's trade

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balance surplus in June 2024 was USD 2.39 billion. This surplus was lower than the previous year's period, which was USD 3.45 billion. The decline in the value of Indonesia's balance of trade surplus cannot be separated from export performance. For example, Indonesia's export performance in 2023 was recorded at USD 258.82 billion, or below the previous year's export performance of USD 291.90 billion. The slowdown in export value aligns with the moderation in the prices of Indonesia's leading natural resource commodities, such as palm oil and coal. In addition, the economic slowdown in major trading partner countries also contributed to the decline in Indonesia's export performance. Natural resource commodities play a crucial role in enhancing Indonesia's export performance. When key natural resource commodities prices increase, Indonesia's export performance improves, and vice versa. This result aligns with research findings indicating that the prices of natural resource commodities positively impact Indonesia's balance of trade.

CONCLUSION

Impulse response analysis is utilized to demonstrate the existence of the J-curve phenomenon in the trade balance. The study results indicate that, in the long term, the depreciation of the Indonesian rupiah can enhance Indonesia's trade balance. This finding aligns with the theories of Alfred Marshall and Abba P. Lerner regarding the relationship between exchange rate depreciation and a country's trade balance. Based on the impulse response analysis, a J-curve phenomenon is evident in Indonesia's trade balance due to the rupiah depreciation. However, it is essential to emphasize that the improvement in Indonesia's balance of trade is not solely attributable to the rupiah's depreciation but also the rise in the prices of natural resource commodities. During the study period, leading natural resource commodities in Indonesia, such as coal and crude palm oil, experienced significant price increases. This fact is supported by the study's findings that the prices of natural resource commodities positively affect Indonesia's trade balance. Additionally, other research indicates that Indonesia's industrial production index positively affects the balance of trade, while global trade policy uncertainty negatively impacts it.

Although the results of the study indicate that the depreciation of the Indonesian rupiah has a positive impact on the balance of trade, the stability of the rupiah remains paramount. One of the critical points of this study is to reaffirm the significant role of natural resource commodities in Indonesia's balance of trade. Exchange rate depreciation positively affects the trade balance, provided an increase in the prices of natural resource commodities accompanies it. Therefore, the rise in the prices of these commodities in recent years has contributed to Indonesia's consistent surplus balance of trade. However, Indonesia's reliance on natural resource commodities for exports is concerning due to the price fluctuations in the global market.

Additionally, the added value generated from the export of natural resource commodities is relatively low. A viable policy response would accelerate natural resource-based industrialization to create added value and reduce vulnerability to price fluctuations. Furthermore, there must be a prompt and effective response to the trade policies of other countries that exhibit an inward-looking trend, which increases global trade uncertainty.

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Adaptive Market Hypothesis: Evidence from Sharia Stocks in Asian Countries

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ABSTRACT

Research Originality: The adaptive market hypothesis, which is a new way to test capital market performance that reconciles the efficient market hypothesis (EMH) with behavioral finance, is the focus of our research. Our study's novelty lies in testing the efficiency of the Islamic capital market in six Asian countries: Bangladesh, India, Indonesia, Malaysia, Pakistan, and Thailand, over different periods: before, during, and after the COVID-19 pandemic.

Research Objectives: We aim to delve into its application in the Islamic capital market, which has seen significant growth in recent years.

Research Methods: We employed the variance ratio test, the ARIMA model, and the Elman neural network to test efficiency.

Empirical Result: Our findings revealed that the efficiency of sharia indices in these countries was not constant over the three periods, thereby supporting the existence of the adaptive market hypothesis.

Implications: The results of this study are not only important for academic discourse but also offer practical applications for investors to refine their investment strategies, engaging the audience in a discussion on Islamic capital market efficiency.

Keywords:
adaptive market hypothesis; sharia stocks; Asian countries

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INTRODUCTION

According to the efficient market hypothesis (EMH), first introduced by Fama (1965), if a market is efficient, all market information is reflected in stock prices instantly, and prices adjust to new information. Stock prices move randomly following the information circulating. It is highly unlikely to take abnormal returns from predicting price movements. Investors can only beat the market for some time, which is also random. There are two assumptions underlying the EMH, called the perfect market assumption, and investors are rational humans who behave rationally and always look for profit opportunities that lead to market efficiency. This second assumption has received much criticism from proponents of behavioral finance (Fakhoury, 2020; Yildirim, 2017). They argue that humans are normal creatures who are sometimes irrational, and this contradicts the basic assumptions of the EMH.

Another critique of EMH theory is that there needs to be a clear definition of the rate at which a market can absorb information. The market speed varies in adjusting to new information. For some time, the market might behave according to the definition of EMH, and for another period, it shows anomalies (Woo et al., 2020). Researchers have also identified numerous market anomalies in the capital market, each with varying degrees of prevalence across different countries (Khan & Rabbani, 2019; Obalade & Muzindutsi, 2019; Shahid & Sattar, 2017). Among the most extensively studied are calendar anomalies, size anomalies, and anomalies during crises.

Calendar anomalies manifest when stock prices exhibit a trend or pattern at specific times, such as the January effect, holiday effect, and Monday and Friday (Khan & Rabbani, 2019; Obalade & Muzindutsi, 2019; Shahid & Sattar, 2017). Rossi (2015) argued that calendar anomalies are a compelling counterpoint to the EMH theory. Banz's (1981) study demonstrated that company size is a crucial determinant of investor returns, with smaller companies outperforming larger ones. This size effect has significant implications for investment strategies, as further substantiated by studies conducted by Pan et al. (2021) and Xiao (2023).

The anomalies observed in the market also contradict the EMH model, thus encouraging the presence of behavioral finance. Unlike EMH, which is based on rational decision-making, behavioral finance introduces a component of irrationality, leading to the emergence of a new paradigm (Seth & Chowdary, 2017; Kumar & Chandel, 2018). However, according to Lo (2005), behavioralists face a fundamental theoretical problem: a solid theory that can answer questions about anomalies in EMH. He initiated the idea of the adaptive market hypothesis (AMH), which is considered to be able to reconcile EMH with behavioral finance. Several studies, such as those conducted by Akhter and Yong (2019), Akhter and Yong (2021), Sing and Singh (2019), Tripathi et al. (2020), and Urquhartand McGroarty (2016) support AMH.

Studies regarding the existence of AMH in the Islamic capital market are academically important because the Islamic capital market has experienced significant growth over the past few years (Paltrinieri et al., 2018; Saleem & Ashfaque, 2020). A

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study on the existence of AMH in the Islamic capital market is also necessary because it can provide crucial input for investors when making investment decisions, underscoring the practical relevance of our research. Investors can set the best investment strategy in different economic conditions, including determining the extent to which the Islamic capital market faces extreme conditions, such as pandemic situations.

Several researchers have studied capital market efficiency during the COVID-19 pandemic with different results (Ammy-Driss & Garcin, 2023; Evangelos, 2021; Gu, 2023; Saleem et al., 2023; Vasileiou, 2021). Their studies show that the impact of the pandemic on capital markets varies by country, as demonstrated in the study conducted by Rodoni et al. (2022), which examined the efficiency of Islamic capital markets in Southeast Asian countries. Their study results show that Thailand's Sharia capital market was more efficient during the pandemic than in the preceding period. In contrast, the Sharia capital market in Malaysia showed the opposite condition. The results of this study highlight the adaptability of the capital market, which is efficient in certain conditions and inefficient in others, providing a reason for optimism.

However, the AMH theory is not exempt from criticism, such as that articulated by Li et al. (2021). They stated that, unlike EMH, which has become the standard use in academia and industry, AMH is a qualitative theory without a solid test method. In addition, a study conducted by Munir et al. (2022) shows that only part of the presence of AMH can be proven. The weakness of AMH has also been acknowledged by its initiator. However, Lo stated that although the AMH theory is qualitative, the implications of this theory can be used by investors and consultants to manage better investment strategies. The analysis in this study is limited to the Islamic stock index in six countries: Bangladesh, India, Malaysia, Pakistan, and Thailand, using the variance ratio test, ARIMA model, and Elman neural network..

Therefore, the novelty from this study lies in testing the efficiency of the Islamic capital market in six Asian countries: Bangladesh, India, Indonesia, Malaysia, Pakistan, and Thailand, over different periods: before, during, and after the COVID-19 pandemic. The purpose of this study is to delve into its application in the Islamic capital market, which has seen significant growth in recent years.

METHODS

Variance ratio tests are established on the principle that if stock returns exhibit a random walk, then the variance of q-differences in an uncorrelated series is q-times the variance of its first differences (Lo & MacKinlay, 1988). If there are n+1 observations, p_0 , p_1, p_2 . . ., p_n are obtained at an equal interval, 1/q of the variance P_t, P_{t-q}, is expected to be equal to the variance p_t - p_{t-1}, for a time series characterized by a random walk. To put it more simply, the variance ratio VR(q) is defined as:

$$VR(q) = \frac{\sigma^2(q)}{\sigma^2(1)}$$

If a time series data is random, then the variance of the q-difference is q times the variance of the first difference:

$$Var(p_t - p_{t-q}) = qVar(p_t - p_{t-1})$$

The variance ratio test requires a large number of data. To fulfill this requirement, the daily data was used in this study. Confidence interval for the variance ratio test in this study was 95%. If the variance ratio test score is > 5%, then the data is random and follows a random walk pattern.

ARIMA is a forecasting method. The formation of its model is based on the influence of time by using past and present data as interrelated variables. The ARIMA model consists of three parts: autoregressive (AR), moving average (MA), and integrated (I) part. The general equation of the ARIMA model is as follows:

$$Y_t = Y_{t-1} + \varphi_0 + \varphi_1(Y_{t-1} - Y_{t-2}) + \cdots + \varphi_p(Y_{t-p} - Y_{t-p-1}) - \omega_1, \varepsilon_{t-1} - \cdots - \omega_q, \varepsilon_{t-q} + \varepsilon_t$$

Where

Y_t : dependent variable at time t
ω_0 : intercept
ω_{t-p} : MA component coefficient
ε_{t-p} : previous residual value (lag)
ε_t : residual at time t

A common way to measure the stock market efficiency is by using a forecasting method. The predictability of stock prices or returns based on past data is considered an effective method to test weak-form efficiency (Lim & Brooks, 2011). One of the most popular methods to forecast time series data is recurrent neural network (RNN). A typical RNN architecture consists of input, hidden, and output layers, and has at least one context layer that has a function as a memory of the network (see Figure 1). The output of the previous cell or context layer, sometimes also called the recurrent layer, is connected back and entered as input on the hidden layer, thus resembling a chain (Dautel et al., 2020).

Elman network is one of the RNN types that is used to forecast time series data with high accuracy and better results than other traditional methods (Krichene et al., 2017; Wutsqa et al., 2014; You, 2022). A typical model of Elman network with m neurons in input layer, n neurons in hidden layer and one output is shown in Figure 2. The relationship between the input and output is given by following equation:

$$y_{t+1}(k) = \sigma\left(\sum_{j=1}^{m} v_j z_{jt}(k)\right)$$

Where z_{jt} is a set of output vector of hidden layer at time t and v_j are the weights that connect the node j in the hidden layer to the output. The output of hidden layer at time can be written as follow

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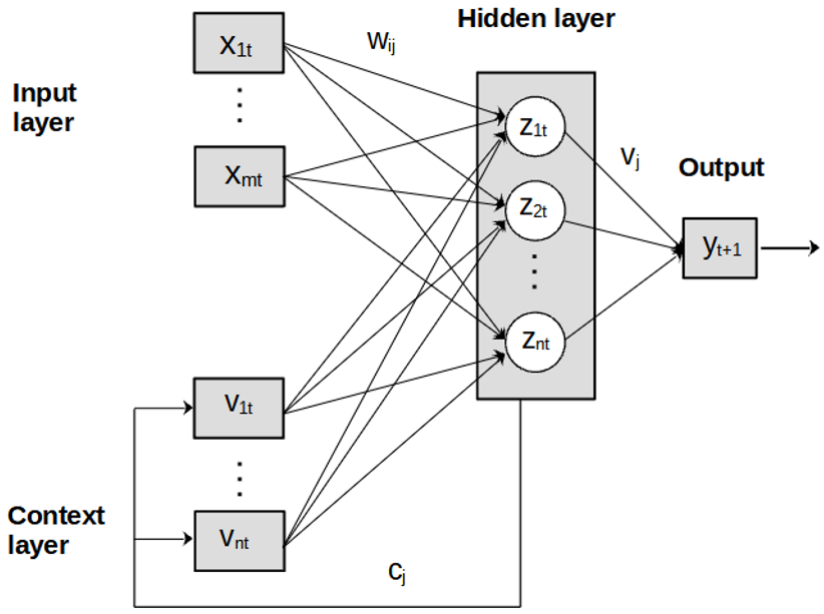
$$z_{jt}(k) = \sigma\left(\sum_{j=1}^{n} w_{ij}x_{it}(k) + \sum_{j=1}^{m} c_j z_{jt}(k-1)\right)$$

Where x_{it} is a set of input vector at time t, w_{ij} are the weights that connect the node i in the input layer to the node j in the hidden layer while c_j are the weights that connect the node j in the hidden layer to the node in context layer, and σ is a sigmoid function.

Figure 2. A typical structure of Elman Network



This study employed the Wilcoxon test to determine the significance of the stock index forecasting results obtained through the ARIMA model and Elman neural network statistical test. It is a non parametric test method to measure the significance of the difference between two groups of paired data that are not normally distributed. The confidence interval used is 95%. If the p-value is > 5%, then there is no significant difference between the stock prices predicted using the ARIMA and Elman neural network model and actual prices.

Table 1. The Data Based on Period

	Data Period	Purpose
Period 1	January, 4 2016 - November, 30 2019	Training
	December,1 2019 - December, 30 2019	Test
Period 2	Januari, 4 2020 - October, 30 2021	Training
	November, 1 2021 - November, 30 2021	Test
Period 3	Januari, 4 2022 - November, 30 2023	Training
	December,1 2023 - December, 30 2023	Test

The data for this study comprised sharia indices in six Asian countries, namely DSEX Shariah Bangladesh (DSES), Jakarta Islamic Index Indonesia (JKII), FTSE Bursa Malaysia Hijrah Shariah (FTFBMHS), Karachi Meezan 30 Pakistan (KMI30), Nifty 50 Shariah India (NI50SH), and FTSE SET Shariah Thailand (FTFSTSH). The data spanned from January 4, 2016 to December 30, 2023 and was sourced from the website www.investing.com. The data was divided into three parts, and each period was divided into two: data for training and the model for testing and validation of the ARIMA model and Elman neural network (Table 1).

RESULTS AND DISCUSSION

Table 2 shows the characteristics of the indices in the observed countries in the form of descriptive statistics. The DSES, JKII, and NI50SH indices were positively skewed during the pandemic, which indicates that the investors may expect frequent small losses and a few significant gains from the investment. Meanwhile, the FTFBMS, FTFSTSH, and KMI30 indices showed the opposite. The index NI50SH from India exhibited the highest expected return but also the most volatile index during the pandemic.

Table 2. Descriptive Statistics of Sharia Indices in six Asian Countries

Index	Period	N	Mean	Std.Dev	Max	Min	Skewness
DSES	Period 1	968	-0,00009	0,00590	0,02577	-0,02048	0,17207
	Period 2	427	0,00085	0,01211	0,10142	-0,06986	0,99725
	Period 3	414	-0,00012	0,00555	0,02972	-0,02559	-0,06283
FTFBMS	Period 1	974	-0,00002	0,00560	0,01896	-0,03365	-0,43042
	Period 2	470	0,00007	0,01031	0,05961	-0,05195	-0,31290
	Period 3	486	-0,00008	0,00758	0,03678	-0,02336	0,02648
FTFSTSH	Period 1	975	0,00025	0,00819	0,04610	-0,03779	-0,05742
	Period 2	464	0,00013	0,01576	0,10185	-0,10508	-0,97439
	Period 3	484	-0,00020	0,00723	0,02362	-0,03010	-0,04157
JKISSI	Period 1	968	0,00032	0,00823	0,02673	-0,04254	-0,29841
	Period 2	465	0,00009	0,01349	0,09073	-0,06347	0,17004
	Period 3	485	0,00030	0,00710	0,01990	-0,02840	-0,43660
KMI30	Period 1	987	0,00025	0,01253	0,05027	-0,04982	0,01287
	Period 2	473	0,00024	0,01508	0,06389	-0,07532	-0,49525
	Period 3	493	0,00079	0,01190	0,06678	-0,04610	-0,14005
NI50SH	Period 1	978	0,00048	0,01733	0,19527	-0,16076	2,00489
	Period 2	472	0,00122	0,01671	0,14218	-0,12364	0,21216
	Period 3	493	0,00015	0,00964	0,02906	-0,04362	-0,41345

Most of the indices, except for NI50SH, indicated lower expected returns during the pandemic compared to the time before and after the pandemic. This finding is in line with those of the study by M. N. Khan et al., (2024), Naseem et al. (2021), and Chundakkadan

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and Nedumparambil (2022). They found that investors' sentiment during the COVID-19 pandemic suppressed the returns of stock markets. All indices, with the exception of NI50SH, were also riskier during the pandemic than other periods. This finding is not unexpected as other studies have shown that stock markets tend to be more volatile during a crisis.

Table 3 shows the results of return's randomness test using variance ratio test. The return is said to be random if the p-value is > 0.05, and vice versa. FTFBMS and FTFSTSH were found to be efficient in all periods. Meanwhile the indices DSES, NI50SH, and KMI30, were not random in period 1. Interestingly, these indices improved in period 2, which indicates that the prices move randomly during and after the pandemic. In terms of weak-form efficiency, their performance during and after the pandemic was better than that in the previous period. Only JKII lost its randomness after the pandemic.

The test result using the Elman neural network and ARIMA model is presented in Table 4. The Wilcoxon test was the statistical method used to measure the significance of the difference between actual and predicted data using the Elman neural network and ARIMA model. This test is used as a statistical method to analyze significant differences between two groups of data that are not normally distributed. If the p-value is > 5%, then the actual stock price index is not significantly different from the stock price predicted using the Elman neural network and ARIMA model, suggesting that the market is inefficient. The prediction using the Elman network showed that DSES was the only index that proved to be efficient in all periods, while JKII was the only index that was found to be efficient in all periods according to the ARIMA model. The other indices showed different results.

Table 3. Test result using Variance Ratio Test

Index	Period	Stat	p-value
DSES	Period 1	31,6357	0,0000
	Period 2	1,3828	0,2396
	Period 3	2,3528	0,1250
FTFBMS	Period 1	1,7716	0,1830
	Period 2	0,0406	0,8400
	Period 3	1,3999	0,2360
FTFSTSH	Period 1	0,1197	0,7290
	Period 2	1,9753	0,1598
	Period 3	1,54535	0,2138
JKISSI	Period 1	0,0192	0,8890
	Period 2	0,0803	0,7760
	Period 3	4,9048	0,0267
KMI30	Period 1	16,3747	0,0000
	Period 2	1,7326	0,1880
	Period 3	1,8499	0,1730
NI50SH	Period 1	4,2777	0,0386
	Period 2	2,2210	0,1360
	Period 3	1,0407	0,3076

Table 5 provides a comprehensive overview of the test results on six Islamic indices in Asia, using three methods, with positive signs indicating efficiency and negative signs pointing to inefficiency. The use of different methods in testing the indices led to a variety of results. This diversity in outcomes was not unexpected, given the established fact that tests conducted using different methods can yield divergent results. The presence of random walk patterns and the level of stock market efficiency are notably influenced by the chosen methodology, underscoring the importance of the research process.

The results also showed that all indices exhibited different efficiency in all periods. Sharia stocks in these countries showed different degrees of efficiency following global and local events. This finding strongly supports the adaptive market hypothesis. These results align with the results of previous studies which show that there are changes in efficiency in capital markets, both in developed and emerging markets, in the short and long terms (Akhter & Yong, 2021; Boya, 2019; Cruz-Hernández & Mora-Valencia, 2024; Dos Santos et al., 2024; Munir et al., 2022; Noreen et al., 2022). Capital market efficiency always appears to coexist with market anomalies, resulting in a constant switch between efficient and inefficient conditions. Capital market inefficiency conditions are generally related to major macroeconomic factors (Boya, 2019), institutional factors (Dos Santos et al., 2024), and are conditioned to the state of the market (Tripathi et al., 2020).

Table 4. Test Result using Elman Neural Network and ARIMA Model

Index	Period	p-value	
		Elman	ARIMA
DSES	Period 1	0,6554	0,0000
	Period 2	0,0000	0,0000
	Period 3	0,0020	0,0000
FTFBMS	Period 1	0,0000	0,0000
	Period 2	0,0000	0,0000
	Period 3	0,1909	0,2024
FTFSTSH	Period 1	0,2449	0,0042
	Period 2	0,0000	0,1231
	Period 3	0,0234	0,5217
JKISSI	Period 1	0,0000	0,0000
	Period 2	0,0000	0,0000
	Period 3	0,0000	0,1850
KMI30	Period 1	0,0000	0,0000
	Period 2	0,0000	0,0000
	Period 3	0,3184	0,0532
NI50SH	Period 1	0,2894	0,9563
	Period 2	0,0000	0.9563
	Period 3	0,9193	0,0000

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Three important aspects emerge from this study. First, four indices, namely DSES, FTFBMS, JKII and KMI30, showed a good level of efficiency during the pandemic compared to the other two indices. All testing methods showed consistent results indicating that the four were efficient in weak form. Meanwhile, FTFSTSH and NI50SH were declared inefficient based on testing using the ARIMA model. Both indices also showed higher risks, represented by higher standard deviations during the pandemic compared to other indices. This indicates that investors can beat the market during the pandemic consistently. These results are in line with those of Pillai et al. (2021) and Bhatia (2022) which showed that the capital market in India was inefficient during the pandemic. The increasing expected returns in the Indian capital market during the pandemic as shown in this study was also reported by Rao et al. (2021). According to the results of their study, there was an abnormal return that occurred during the lockdown.

Second, two indices, JKII and KMI30, experienced an increase in expected returns after the pandemic ended. Interestingly, both indices experienced a decrease in the level of market efficiency. Based on testing using the variance ratio test and ARIMA model, the JKII index was declared inefficient after the pandemic. Meanwhile, the KMI30 index was declared inefficient according to the results of testing using the ARIMA model and Elman network.

Table 5. Summary of the Results

Index	Period	Variance Ratio	ARIMA	Elman Network
DSES	Period 1	-	+	-
	Period 2	+	+	+
	Period 3	+	+	+
FTFBMS	Period 1	+	+	+
	Period 2	+	+	+
	Period 3	+	-	-
FTFSTSH	Period 1	+	+	-
	Period 2	+	-	+
	Period 3	+	-	+
JKISSI	Period 1	+	+	+
	Period 2	+	+	+
	Period 3	-	-	+
KMI30	Period 1	-	+	+
	Period 2	+	+	+
	Period 3	+	-	-
NI50SH	Period 1	-	-	-
	Period 2	+	-	+
	Period 3	+	+	-

Third, a different situation occured in the DSES index. Before the pandemic, the index did not align with the random walk hypothesis. This finding is inline with the

study from Raquib & Alom (2015) which state that the stock market from Bangladesh didn't inline with EMH and not followed the Random walk model. However, from the pandemic until its end, DSES was the only one declared efficient according to the three test methods. Compared to the other five capital markets, the size of Bangladesh stock market was smaller. These results indicate that market size is not correlated with efficiency. At certain times, small capital markets can be more efficient than larger ones. This finding is in line with a study conducted by Rönkkö et al. (2024), which shows that small capital markets can be more efficient than large capital markets for a fairly long period of time.

The changes in the level of market efficiency in three different periods show that AMH can provide a better explanation than EMH. It is not only caused by market anomalies at certain times but also by the interaction between rational and irrational investors. EMH cannot explain whether rational investors cause market efficiency during a crisis. It could be rational or irrational investors who force these conditions. Fama (1965) mentioned that rational investors would eliminate the effects caused by irrational investors. Which investor type is more dominant, the rational or irrational investors, remains questionable.

The results of this study showed that the Islamic indices exhibited efficiency at certain times, while at other times, they did not follow the random walk. This finding supports the adaptive market hyptothesis. While our study provides valuable insights, it is not without limitations. One limitation is that we only tested the efficiency of Islamic indices in six Asian countries. In future research, adding more countries, not only in Asia, is suggested to see how the market efficiency evolves. This could provide a more comprehensive understanding of market efficiency in Sharia stock markets.

CONCLUSION

This study aims to analyze the existence of adaptive market hypothesis in sharia indices in six Asian countries. The results showed that all indices exhibited different degree of efficiencies. The market efficiencies were not constant, following some economic and non-economic events. As shown in previous studies, capital market efficiency is changing over time. In adjusting to new information, the market speed differs from one country to another. This study raises questions regarding the efficient market test. For example, if a capital market is said to be random during a pandemic, it could be rational or irrational

The adaptive market hypothesis (AMH) offers a new economic theory that combines principles of efficient market hypothesis and behavioral finance, and may address this issue. However, even though it is not possibleto prove the AMH's reliability with a substantial degree of certainty, it may still be employed as an early indicator whether a competition in a stock market is fair, given that no individual can constantly beat the market. The regulator can use the information to evaluate the performance of the market. Investors can enhance their investment strategies by using the information about market efficiency.

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Examining the Sustainability of Food Consumption Based on Religiosity Dimensions in Urban and Suburban Communities

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ABSTRACT

Research Originality: This study offers a new perspective on the relationship between religiosity and sustainable food consumption in urban and peri-urban communities in Lampung, Indonesia.

Research Objectives: The objective was to examine the differences in sustainable food consumption between urban and peri-urban communities, exploring the role of religious beliefs in shaping consumption behavior.

Research Methods: A quantitative approach using comparative analysis was used. Data were collected from 250 respondents using purposive sampling, analyzed through statistical tools such as the Shapiro-Wilk Normality Test and Independent Sample t-test.

Empirical Results: This study found that there were no differences in consumption behavior between urban and suburban communities with the dimensions of religiosity in the aspects of beliefs and practices. There were differences in consumption behavior between urban and suburban communities with the dimensions of religiosity in the aspects of knowledge and behavior.

Implications: This study highlights the need for policymakers and businesses to consider religious factors in promoting sustainable consumption, suggesting that urbanization and access to religious education influence food choices based on religiosity.

Keywords:
consumption behavior; religiosity; urban communities; suburban communities

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INTRODUCTION

In Indonesia, differences in food consumption patterns between urban and suburban communities are visible. Differences in access to food sources, lifestyle, and income levels influence this. Urban communities have easier access to various types of local and imported food, while suburban communities rely more on local food. There is an increasing trend among urban communities to consume organic and healthy food (Maredia et al., 2022). According to a survey from the Indonesian Organic Industry Association, sales of organic products in big cities have increased by 20% in the last five years. The Indonesian government faces challenges in ensuring sustainable food security, especially in urban areas with high dependence on food supply chains (Ma et al., 2022). Initiatives such as urban farming and fisheries are being developed to overcome this problem. The phenomenon of sustainable food consumption in Indonesia shows diverse dynamics between urban and suburban communities. The main challenge is balancing consumption needs with environmental sustainability and food security (Adeosun et al., 2022).

Issues and problems surrounding the sustainability of food consumption in urban and suburban communities in Lampung Province, Indonesia, cover several important aspects. In Lampung, there are significant differences in access to food sources between urban communities in cities such as Bandar Lampung and suburban communities in more remote areas. More infrastructure and transportation in several suburban areas are needed to obtain diverse and quality food (Seda et al., 2020). Even though Lampung is one of Sumatra's food baskets, urban communities tend to depend on imported food, which is only sometimes sustainable from an economic and environmental perspective. Climate change is seriously impacting the agricultural sector in Lampung, affecting local food production (Puigdueta et al., 2021). This condition directly impacts food availability and prices, especially for suburban communities more dependent on local food. Economic inequality between urban and suburban communities in Lampung affects their ability to access quality food. Communities with lower incomes, especially in suburban areas, are often limited to cheaper and less nutritious food (Niankara, 2023).

The gap occurs where most of the population is Muslim in Lampung Province. Halal and haram have an essential role in food consumption. However, on the other hand, urban communities have better access to information and certified halal products, while in suburban areas, this practice is more based on local traditions and beliefs. In schools and religious institutions in Lampung, religious education includes aspects of responsible and sustainable food consumption (Islam et al., 2022). This can differ between urban and suburban areas depending on the resources and curriculum followed. Urbanization in Lampung can reduce the influence of traditional and religious values in food consumption, along with the increase in modern and global lifestyles (Hayat et al., 2023). In several suburban areas of Lampung, there are limitations in fulfilling halal food due to limited resources and market access. Religious teachings influence awareness about environmental preservation and sustainable food consumption. This condition can differ between urban and suburban communities depending on the level of education and exposure to religious teachings about the environment (Dzanku et al., 2024).

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The urgency of research on the sustainability of food consumption in urban and suburban communities by paying attention to differences in the dimensions of religiosity is critical, especially in countries with cultural and religious diversity, such as Indonesia. This research can better understand how religious values influence food consumption behavior (Vanany et al., 2020). This condition is essential for designing public policies and educational programs appropriate to the local context. In many communities, religion plays a vital role in daily life, including when it comes to food choices. Understanding this can help design more effective and sustainable food strategies (Naeem et al., 2020). This research can identify how religious practices influence food security and sustainability, especially in the face of climate change, Urbanization, and economic pressures. More effective education and public awareness methods can be developed through research to promote sustainable food consumption, considering religious values (Amalia et al., 2020).

By understanding the differences in the dimensions of religiosity between urban and suburban communities, policymakers can design more inclusive food policies that are sensitive to the needs of different groups of people. This research supports global efforts to achieve the Sustainable Development Goals, mainly reducing hunger and ensuring sustainable consumption and production patterns (Hassan et al., 2020). Understanding religiosity-based consumption preferences can help support local farmers and food production, which is often more sustainable. Understanding the differences and similarities in food consumption between urban and suburban communities based on religiosity dimensions can help build social cohesion and integration between community groups (Iranmanesh et al., 2020). In the context of rapid social and economic change, this research is important for adapting sustainable food consumption practices by considering changes in the dimensions of people's religiosity (Khan et al., 2020).

Research gaps on sustainable food consumption often highlight environmental, social, and economic factors, but only some explore the dimension of religiosity as an essential element in people's consumption patterns. Previous studies have focused on issues such as food accessibility, consumption preferences, and the environmental impacts of food systems, especially in urban and suburban areas. However, the relationship between sustainable consumption and belief or religiosity factors must be discussed in depth, especially in Indonesia, which has many beliefs and cultural values. Existing studies generally ignore the influence of religious beliefs in shaping sustainable food consumption habits, even though religiosity is often a pillar in daily decision-making, including in terms of food (Utomo et al., 2020). This gap becomes even more apparent when considering the community in Lampung Province, which has cultural and religious heterogeneity.

However, more research should focus on how religiosity factors interact with sustainable food consumption decisions in urban and suburban environments. This study seeks to fill this gap by examining in depth how the dimension of religiosity influences food consumption choices and practices and how this aspect contributes to sustainable consumption in both regions. This research is expected to contribute significantly to expanding the understanding of the interaction between religiosity factors and the

sustainability of food consumption, especially in the context of society in Lampung Province (Bukhari et al., 2021).

This research focuses on the differences in the sustainability of food consumption in urban and suburban communities in the dimension of religiosity in Lampung Province. The novelty of this study lies in the approach used in exploring the sustainability of food consumption through a religious perspective, especially in urban and suburban communities in Bandar Lampung City and South Lampung Regency. Previous studies focus on the technical or practical aspects of sustainable food consumption, such as environmentally friendly behavior or efficiency in the food supply chain. However, the spiritual or religious dimension that can influence consumption decisions has yet to be a primary concern. In the context of the religiously and culturally diverse Lampung community, understanding how religious beliefs influence food consumption patterns and their relationship to sustainability is new and significant to study (Suhartanto et al., 2020).

In addition, this study also offers novelty in terms of methods that combine multidisciplinary approaches. This research combines social, religious, environmental, and economic disciplines, providing a unique multidisciplinary perspective. This study not only focuses on economic or environmental factors but also investigates how religious beliefs and practices can drive the creation of more sustainable food consumption patterns. Thus, this study can fill the gap in the existing literature and provide new insights relevant to policymakers, especially in the context of food sustainability in urban and suburban areas in Lampung Province (Memon et al., 2020).

Overall, this research offers a new and in-depth perspective on how religious values influence food consumption patterns in urban and suburban communities, especially in Lampung Province, which has not been studied much before. This study significantly contributes to the existing literature and can guide policymakers in developing more inclusive and sustainable food strategies.

METHODS

This study uses a quantitative methodology with comparative techniques to compare food consumption behavior in the context of religiosity in urban and suburban communities in Lampung Province. This methodology involves systematic collection and analysis of numerical data to understand the patterns of differences between the two groups of people. Data is taken based on five primary factors influencing food consumption behavior in the dimension of religiosity: aspects of belief, knowledge, practice, behavior, and their overall effect on consumption sustainability. These aspects are designed to dig deeper into how religious beliefs influence people's consumption decisions in both regions so that researchers can identify which variables are most significant in influencing food consumption sustainability.

Over the course of two years, from January 2022 to December 2023, this study meticulously gathered data from residents of 15 districts/cities in Lampung Province, which has a population of 9,176,546 people. The sampling approach used a purposive

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sampling technique, which means that researchers selected respondents who met certain criteria. These criteria include urban communities residing in Bandar Lampung City and suburban communities residing in South Lampung Regency, with an age range of 18 to 55 years. In addition, the selected respondents have a minimum education level of high school to Masters and a monthly income of between IDR 1,000,000.00 to more than IDR 5,000,000.00. These criteria are set to ensure that respondents have sufficient understanding of the sustainability of food consumption and the relevance of religiosity in their daily lives. Respondents were selected from two geographically different areas, namely urban communities in Bandar Lampung City and suburban communities in South Lampung Regency. The selection of these two areas is important to assess how geographical differences affect food consumption behavior related to religiosity.

The selected respondents were between 18 and 55 years old, a productive age group considered to have a significant influence on consumption decision-making, including sustainability and religiosity. Respondents must have a minimum education level of high school to Master. This criterion was chosen to ensure that respondents adequately understand issues related to sustainable consumption and the relevance of religiosity in everyday life. The selected respondents have an income of between IDR 1,000,000.00 to more than IDR 5,000,000.00 per month to capture variations in consumption behavior based on economic capacity. Income often influences consumption patterns, especially regarding accessibility to halal and ethical products.

In this study, 250 respondents were selected who were considered representative to provide a valid and reliable picture of food consumption patterns and the influence of religiosity. The research instrument used was a questionnaire distributed via Google Forms, using the Likert Scale as a measuring tool. The Likert Scale, a precise tool, is used to assess the intensity of religious beliefs, knowledge, practices, and behaviors in relation to the sustainability of food consumption. Through this approach, the study attempts to describe the differences in the dimensions of religiosity in sustainable food consumption between urban and suburban communities in Lampung Province. A sample size of 250 is considered representative enough to provide a valid and reliable picture of food consumption behavior, especially in a comparative study like this. The selection of a sample of this size allows researchers to conduct relevant statistical tests, such as a test of differences between the two groups of people studied (urban and suburban communities), without revealing the accuracy of the results. The use of a sample of 250 respondents also takes into account the diversity of the population in Lampung Province, which has a population of 9,176,546 people spread across 15 districts/cities. This sample is considered sufficient to capture variations in consumption behavior caused by differences in levels of religiosity, access to information, education, and socio-economic conditions in the two regions.

Normality Test helps understand how well the data is distributed. When data follows a normal distribution, estimates of population parameters such as mean, variance and regression coefficient will be more accurate and confident that the estimation results are close to the actual value. Not performing a Normality Test or ignoring it

can result in bias in statistical analysis. The Shapiro-Wilk Normality Test is based on a test statistic specifically designed to measure the degree to which a data sample fits a normal distribution. This statistic is referred to as the Shapiro-Wilk test statistic. One of the main advantages of this method is its sensitivity to deviations from the normal distribution. In other words, if there is even a slight deviation from normality in a data sample, the Shapiro-Wilk Test will detect it. If the Shapiro-Wilk Test results show that the Sig. greater than 0.05, then this indicates that the data has sufficient statistical evidence to accept that the data follows a normal distribution. The validity test is to measure the extent to which an instrument or measurement tool really measures what it is intended to measure. By testing validity, researchers can ensure that the measuring instruments used are appropriate to the concept or variable they want to measure. A significance value that is smaller than the predetermined alpha (α) (0.05) indicates that there is sufficient statistical evidence to support the validity of the measuring tool or instrument.

Table 1. Operational Definition of Variables

No.	Variable	Dimensions	Indicator	Scale
1.	Consumption Behavior in the Dimension of Religiosity	Aspects of Belief	The Influence of Religion on Hygiene, namely the extent to which religious beliefs influence individual hygiene in choosing healthy products and food.	Likert
		Knowledge Aspect	Religious Friendly Product Selection where individuals prefer products or brands that meet their religious requirements.	Likert
		Practical Aspects	Consumption of Halal Products where individuals consistently choose products or services that have been certified as halal in accordance with their religious beliefs.	Likert
		Behavioral Aspects	Consumer Ethics where individuals avoid waste in their consumption as a form of religious ethics.	Likert

Reliability testing is to measure the extent to which a measurement tool or instrument can be relied upon and consistently measure the same concept or variable in each different measurement or data collection. If the Cronbach's Alpha value is greater than 0.60, then the instrument is considered to have a good level of internal reliability or sufficient consistency. Independent Sample t-Test, also known as independent sample t-test, is a statistical analysis technique used to compare the means of two groups that are unrelated or independent of each other. This test is used when having two groups of data that are completely independent of each other. This means that data in one group is not related to data in other groups. This p-value is often referred to as the Significance value (Sig.). If the Sig value. less than the previously determined significance level (namely 0.05), then we conclude that there is a significant difference between the two groups of data.

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RESULTS AND DISCUSSION

Respondent characteristics in this study include various relevant demographic aspects. Respondent characteristics serve as a basis for analyzing behavioral patterns or perceptions in research because these variables often influence individuals' attitudes, decisions, and actions. Table 2 provides an overview of the characteristics of respondents. Based on the education level of respondents, it is known that 8.4% of urban residents have a high school education, 13.6% have a Diploma education, 46.8% have a Bachelor's degree (S1) and 31.2% have a Postgraduate (S2) education, while the education level of community respondents Suburban 35.6% have a high school education, 17.6% have a diploma, 38.4% have a bachelor's degree (S1) and 3.8% have a postgraduate (S2) education.

Table 2. Sample Characteristics

No.	Social and Demographic Characteristics		Urban Society		Suburban Society	
			Number of Respondents	Percentage (%)	Number of Respondents	Percentage (%)
1.	Education	Senior High School	21	8.4%	89	35.6%
		Diploma	34	13.6%	44	17.6%
		Bachelor degree)	117	46.8%	96	38.4%
		Strata (S2)	78	31.2%	12	4.8%
2.	Age	18 - 25 years old	48	19.2%	79	31.6%
		26-35 years old	136	54.4%	98	39.2%
		36-45 years old	60	24%	137	54.8%
		> 46 Years	6	2.4%	15	6%
3.	Gender	Man	108	43.2%	62	24.8%
		Woman	142	56.8%	188	75.2%
4.	Work	Private sector employee	89	35.6%	52	20.8%
		State Civil Apparatus	59	23.6%	4	1.6%
		Self-employed	46	18.4%	73	29.2%
		Housewife	22	8.8%	105	42%
		Teacher	24	9.6%	14	5.6%
		Etc	10	4%	2	0.8%
5.	Income	Rp. 1,000,000 - Rp. 2,000,000	18	7.2%	101	40.4%
		Rp. 2,00,001 - Rp. 3,000,000	75	30%	89	35.6%
		Rp. 3,00,001 - Rp. 4,000,000	87	34.8%	48	19.2%
		Rp. 4,00,001 - Rp. 5,000,000	56	22.4%	10	4%
		> Rp. 5,000,000	14	5.6%	2	0.8%

Based on the analysis of participant ages, it can be seen that the 26 to 35-year age group constitutes the majority of respondents from urban communities, namely around 54.4% of the total sample, while the 36 to 45-year age group constitutes the majority of respondents from suburban communities, namely around 54.8% of the total sample. Based on gender, the majority of urban community respondents were women, namely 56.8% of the total responses, and in suburban communities, some of the respondents were women, namely 75.2% of the total responses. If we look at the income aspect, most respondents from urban communities generate income in Rupiah (IDR) 3.00.001 - 4,000.000, reaching 34.8%. In contrast, most respondents from suburban communities generate income in Rupiah (IDR). 2,00,001 – 3.000.000, reaching 35.6% of the total responses.

Based on data from the characteristics of the respondents obtained, the respondents' education level shows a significant difference between urban and suburban communities. In urban areas, most respondents (46.8%) have a bachelor's degree (S1), while in suburban communities, the most significant percentage of respondents (35.6%) only have a high school education. This data reflects that urban communities generally have higher access to education than suburban communities, which can affect their food consumption preferences, especially related to awareness of the aspects of desire and religious values in food consumption. Regarding age, most respondents are in the 26 to 35-year age group (54.4%), while in the suburbs, most respondents are in the 36 to 45-year age group (54.8%). This age group shows that most respondents in both areas are of productive age and have an active role in making family consumption decisions.

Table 3. Normality Test Results Shapiro-Wilk Consumption Behavior of Urban and Suburban Communities with Religiosity Dimensions

		Statistics	Sig
Aspects of Belief	Consumption_Behavior_Dimension_Religiosity_Urban_Society	.109	.144
	Consumption_Behavior_Dimension_Religiosity_Sub_Urban_Communities	.098	.201
Knowledge Aspect	Consumption_Behavior_Dimension_Religiosity_Urban_Society	.114	.173
	Consumption_Behavior_Dimension_Religiosity_Sub_Urban_Communities	.131	.094
Practical Aspects	Consumption_Behavior_Dimension_Religiosity_Urban_Society	.211	.154
	Consumption_Behavior_Dimension_Religiosity_Sub_Urban_Communities	.184	.148
Behavioral Aspects	Consumption_Behavior_Dimension_Religiosity_Urban_Society	.139	.130
	Consumption_Behavior_Dimension_Religiosity_Sub_Urban_Communities	.156	.097

Source: Data Processing (2023)

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In this context, the religious values adopted by individuals of productive age can influence their decisions regarding the food they consume, including awareness of halal and tayyib and aspects of the desire to carry out daily consumption practices. In addition, differences are also seen in terms of income. Most respondents from urban communities have a monthly income of IDR 3,000,001 to 4,000,000 (34.8%), while most suburban respondents have a lower income, namely in the IDR 2,000,001 to 3,000,000 (35.6%). This difference in income can affect purchasing power and consumption preferences, where people with higher incomes tend to have greater access to more varied and sustainable foods following their religious values.

Normality tests help ensure that results found in a sample can be generalized to the population if normality assumptions are fulfilled. The normality test is used to detect outliers or extreme data that influence the analysis results. One of the main goals of a normality test is to ensure that the basic assumptions of a normal distribution are fulfilled. Knowing whether the data is normally distributed can identify the risk of misinterpretation or wrong conclusions in the analysis. Thus, the purpose of carrying out a normality test is to ensure that the basic assumptions of a normal distribution are fulfilled so that the statistical analysis results are more reliable.

Suppose we apply the test shapiro-wilk Based on data on the consumption behavior of urban and suburban communities with the religiosity dimension in Table 3. In that case, all aspects of belief, knowledge, practice, and behavior have sig values greater than 0.05, indicating that the data is normally distributed. These results can also confirm that the data on the consumption behavior dimension of religiosity is suitable for use in research.

Table 4. Validity Test Results Consumption Behavior of Urban and Suburban Communities with Religiosity Dimensions

	items	Sig. (2-tailed)	Information
Consumption_Behavior_Dimension_Religiosity_ Urban_Society	DR1	0.002	Valid
	DR2	0.000	Valid
	DR3	0.000	Valid
	DR4	0.001	Valid
Consumption_Behavior_Dimension_Religiosity_ Sub_Urban_Communities	DR1	0.000	Valid
	DR2	0,000	Valid
	DR3	0.002	Valid
	DR4	0.001	Valid

Source: Data Processing (2023)

The validity test results in Table 4, which are presented regarding the consumption behavior of urban and suburban communities with the religiosity dimension, show that all indicators obtained a value below 0.05 based on Sig. (2-tailed). This result indicates that the instruments or indicators used to measure the dimensions of religiosity have been proven valid in the context of this research. This result means the instrument measures what is expected.

The results of the reliability test in Table 5, which are presented regarding the consumption behavior of urban communities with the dimension of religiosity, show the value of Cronbach's alpha with a figure of 0.850 and Suburban society's consumption behavior with the dimension of religiosity shows values Cronbach's alpha with the number 0.722 where this number exceeds the minimum limit of 0.60. The instruments or measurement tools used in research are reliable. In this context, good reliability indicates that the instrument is reliable or consistent in measuring the concept or variable it wants to measure. A good level of reliability shows that the measurement instrument provides consistent results if used repeatedly. This result means that if the public consumption behavior instrument with the religiosity dimension is used to measure the same variable in different objects, namely urban and suburban communities, the results tend to be similar.

Table 5. Reliability Test Results Consumption Behavior of Urban and Suburban Communities with Religiosity Dimensions

	Cronbach's Alpha	Information
Consumption_Behavior_Dimension_Religiosity_Urban_Society	0.850	Reliable
Consumption_Behavior_Dimension_Religiosity_Sub_Urban_ Communities	0.722	Reliable

Source: 2023 Data Processing Results

The empirical findings show that the significance value (sig) is 0.175 in the comparative test of urban and suburban consumption behavior about the religiosity dimension in the belief aspect in Lampung Province. With a sig value greater than 0.05, it can be concluded that there is no significant difference between the consumption behavior of urban communities in Bandar Lampung City and suburban communities in South Lampung Regency based on their belief aspects. This result means that urban and suburban communities have relatively similar consumption behavior patterns when influenced by the religiosity dimension in the belief aspect. This finding indicates that the belief aspect in religiosity has a strong and uniform influence on people's consumption behavior in both regions. Lampung Province, which is predominantly Muslim, shows similarities in religious values and views that encourage people in urban and suburban areas to adopt consumption behavior that is in accordance with their beliefs. In this case, the similarities in consumption behavior between the two groups reflect that their religious beliefs are a more dominant binding factor than other geographical or socio-economic factors.

Furthermore, the uniformity of this consumption behavior can also be linked to firm and even religious culture and norms throughout Lampung Province. In Bandar Lampung City, the urban center, and South Lampung Regency, which is more remote, people have equal access to religious education, information, and products that support adherence to their religious beliefs. Awareness and understanding of the importance of adhering to religious teachings regarding consuming goods and services are similar in both areas, so

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there is no significant variation in consumption behavior between urban and suburban communities. In addition, the development of technology and increasingly equitable access to information also support the homogeneity of this consumption behavior. People in urban and suburban areas in Lampung, regardless of differences in infrastructure, now have almost equal access to information about the importance of consistency in practicing religious beliefs. Information about products based on religious values, such as halal food or other ethical products, is now more easily accessible to all levels of society. This condition ultimately strengthens the finding that the dimension of religiosity in the aspect of belief does not cause significant differences in consumption behavior between urban and suburban communities in Lampung Province.

Table 6. Comparison Test ResultsIndependent Sample T-Test Consumption Behavior of Urban and Suburban Communities with Religiosity Dimensions

		Sig. (2-tailed)	Information
Aspects of Belief	Consumption_Behavior_Dimension_ Religiosity_Urban_Society Consumption_Behavior_Dimension_ Religiosity_Sub_Urban_Communities	0.175	No difference
Knowledge Aspect	Consumption_Behavior_Dimension_ Religiosity_Urban_Society Consumption_Behavior_Dimension_ Religiosity_Sub_Urban_Communities	0,000	There is a difference
Practical Aspects	Consumption_Behavior_Dimension_ Religiosity_Urban_Society Consumption_Behavior_Dimension_ Religiosity_Sub_Urban_Communities	0.247	No difference
Behavioral Aspects	Consumption_Behavior_Dimension_ Religiosity_Urban_Society Consumption_Behavior_Dimension_ Religiosity_Sub_Urban_Communities	0.003	There is a difference

Source: 2023 Data Processing Results

In the context of macroeconomics, especially related to deflation and recession, an analysis of people's consumption behavior in the dimension of religiosity can provide valuable insights. During an economic recession, people's purchasing power generally decreases, and consumption patterns tend to change. However, in conditions where religious beliefs are the main driving factor of consumption behavior, as found in this study, the impact of economic recession on consumption behavior can be minimized. A decrease in demand for non-essential consumer goods or not following religious values may occur during a recession. However, products that follow religious teachings, such as halal food, will still be consumed consistently. This is because religious values continue to function as a basis for making consumption decisions, even when external economic factors, such as deflation or recession, affect the market. In other words, in challenging economic conditions, people who are influenced by religious beliefs may

be more likely to maintain their consumption patterns than follow religious principles. Deflation, characterized by falling prices of goods, will change people's consumption patterns in general but does not always affect consumption decisions based on religious values. This study shows that despite the decline in prices or economic contraction, the consumption behavior of the Lampung community, both in urban and suburban areas, remains uniform because their religious beliefs influence it. This shows that religiosity can act as a social stabilizer in maintaining the consistency of consumption behavior amidst economic instability.

Nassè et al. (2020) found that religiosity significantly impacts consumer preferences for halal products. This result suggests that consumers with high levels of religiosity tend to have uniform consumption patterns, regardless of their geographic context, which aligns with the study results, which found no significant differences between urban and suburban communities. Research supported by Arli et al. (2022) found that consumers' intrinsic religiosity significantly influences ethical behavior through the ethical ideology they adhere to. Religiosity plays a role in shaping consumption behavior that is following religious beliefs. This is relevant to the finding that people's consumption behavior, both urban and suburban, is influenced by their beliefs. The results of the study by Roy et al. (2024) show that religiosity is an important factor in guiding consumption behavior, which is in line with the study's findings, which shows consistency in consumption behavior between urban and suburban communities regarding religious beliefs. Theory of Reasoned Action (TRA) by Martin Fishbein and Icek Ajzen in 1967 explained that individual behavior is determined by the intention to perform a certain behavior, which is influenced by the individual's attitude towards the behavior and the prevailing subjective norms. TRA states that a person's belief or trust about the consequences of an action influences their intention to act, ultimately influencing their behavior. In the context of religiosity in the aspect of belief, urban and suburban communities with strong religious beliefs tend to have similar consumption behavior because the religious norms they adhere to influence their consumption intentions and behavior uniformly (Abdulkadir, 2022).

Overall, the position of the results of this study lies in the disclosure that the dimensions of religiosity, especially the aspect of belief, have a significant and consistent influence on consumption behavior, even beyond geographical and socio-economic factors. In an economy experiencing deflation or recession, consumption behavior guided by religious values remains stable and shows stronger resilience than consumption behavior driven solely by economic factors. This study found that the belief in religiosity does not cause significant differences in consumption behavior between urban and suburban communities in Lampung Province. This is supported by other studies that show that religiosity has a consistent and significant influence in shaping consumption behavior, regardless of geographic context.

The empirical findings show that the significance value (sig) is 0.000 in the comparative test of urban and suburban consumption behavior with the dimension of religiosity in the knowledge aspect in Lampung Province. With a sig value smaller than

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0.05, there is a significant difference in consumption behavior between urban communities in Bandar Lampung City and suburban communities in South Lampung Regency based on the dimension of religiosity in the knowledge aspect. This shows that understanding and knowledge related to religious teachings related to consumption affect the behavior of the two groups differently. The level of access and exposure to higher information in urban areas influences the difference. Urban communities, such as Bandar Lampung City, tend to have better access to educational resources, media, and technology that provide broader information related to religious values and their application in everyday life, including consumption. More profound knowledge of products that are in accordance with religious principles, such as halal and ethical products, allows urban communities to be more selective in choosing the goods and services they consume. In contrast, suburban communities in South Lampung Regency have more limited access to detailed religious information and education, which affects their knowledge regarding consumption that is in line with religious values.

Although they also hold fast to religious beliefs, limited access to relevant information can make their consumption behavior different from that of urban communities. For example, they are less aware of more specific details about products that meet certain religious standards. Hence, their consumption behavior tends to be more straightforward and less influenced by the religiosity dimension in the knowledge aspect. In addition, this difference in consumption behavior can also reflect differences in lifestyle between urban and suburban communities. Urban communities are more exposed to the dynamics of globalization and modernization, which encourages them to be more careful in choosing products based on the religious values they understand through extensive education and information. In contrast, suburban communities prioritize basic needs without considering too much detail of religious knowledge in making consumption decisions. Overall, these results indicate that the knowledge dimension in religiosity plays an important role in differentiating consumption behavior between urban and suburban communities in Lampung Province.

People's consumption behavior tends to change in the context of the economy, especially during deflation or economic recession. During deflation, prices of goods fall, which should increase consumer purchasing power. However, in a society influenced by religiosity, especially in the dimension of religious knowledge, price changes do not always directly affect consumption behavior. Deeper knowledge of religious teachings, as found in urban communities, will encourage more selective consumption behavior and be oriented towards religious values, even though the price of goods falls. Conversely, when people's purchasing power decreases in a recession, consumption behavior may be prioritized on basic needs. However, for people with a high level of religious knowledge, religious teachings still influence consumption choices. Urban communities with broader access to religious education and information may consistently choose products based on their beliefs, even amid difficult economic situations. They still tend to choose halal and ethical products, even though the price of other goods may be more affordable. On the other hand, suburban communities with more limited access to religious information

may tend to focus more on basic needs and prioritize religious aspects less in their consumption choices during deflation or recession. They do not have enough information to make consumption decisions that align with religious principles in depth, so prevailing economic conditions drive their consumption behavior.

The study (Floren et al., 2020) examines the impact of religiosity on Muslim consumer behavior, indicating that religious knowledge significantly influences consumption choices. Higher knowledge of Islamic law causes consumers to be more selective in choosing products. This supports the finding that urban communities with better religious knowledge can show different consumption behaviors than suburban communities. The research support (Junaidi, 2021) highlights how Muslim consumers' religious knowledge influences their product preferences. Consumers who are more knowledgeable about halal rules are more likely to purchase products according to their knowledge. This is relevant to the differences between urban and suburban communities based on the knowledge dimension of religiosity. The study (Santovito et al., 2023) concludes that religious knowledge influences consumer behavior in choosing food products that are by religious beliefs. Consumers with higher religious knowledge are more stringent in ensuring that the products they consume meet religious requirements.

Social Cognitive Theory (SCT) by Albert Bandura in 1986 emphasized that the interaction between the individual, the environment, and behavior influences learning and behavior. One of the core concepts of this theory is self-efficacy, which refers to a person's belief in their ability to perform a specific action. In the context of religiosity and consumption, urban communities with greater access to religious knowledge and education may have higher self-efficacy in applying religious teachings to their consumption behavior. This condition means they are more likely to implement religious rules and norms in their consumption choices than suburban communities with limited access to such knowledge (Mirkhah et al., 2020). The results of this study occupy an important position in the literature that examines the relationship between religiosity and consumption behavior, especially in the context of differences in geographical areas and access to information. The finding that religious knowledge plays a significant role in differentiating the consumption behavior of urban and suburban communities provides a new contribution to understanding how dimensions of religiosity influence consumption decisions, especially in areas with different access to information. In economics, this study also offers insights into how religious knowledge can mitigate the impact of deflation and economic recession on consumption behavior. Communities with higher religious knowledge tend to maintain consistent consumption principles, even when the economy is unstable. This proves that religiosity can be a social stabilizing factor in maintaining consistent consumption behavior, even in a volatile economic environment.

The empirical findings show that the significance value (sig) is 0.247 in the comparative test of urban and suburban consumption behavior about the dimensions of religiosity in the practical aspect of Lampung Province. With a sig value greater than

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0.05, it can be concluded that there is no significant difference between the consumption behavior of urban communities in Bandar Lampung City and suburban communities in South Lampung Regency based on the practical aspect of their religiosity. The practical aspect of religiosity includes real actions and behaviors based on religious teachings, such as the habit of choosing products that follow religious rules, including halal or ethical goods. The similarity in consumption behavior can be interpreted as the urban and suburban communities in Lampung Province having a similar approach to applying religious teachings in everyday life, especially in consumption. This result shows that both groups have the same level of compliance with religious rules that influence their consumption behavior. In the context of religiosity in the practical aspect, both urban and suburban communities integrate religious teachings into their consumption decisions without any striking differences. This result reflects consistency in applying religious values, regardless of geographical differences.

One factor that explains this similarity is the relatively equal access to religious guidance and information on the practical application of religious teachings in urban and suburban areas. Despite differences in infrastructure and economic development, public awareness of the importance of implementing religious teachings in consumption behavior remains strong and evenly distributed throughout Lampung Province. Religious values such as the importance of product halalness and consumption ethics have been embedded in people's daily lives, which explains why their consumption behavior is relatively similar. In addition, the homogeneity of culture and religious norms in Lampung Province, where the majority of the population is Muslim, also plays a role in this similarity in behavior. The habit of applying religious principles practically in consumption activities is widely accepted and consistently carried out by people in both regions. Thus, it can be concluded that the practical aspect of religiosity plays an important role in shaping people's consumption behavior but does not trigger differences between urban and suburban communities in Lampung Province.

In economics, especially in deflation or recession, people's consumption patterns can change due to economic pressures. In times of deflation, where prices of goods decrease, consumers may be encouraged to buy more affordable goods. However, in the context of religiosity in the practical aspect, where consumption behavior is based on adherence to religious teachings, such as choosing halal and ethical products, price reductions do not always directly impact changes in consumption patterns. Public awareness of the importance of consuming products by religious principles, both in urban and suburban areas, may be stronger than the incentive of lower prices. In conditions of recession, where people's purchasing power decreases, consumption behavior is generally more focused on basic needs.

However, in societies that are influenced by religiosity in the practical aspect, consumption, that is, by religious teachings, remains a priority, even though purchasing power is limited. Communities that integrate religious values into their consumption tend to prioritize products that meet religious rules, even though economic conditions pressure

them to be more economical or selective. This result shows that in situations of deflation or recession, the consumption behavior of urban and suburban communities in Lampung Province remains consistent because economic factors and adherence to religious values influence their consumption decisions. Economic conditions may influence how much goods are purchased, but consumption behavior remains stable when choosing products that align with religious principles.

The study (Akhtar et al., 2020) shows that the influence of religiosity on consumer behavior can be similar across locations. The study (Orellano et al., 2020) found that Islam influences consumer choices regarding products and services, especially in the context of Sharia norms. The study supports that religiosity generally influences consumption decisions, but its influence on practical aspects tends to be uniform across locations. Research support (Alsaad et al., 2021) found that religiosity can influence ethical consumption through consumers' perceptions of efficacy, supporting the conclusion that religious practices play a role in consumption decisions without significant differences across regions. The Hunt-Vitell Theory of Ethics by Shelby Hunt and Scott Vitell in 1986 focuses on how individuals make ethical decisions, considering two main components: deontological (obligation) and teleological (outcome) ideologies. In the context of religiosity, this theory is used to understand how people in urban and suburban areas use their religious norms in making consumption decisions. Because the religious teachings that underlie ethical values are similar in both areas, consumption decisions also do not show significant differences (Nurhayati et al., 2020). This study is important in the relationship between religiosity and consumption behavior.

The finding that the practical aspect of religiosity does not trigger significant differences between urban and suburban communities adds to the understanding of how religious norms influence consumption. This result also strengthens the literature stating that religiosity plays a major role in ethical consumption decisions, regardless of geographic factors. In an economic context, this finding provides insight that although economic pressures such as deflation and recession can affect people's purchasing power, consumption behavior based on religious teachings remains stable. This result highlights the role of religiosity as a stabilizer in consumption behavior amidst fluctuating economic dynamics. Overall, this study shows that religiosity, especially in the practical aspect, is a strong and uniform factor in shaping people's consumption behavior in urban and suburban areas. However, economic conditions or geographic factors can influence other aspects of their economic behavior.

The empirical findings show that the significance value (sig) is 0.003 in the comparative test of urban and suburban consumption behavior with the dimension of religiosity in the behavioral aspect in Lampung Province. With a sig value smaller than 0.05, there is a significant difference between the consumption behavior of urban communities in Bandar Lampung City and suburban communities in South Lampung Regency based on the dimension of religiosity in the behavioral aspect. This result means that real actions or manifestations of religious beliefs, reflected in daily consumption behavior, differ between communities in the two regions. This difference can be explained

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by variations in social, economic, and accessibility contexts that influence how urban and suburban communities apply their religious values in consumption practices. Urban communities in Bandar Lampung City may be more exposed to more diverse modern consumption trends and more critical in choosing products based on their religious principles. They may have better access to information about halal products, as well as more choices of goods that support strict religious practices. In contrast, suburban communities in South Lampung Regency may have more limited access to various products and information, so their consumption behavior may differ in its application, although still based on religious principles.

Furthermore, different lifestyles between urban and suburban communities may also play a role in influencing consumption behavior. Urban communities, who often live in more modern and dynamic environments, may be more involved in activities that influence how they consume, such as more explicitly choosing more environmentally friendly products or products that support religious values. On the other hand, suburban communities may focus more on basic consumption needs and prioritize products that are more affordable and easily accessible. However, they still consider aspects of religiosity in their consumption decisions. These significant differences indicate that although religious values remain the primary guideline in consumption behavior in both areas, applying these aspects in daily practice may differ due to the influence of the social and economic environment. Factors such as access to information, product availability, and social dynamics in urban and suburban environments are key elements that trigger these differences. However, both are still based on the same principles of religiosity.

During deflation and economic recession, people's consumption behavior can experience significant changes. Deflation, which is characterized by a decrease in the price of goods, may encourage consumers to buy more goods because their purchasing power increases. However, in the context of religiosity, more selective consumers, such as those in urban communities, still adhere to religious principles in choosing products, even though the price of goods decreases. This means that despite an economic incentive to buy more, urban communities that are more critical in choosing halal and ethical products wait to respond to price decreases with significant changes in consumption patterns. On the contrary, in recessionary conditions, where people's purchasing power decreases, suburban communities more focused on basic needs are encouraged to choose cheaper and more affordable products without paying too much attention to stricter aspects of religiosity. While urban communities still maintain consumption standards that follow religious principles, suburban communities under greater economic pressure tend to make consumption decisions based on the price and availability of products, even though they still consider religious norms.

Research (Bukhari et al., 2020) provides facts that religiosity influences purchasing preferences for imported products in a religious context, especially for Muslim consumers. Research findings support (Hong et al., 2020) found that the availability of halal products in China is quite limited, and consumers who are more loyal to their faith and have

experience purchasing halal personal care products are willing to pay more for them. Research supports (Chukwu et al., 2022) that religiosity drives purchasing decisions based on religious norms, including in the consumption of ethical products. Theory of Planned Behavior (TPB) by Icek Ajzen in 1985 explains that individual behavior is influenced by three main components: attitudes toward behavior, subjective norms, and perceived behavioral control.

In the context of religiosity in the behavioral aspect, TPB helps to understand that people's consumption behavior is influenced by their attitudes toward religious teachings, social norms that apply in their environment, and perceptions of their ability to apply these religious teachings in consumption decisions. The finding that differences in consumption behavior between urban and suburban communities can be explained through differences in social norms and perceived behavioral control. This theory supports the finding that different social norms in urban and suburban areas can cause differences in consumption behavior (Vanany et al., 2020).

In this regard, the position of this study strengthens the literature by showing that religiosity not only influences consumption decisions in general but also that the impact of religiosity can vary depending on the context of social, economic, and accessibility. In the context of an economy experiencing deflation or recession, this study also provides insight into how consumption behavior based on religious values may be more stable in urban communities with better access to information and products that align with religious norms. On the other hand, suburban communities that face more significant economic pressures may have to balance their religious principles and economic needs.

CONCLUSION

The conclusion of this study shows differences in the consumption behavior of urban and suburban communities in Lampung Province based on the dimensions of religiosity in several aspects. There are no significant differences in belief and practical aspects, where people in both regions tend to have similar views and practices in implementing religious teachings in consumption, such as choosing halal or ethical products. However, there are significant differences in the aspects of knowledge and behavior. Urban communities in Bandar Lampung City have more comprehensive access to information and products, which makes them more critical and selective in implementing religious values in consumption. In contrast, suburban communities in South Lampung Regency tend to have limited access and exposure to information that influences their consumption behavior differently.

Based on the research findings, the policy recommendations that can be taken are to strengthen access to information and education related to halal and ethical products in suburban areas. The government, through cooperation with religious institutions and community organizations, needs to increase socialization and campaigns related to the importance of consumption in accordance with religious values, especially in areas

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that have limited access to products and information. In addition, it is necessary to develop infrastructure that supports the distribution of halal and ethical products so that suburban communities have the same access as urban communities. In the long term, this policy will not only strengthen religious awareness in consumption, but also support the sustainability of food consumption in accordance with religious principles throughout Lampung Province. The successful implementation of these recommendations relies on the active participation and collaboration of all stakeholders, including the audience. Thus, differences in consumption behavior between urban and suburban communities can be minimized, and the sustainability of food consumption based on religious values can be realized more evenly. Your role in this process is crucial and your efforts will be instrumental in achieving these goals.

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Determinants of Paying Zakat Through E-Zakat in Tarakan

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ABSTRACT

Research Originality: The existence of adequate infrastructure, especially in the Tarakan City area, makes the author utilize the integration of the conceptual approaches of the Technology Acceptance Model and the Theory of Planned

Research Objectives: This study aims to analyze the influence of variables from the Technology Acceptance Model (TAM) theory and the Theory of Planned Behavior (TPB) on the interest in paying zakat, infaq, and alms through e-zakat.

Research Methods: This study uses primary data from the distribution of questionnaires using the purposive sampling method with 111 respondents who are Muslim and domiciled in Tarakan City. The research method is the Structural Equation Model (SEM) Partial Least Square (PLS) approach.

Empirical Results: The results obtained that attitudes and behavioral control have a significant influence on the interest in use, while the perception of usefulness, perception of ease, and subjective norms do not have a significant influence on the interest in paying zakat, infaq, and alms through e -zakat.

Implications: The community still feels comfortable and easy to pay ZIS directly and the presence of people close to them or the surrounding environment has not fully provided confidence to the Muslim community of Tarakan City to use e-zakat as a payment service.

Keywords:

zakat digital payment; theory of acceptance model; theory of planned behavior

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INTRODUCTION

Digital technology's development has drastically changed today's society's lifestyle. The Association of Internet Service Providers provides report data that internet usage in Indonesia will reach 210 million people in the period 2021-2022 or 77.02 percent of the total population of Indonesia (Association of Indonesian Internet Service Providers, 2022). The widespread use of technology in society provides a significant opportunity to encourage zakat payments. The digital era answers BAZNAS' call for innovation policies in collecting zakat funds closely related to information technology systems (Astuti & Prijanto, 2021; Anindya & Pimada, 2023).

Digitalization of zakat is being continuously pursued because one of the aims of online zakat services is to make it easier for people to pay ZIS (Zakat, Infaq, and Alms) at flexible times and places. The collection of zakat, infaq, and alms in the last five years has experienced a positive trend, as shown in the following data in Table 1.

Table 1. National ZIS Collection

Year	ZIS Collection Amount (Trillion)
2019	10.23
2020	12.50
2021	14,12
2022	22.48
2023	33.00

Source: Puskas BAZNAS (2024)

Data from Puskas BAZNAS, 2024 shows that the collection of National ZIS funds for the 208-2023 period has a positive trend, or the realization of the collection has increased. However, the projected potential for zakat is 327.6 trillion, so from the total collection achievement in 2023, which is 33 trillion, only 10% of the potential zakat should be (Puskas BAZNAS, 2024). Zakat plays a significant role on Indonesia's economic recovery after pandemic (Ascarya, 2022; Hassan, 2015; Mawardi et al., 2023; Shuaib & Sohail, 2022). The presence of technology needs to be utilized as a solution to achieve the potential that zakat should be. Technology can also be a more effective way of collecting zakat, infaq, and alms. The ineffectiveness of collection can be caused by, among other things, the problem of the distance between the muzakki and BAZ (Amil Zakat Agency) or LAZ (Amil Zakat Institution) and the availability of muzakki time. This problem is included in the external category of the three categories of zakat collection problems in Indonesia, namely internal, external, and system (Ascarya & Yumanita, 2018). Distance has an influence on the muzakki's intention to pay zakat, which causes delays in receiving or collecting zakat. Also, distance causes operational costs to arise, making zakat management inefficient (Haffizha & Laksamana, 2023; Beik et al., 2021; Hudaefi et al., 2022; Mahmood et al., 2021).

Research conducted in the Tanjungpinang City area also stated that long distances are a problem paying zakat (Prakarsa et al., 2022). Sakka and Qulub (2019) also

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explain that online zakat fund receipts exceed 2% of the stated target. This amounted to 1,114 billion, and the funds collected were 1,242 billion. Thus, implementing a finance technology-based zakat payment system is effective at LAZ Dompet Dhuafa, South Sulawesi. Masrurah (2019) also stated that the online application system for Zakat, infaq, and Alms is an alternative solution for fund distribution management. Online collection of ZIS funds began to be looked at and given special attention by BAZNAS in 2016. The implementation of zakat digitization refers to the DSN MUI fatwa Number 116/DSN-MUI/IX/2017 concerning Sharia electronic money and the DSN MUI fatwa Number 117/DSN-MUI/ IX/2018 concerning Sharia-based information technology financing services. With this, the synergy between OPZ and digital financial platforms, such as mobile banking services, mobile apps, PayPal, and e-commerce services, is accelerating.

BAZNAS -as a non-structural government institution responsible for coordinating, controlling, and planning the management of zakat nationally- needs to be competent in reading the reality that donations through digital channels have become a trend with quite a significant increase. This is proven by changes in how people donate simultaneously, paying zakat, infaq, and other general donations. The average increase in digital donations through the Gopay e-wallet increased by 72%, with users covering all groups of society. The increase in the collection of ZIS funds nationally through e-zakat has continued since 2016, contributing 1% to more than 30% in 2020. This data indicates that there are equal opportunities in regional coverage. It is essential to realize the effectiveness of collecting ZIS funds evenly across the country with adequate infrastructure support. Innovation, strategy, and concrete steps must be taken to continue increasing the amount of ZIS funds so that the benefits can be felt evenly and widely.

Digital-based zakat, infaq, and alms collection in Tarakan City will be implemented in 2020. In 2021, the target to be achieved by BAZNAS Tarakan City is 8 billion rupiah. The zakat receipts obtained are based on the Tarakan City BAZNAS financial report of 6.205 billion rupiah. The need to realize and achieve targets makes zakat institutions need to improve zakat collection methods. One of them is the digitalization of zakat. The target, total collection of zakat, infaq, and alms funds in Tarakan City, and online collection from 2020 to 2023 are shown in Table 2.

Table 2. Target and Realization of Tarakan City ZIS Fund Collection

Information	Years			
	2020	2021	2022	2023
ZIS Fundraising Target	8.700	8.700	8.700	8.700
Fundraising Realization	6.237	7.843	8.247	8.296
ZIS Online Fundraising	2.603	4.246	2.729	2.844

Table 2 shows that the realization of ZIS collection from 2020 to 2023 has yet to reach the target, even though the collection percentage reached 95% in 2023. Collection obtained via digital has also decreased from 2021 to 2022 and only experienced an increase

of 2% from 2022 to 2023. The population of Tarakan City in 2022 will be 248,972 people. Sakka & Qulub (2019) explained that receiving zakat funds online exceeded 2% of the target set at 1.114 billion, and the funds collected were 1.242 billion. Thus, implementing a zakat payment system based on finance technology is effective at LAZ Dompet Dhuafa South Sulawesi.

Masrurah (2019) also stated that the online application system for zakat, infaq, and alms is an alternative solution that can help the management process of fund distribution. Using fintech as part of e-zakat dramatically helps increase the receipt of zakat, infaq, and alms funds. This data is supported by Jamaludin & Aminah (2021) which states that the collection of zakat funds at BAZNAS Tangerang City can be said to be effective by using digital zakat consisting of the use of e-payments such as GoPay, LinkAja, GoMobile, OVO, ShopeePay, Mobile Banking. Hidayat & Mukhlisin (2020) also support the significance of zakat collection through fintech with an increase every year, reaching almost 100% from 2017 to 2018. ATMs, mobile applications, fintech, applications made with blockchain technology, artificial intelligence, and big data can play an essential role in effective fundraising including zakat management (Muneeza & Nadwi, 2019; Ahmed & Ward, 2016).

The existence of adequate infrastructure, especially in the Tarakan City area, makes the author utilize the integration of the conceptual approach of the Technology Acceptance Model and the Theory of Planned Behavior to study public perception in accepting the existence of digital-based zakat services in order to study and evaluate aspects that can influence the acceptance of the use of technology, in addition, this study also differentiates from previous studies in independent and dependent variables, namely perceptions of usefulness, perceptions of ease, attitudes towards technology, subjective norms, and behavioral control.

The novelty of this study is combine between theory of planned behavior and technology acceptance model to explain about digital zakat payment. According to Cheng (2019) both theory can be use to explain the behavior about transaction using technology. This study has yet to be studied, and something new has been found. This research is expected to provide information and reference materials for increasing scientific knowledge regarding zakat fund management strategies in the current digital era in a region.

METHODS

This research uses explanatory research with quantitative data analysis. The primary data is obtained by distributing questionnaires in the form of several statements representing research variable indicators and a Likert scale as the assessment scale in this research. The population in this research is the Muslim community of Tarakan City, 209,637 people. Determining the sample uses non-probability sampling with a purposive sampling method, where the sample criteria are people who know or have used or are currently using e-zakat to pay ZIS. The sample size was determined using the Slovin formula to obtain a minimum of 100 samples. In this study, the number of samples used was 111 people.

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The data analysis method consists of descriptive statistics using SPSS because the researcher only wants to describe the sample data and avoid making conclusions that apply to the population from which the sample was taken. Then, inferential statistics uses Smart PLS to analyze sample data and apply the results to the population. This research uses the Structural Equation Model (SEM) Partial Least Square (PLS) approach with the help of a computer program, namely Smart PLS 4.0.

RESULTS AND DISCUSSION

Based on the questionnaire collected from 111 respondents, all respondents are aware of the digitalization of zakat or payment of zakat, infaq, and alms through digital services. However, not all respondents have ever made ZIS payments through digital services. The complete respondents based on digital services or e-zakat are shown in Table 2. Table 2 revealed that out of 111 new respondents, 44 or 39.6% have used or paid ZIS through digital services. At the same time, 67 people, or 60.4%, have never used e-zakat. This study had more respondents who had never used e-zakat even though they knew about ZIS payments. Based on the questionnaires collected, out of 44 people who have paid ZIS through digital services, here is a description of the digital services used by respondents.

Table 2. Respondents Based on E-Zakat Usage

Use of E-Zakat				
		Frequency	*Percent*	*Valid Percent*
Valid	Once	44	39.6	39.6
	Never	67	60.4	60.4
		111	100.0	100.0

Table 3 provides an overview of the types of services used by 44 respondents who have paid ZIS using digital services. The data collected showed that 4 or 9.1% of respondents used virtual account services to pay ZIS. In more detail, as many as four people used Bank Syariah Indonesia (BSI) virtual accounts as digital services to pay ZIS. In addition, as many as 3 or 6.8% of respondents used e-wallet services to pay ZIS.

It was explained in more detail that the three people used DANA as a digital service to pay ZIS. Bank transfer services were the choice most often chosen by respondents. As many as 32 or 72.7% of respondents used bank transfer services to pay ZIS. With details, 25 or 56.8% of respondents used Bank of Shariah Indonesia (BSI) as a digital service by transfer to pay ZIS. They continued with Bank of Mandiri, which was the choice of respondents in using digital services by transfer to pay ZIS to as many as three people (6.8%).

Table 3. Respondents Based on Digital ZIS Payments

E-Zakat Services Ever Used	Frequency	Percentage
Virtual Account	**4**	**9.1**
Bank of Shariah Indonesia	4	9.1
Bank of Muamalat	0	0
Bank of Rakyat Indonesia	0	0
Bank of Negara Indonesia	0	0
Bank of Mandiri	0	0
E-Wallet	**3**	**6.8**
Gopay	3	6.8
Shopeepay	0	0
DANA	0	0
OVO	0	0
LinkAja Syariah	0	0
Transfer Bank	**32**	**72.7**
Bank Syariah Indonesia	25	56.8
Bank Muamalat	2	4.5
Bank Rakyat Indonesia	0	0
Bank Negara Indonesia	1	2.3
Bank Mandiri	3	6.8
Bank Kaltimtara	1	2.3
Scan QRIS	**4**	**9.1**
Credit Card	**1**	**2.3**

Then, through Bank Muamalat by transfer, as many as 2 or 4.5% of respondents used it to pay ZIS. Furthermore, through the Bank of Negara Indonesia (BNI), by transfer, as many as 1 or 2.3% of respondents used it to pay ZIS. Through Bank Kaltimtara, by transfer, as many as 1 or 2.3% of respondents were also chosen to pay ZIS. QRIS scan services were also the respondents' choice in paying ZIS. As many as 4 or 9.1% of respondents used the QRIS scan service to pay for ZIS. Then, as many as 1 or 2.3% of respondents used credit cards to pay ZIS.

In designing the structural model or inner model, it shows the relationship between the latent variables of perceived usefulness (X1), perceived ease (X2), attitude towards technology (X3), subjective norms (X4), behavioral control (X5), and interest in e-zakat (Y). In designing the measurement model or outer model, it shows the relationship between the latent variables of perceived usefulness, perceived ease, attitude towards technology, subjective norms, behavioral control, and interest in e-zakat.

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Table 4. Convergent Validity Test

Constract	Indicator	*Outer Loading*	Information
Perception of usefulness	X1.1	0.816	Valid
	X1.2	0.841	Valid
	X1.3	0.837	Valid
	X1.4	0.877	Valid
	X1.5	0.864	Valid
	X1.6	0.798	Valid
Perception Ease of use	X2.1	0.914	Valid
	X2.2	0.808	Valid
	X2.3	0.886	Valid
	X2.4	0.738	Valid
	X2.5	0.832	Valid
	X2.6	0.865	Valid
Attitude	X3.1	0.808	Valid
	X3.2	0.923	Valid
	X3.3	0.891	Valid
Subjective Norms	X4.1	0.945	Valid
	X4.2	0.936	Valid
Control reception	X5.1	0.948	Valid
behavior	X5.2	0.943	Valid
Interest	Y1	0.952	Valid
	Y2	0.923	Valid
	Y3	0.906	Valid

Outer model evaluation is carried out to assess validity and reliability. The outer model with reflective indicators is evaluated through the convergent and discriminant validity of the indicators that form the latent construct. In addition, composite reliability and Cronbach alpha are also used to assess the indicator block (Ghozali, 2021). This evaluation aims to determine the relationship between the variables and the indicators that compose them. Table 4 shows the results of the outer model diagram evaluation. Based on Table 5, each indicator in this study has good validity, as evidenced by all indicators having a loading factor greater than 0.06. Table 6 shows that the relationship between indicators and constructs is greater than that of other constructs. This result means the latent construct predicts indicators in its block better than others.

The R Square value is 0.605 or 60.5% (see Table 6). Based on Ghozali (2021), the strong model category is more than 0.50 to 0.75. So the following R Square is strong. This result means that 60.5% is influenced by perceived usefulness, perceived convenience, attitudes toward technology use, subjective norms, and behavioral control. Meanwhile, 39.5% of Mrsa is influenced by other variables outside the research.

Table 5. Discriminant Validity Test

X1	X2	X3	X4	X5	Y	Tot.
X1.1 0.816	0.492	0.487	0.440	0.552	0.506	Valid
X1.2 0.841	0.496	0.437	0.348	0.450	0.396	Valid
X1.3 0.837	0.491	0.486	0.283	0.497	0.501	Valid
X1.4 0.877	0.492	0.559	0.403	0.516	0.529	Valid
X1.5 0.864	0.444	0.542	0.288	0.458	0.520	Valid
X1.6 0.798	0.527	0.587	0.316	0.425	0.495	Valid
X2.1 0.490	0.914	0.673	0.535	0.576	0.571	Valid
X2.2 0.614	0.808	0.751	0.465	0.534	0.567	Valid
X2.3 0.412	0.886	0.577	0.403	0.474	0.440	Valid
X2.4 0.498	0.738	0.441	0.371	0.475	0.497	Valid
X2.5 0.402	0.832	0.583	0.426	0.502	0.466	Valid
X2.6 0.492	0.865	0.587	0.524	0.545	0.471	Valid
X3.1 0.616	0.607	0.808	0.364	0.461	0.474	Valid
X3.2 0.569	0.721	0.923	0.475	0.536	0.646	Valid
X3.3 0.467	0.574	0.891	0.550	0.600	0.636	Valid
X4.1 0.396	0.541	0.578	0.945	0.531	0.461	Valid
X4.2 0.380	0.479	0.425	0.936	0.459	0.428	Valid
X5.1 0.534	0.574	0.612	0.596	0.948	0.680	Valid
X5.2 0.558	0.598	0.544	0.398	0.943	0.651	Valid
Y1 0.601	0.556	0.630	0.428	0.696	0.952	Valid
Y2 0.543	0.627	0.637	0.413	0.634	0.923	Valid
Y3 0.492	0.494	0.618	0.477	0.627	0.906	Valid

This test was carried out using a bootstrapping test, which shows that the t-statistics value must exceed 1.96 for a significance level of 5%, and the p-value must be more than 0.05 with the interpretation that H0 can be rejected. This result shows that the relationship between the latent variables is statistically significant. Based on the data processing results, the variable of perceived usefulness does not significantly affect the interest in paying zakat through e-zakat. The original sample (O) = 0.135, which means positive. This variable has a t-statistic value of 1.218, which means less than 1.98, with a significant probability of 0.223, which means greater than 0.05. So, Ha1 is rejected, and H01 is accepted. It can be concluded that the variable of perceived usefulness (X1) has a positive but no effect and is not significant on the interest in paying ZIS through e-zakat (Y).

Table 6. *R Square*

	R Square	***Adjusted R Square***
Y	0.605	0.586

Source: Data Smart PLS, 2024

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This result indicates that the high and low perceptions of usefulness do not affect the interest of the Tarakan City community in making digital ZIS payments or e-zakat. Thus, it can be concluded that the interest of the Muslim community of Tarakan City in paying ZIS online through electronic media is not entirely influenced by the perception of usefulness that comes from a technology service.

Table 7. Hypothesis test results

Hypothesis	Original sample	Std. deviation	T stat	P values	Tot.
X1 -> Y	0.135	0.111	1,218	0.223	Rejected
X2 -> Y	0.046	0.135	0.339	0.735	Rejected
X3 -> Y	0.306	0.150	2,040	0.041	Accepted
X4 -> Y	0.017	0.076	0.218	0.828	Rejected
X5 -> Y	0.402	0.143	2,807	0.005	Accepted

This research is in line with Adha et al. (2020), who state that the perception of usefulness does not significantly affect behavioral intentions to use Tokopedia e-commerce. Sufyan and Mas'ud (2022) also stated that there was no influence of the perception of usefulness on the interest of the millennial Muslim community in operating the KitaBisa.com platform. In addition, Astuti and Prijanto (2021) also stated that the perception of usefulness did not significantly affect people's interest in paying zakat through KitaBisa.com.

Perception of usefulness is the level at which someone believes using a particular subject can improve work performance. In this case, the perception of usefulness is related to people's trust in using digital zakat services to improve performance. Meanwhile, this study shows that the perception of usefulness has an insignificant effect on the interest in paying ZIS using digital services or e-zakat. This condition can happen because respondents tend to make zakat payments directly through mosques or distribute them to those entitled to receive them in the surrounding environment rather than through e-zakat services. This is reinforced by an interview conducted by the researcher with one of the respondents who stated that they preferred to do it directly and asked about the purpose of paying ZIS digitally because in the mosque, there are already people who serve regarding ZIS payments or there is already a place for infaq or alms.

In addition, there are benefits from the spiritual side that are felt by muzakki, such as a sense of satisfaction and feeling more comfort in paying zakat, infaq, and alms, which are done directly (Baharuddin et al., 2021; Nashwan et al., 2021). Muzakki feels more minimized by technological interference that might occur. Then, there is a sense of trust in the people of the zakat institution, and the excellent service felt by muzakki from the habit of paying directly that has been built up so far can be one of the reasons muzakki are calmer and choose to pay zakat, infaq, and alms directly. Wahyudi and Pambudi (2022) state that literacy and education significantly impact the experience of customers using digital zakat payment.

Based on the questionnaire results, the majority of respondents felt the benefits of digitalizing zakat because they only use gadgets, which are items that people often use

and can be carried anywhere in their daily lives. However, not because it is faster, saves time, is practical, effective, and can increase ZIS payments with e-zakat.

Based on the data processing results, the perceived ease variable does not significantly affect the interest in paying zakat through e-zakat. It can be concluded that the perceived ease variable has a positive but no effect and is not significant on the interest in paying zakat, infaq, and alms through e-zakat. This result indicates that the high and low perceptions of ease do not affect the interest of the Tarakan City community in making digital ZIS payments or e-zakat. Thus, it can be concluded that the interest of the Muslim community of Tarakan City in paying ZIS online through electronic media is not entirely influenced by the perception of ease that comes from a technology service.

This is in line with Rohmah et al. (2020), which states that ease does not significantly affect interest in paying ZIS using fintech crowdfunding. Research conducted by Aprilia and Susanti (2022) also stated that convenience does not affect people's decisions to use the DANA e-wallet. In addition, Aristiana (2019) stated that convenience does not have a good effect on people's interest in using digital platforms to pay ZIS.

Perception of convenience is when individuals believe that using a technology service does not require much effort and find it easy to use. Meanwhile, this study shows that the perception of convenience has an insignificant effect on the interest in paying ZIS using digital services or e-zakat. Based on this, people do not feel the convenience of paying zakat, infaq, and alms through digital services, but they find it easier to pay directly. This result could also be caused by network disruptions that have occurred several times in Tarakan City, so people are wary of experiencing obstacles when making transactions. Other things could also be caused by a need for more literacy and socialization of the importance of paying ZIS through digital services to help increase the collection of ZIS funds. Zakat institutions should make a convenient application for customers to make zakat payments through technology (Al Athar & Al Arif, 2021; Al Arif et al., 2023).

This result is in line with the interview conducted by the author with BAZNAS Tarakan City, where BAZNAS has only conducted socialization with several government agencies. It is only an appeal, but in reality, many ASN/PNS still need to do it. In addition, socialization has yet to be comprehensive to all elements of society. Most people know about it through QRIS scans available in large mosques and through transfers. In a study conducted by Rijal et al. (2019), it was also stated that the majority of Indonesian people still prefer to distribute their zakat directly to mustahik or through institutions that are not officially under the auspices of the government, such as mosques, prayer rooms, and social institutions. Based on the questionnaire results, most respondents felt the ease of digitalizing zakat because they realized that gadgets and online services could be used anywhere and anytime. However, it is not because of the convenience of the available features that users are adept at paying ZIS and not because ZIS payments via e-zakat can be used according to user needs.

Based on the data processing results, the attitude variable significantly affects the interest in paying zakat through e-zakat. It can be concluded that the attitude has a positive relationship with the interest in paying ZIS through e-zakat (Y). This result

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indicates that if the attitude towards the use of technology increases, it will trigger an increase in the interest of the Muslim community in Tarakan City in paying zakat online. In this case, the interest in paying ZIS through e-zakat depends on the community's positive attitude. Conversely, the interest in paying ZIS through e-zakat decreases as the community's negative attitude increases.

This study aligns with Sukmawati et al. (2022), which states that attitudes influence the interest in paying ZIS non-cash. Attitudes positively affect the interest in paying zakat through digital payments (Madia & Rachmad, 2023; Purwanto et al., 2021). Attitudes toward the use of technology are that individuals tend to have an interest in carrying out behavior that is considered positive and tend not to have an interest in doing something when it is considered negative. In this case, it is also in line with the results of the variables of usefulness and convenience. ZIS payments through e-zakat, which are considered not to have provided full benefits and have not provided the convenience that is felt, illustrate that people are not yet accustomed to the use of technology and the progress of the ZIS fund collection system. Then, e-zakat has yet to increase public satisfaction and made it easier to pay ZIS frequently. Digital zakat payment can increase the satisfaction level of zakat receipients (Ahmad et al., 2015).

Based on the data processing results, the subjective norm variable has an insignificant effect on the interest in paying zakat through e-zakat. It can be concluded that the subjective norm variable has a positive but insignificant effect on the interest in paying ZIS through e-zakat. This result shows that the influence of subjective norms is insignificant because they have a negligible effect on interest in paying ZIS through e-zakat. In addition, it indicates that the high and low subjective norms do not affect the interest of the Tarakan City community in making digital ZIS payments or e-zakat. Saad & Haniffa (2014) also conclude that subjective norms mediates the relationship of zakat compliance behavior.

This result aligns with Arisandi and Hayati (2023), who states that subjective norms do not influence millennials' interest in paying zakat through Sharia mobile banking. Mujahidah et al. (2021) also state that subjective norms do not significantly influence the intention to accelerate zakat payments during COVID-19. Subjective norms show how much social relationships established by a person with their surroundings can influence a person's decision to carry out a certain action or behavior. The questionnaire results also show that the community agrees that the surrounding environment influences a person to pay ZIS through e-zakat. However, in this study, subjective norms have an insignificant influence. This research is also in line with the previous variable where the community has not felt the full benefits and convenience of paying ZIS through digital services, so there are still many Muslim people in Tarakan City who have not done it and have influenced others.

Based on the data processing results, the behavioral control variable significantly affects the interest in paying zakat through e-zakat. This result indicates that if behavioral control on the use of technology increases, it will trigger an increase in the interest of the Muslim community in Tarakan City in paying zakat online or e-zakat. In this case, the interest in paying ZIS through e-zakat depends on the few obstacles to paying ZIS. The fewer obstacles, the stronger a person's interest in paying zakat through e-zakat. In

addition, a person will also change their thinking depending on the situation and the type of behavior that will be carried out.

Kharisma (2020) states that behavioral control has a positive and significant effect on Go-Pay users' intention to give alms and charity through Go-Pay. Research conducted by Ferinaldy et al. (2019) also states that behavioral control positively affects people's interest in using electronic money. In addition, Mahardika (2020) states that behavioral control has a positive influence on Muslims' intentions to pay zakat. Behavioral control shows each person's perception regarding supporting or inhibiting factors for carrying out and realizing a certain behavior (Durman & Musdholifah, 2020). The results of the questionnaire show that the majority of Muslim people in Tarakan City will use e-zakat to pay ZIS without any coercion. In this case, the people of Tarakan City will be more motivated to use it if they directly know and feel the benefits and convenience of e-zakat, not because of encouragement from others.

CONCLUSION

This research aims to analyze the influence of variables from the Technology Acceptance Model (TAM) theory and the Theory of Planned Behavior (TPB) on the interest of the Tarakan City Muslim community in paying zakat, infaq, and alms via e-zakat. Based on the research results, it is concluded that the constructs from TAM theory, namely perceived usefulness and perceived convenience, do not positively affect interest in paying ZIS via e-zakat.

This result shows that people do not feel the benefits and convenience of e-zakat services. The ease of technology, as measured by the perceived convenience indicator, is different from what the public feels, where they still feel comfortable and easy to pay ZIS directly. The constructs from TPB theory, namely attitude and behavioral control, significantly positively affect interest in paying ZIS via e-zakat. This result shows that when e-zakat is made more accessible, tangible benefits are felt from the technology. It is able to make people aware that there are many advantages of digitizing zakat in zakat collection, public trust will increase, positive attitudes will emerge, and interest in payments will arise. Zakat via e-zakat. Then, people will use e-zakat if they can, supported by existing knowledge and resources. However, subjective norms positively do not have a significant effect on the interest in paying ZIS via e-zakat, which means that there are people Nearby or the surrounding environment have not been able to fully provide confidence to fellow Muslim communities in Tarakan City to use e-zakat as a payment service.

This research can be one of the additional information, evaluation, and policy selection related to the importance of investing in improving regional networks. In addition, the government must work together to help participate in the massive digitalization of zakat through instructions to government elements because zakat is also an instrument that can improve the economy. Massive socialization related to the importance of digitalizing zakat for all elements of society by inviting all stakeholders to work together. In addition to the digitalization of zakat, of course, continue to massively socialize regarding the understanding of the obligation to pay zakat in order to increase the awareness of the

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Muslim community of Tarakana City about the obligation to pay zakat, which is not only zakat fitrah or every month of Ramadan. Digital literacy is also critical to support community resources and knowledge about the importance of using digital.

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Does Reporting of Aksi Cepat Tanggap Cases Affected Public Trust on Zakat Institutions?

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ABSTRACT

Research Originality: Funds misallocation comitted by ACT identified as fraud and the non-transparent financial that reported in online mass online media in terms of negative reporting. This influence has never been studied on the loyalty of zakat payer (muzakki) of paying Zakat in Islamic zakat institutions (LAZ) admidst related to negative reporting of ACT.

Research Objectives: This research analyze the impact of transparency, fraud management and the cases reporting of ACT on public trust in paying zakat, infaq, shadaqah in other Islamic philanthropy institutions.

Research Methods: This research using 100 respondents of muzakki in the year 2023 and 2024. Then, multiple linear regression were involved to analyze the impact of independent variables on dependent variable.

Empirical Results: The results reveal that being transparent and avoiding fraud cases will significantly increase public trust in paying ZIS at LAZ institutions. Meanwhile, coverage of the ACT cases had no impact on the loyalty of muzakki who were also well-educated.

Implications: LAZ are encouraged to provide information related to ZIS funds management, so that trust of the muzakki will increase. Besides, LAZ also needs to have a strong internal control system to prevent fraud.

Keywords:
zakat; case reporting; fraud; negative publication; public trust; transparency; zakah institution

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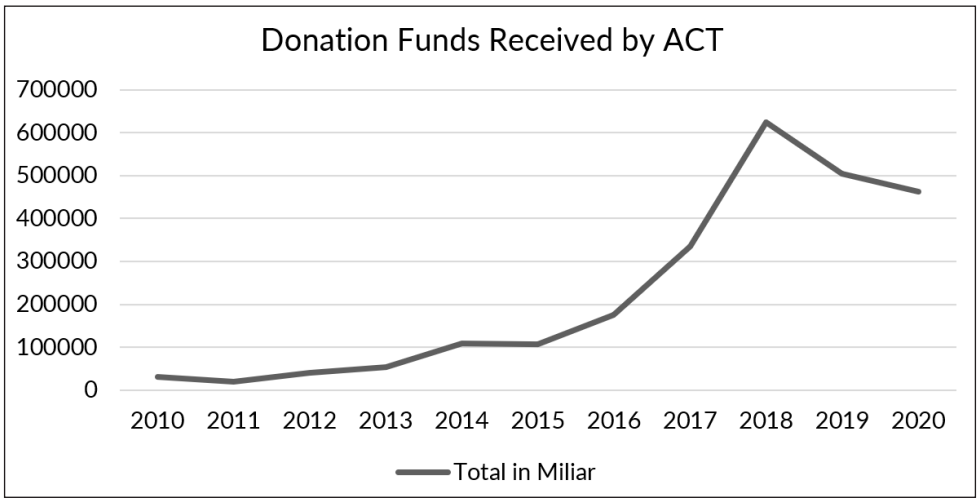
INTRODUCTION

Islamic philanthropy in Indonesia is a potential institution that encourages reducing poverty, both in the long and short term (Iskandar et al., 2021). Aksi Cepat Tanggap (ACT) is one of Indonesia's largest Islamic-based philanthropic institutions. Even though it is not a Zakat Amil institution, ACT was able to collect and manage donations of up to 652 billion rupiah in 2018 (Sedayu, 2022). Figure 1 shows data on the amount of funds collected by ACT between 2010-2020. ACT distributed these funds nationally and internationally to expand its impact, including supporting conflict areas such as Palestine (Sholikhah, 2021).

Figure 1. Funds Managed by ACT between 2016-2020



Source: Sedayu (2022)

From Figure 1, it can be seen that reception and distribution experienced a slight increase in 2016, followed by a significant increase in 2018. This data indicated that the community trusts ACT in managing donations. This achievement shows that public trust in the ACT significantly increased. Meanwhile, donations collected declined by 200 billion rupees from 2018 to 2020. This phenomenon is caused by negative publications in online media related to funds ACT, which degrade public trust hand in hand.

The main topics reported in online media are related to funds misallocation committed by ACT management, known as fraud. It causes the report's financial quality of the ACT to be appropriately questioned. As reported by Tempo magazine, ACT misappropriated social funds paid by Boeing up to 56 billion from the total funds collected by 135 billion. In this case, ACT is suspected of committing corruption since the beginning of 2022 (Sedayu, 2022). Other mainstream online mass media outlets have published these cases as negative reports. Table 1, the number of negative reports related to ACT cases in online mass media mainstream are summarized into several categories of main topics.

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Table 1. Number of Negative Reporting of ACT's Cases Released by Online Mass media

Topic Category	Name of Media	Number of Article
Public trust decreases	Suara.com	3
	CNN Indonesia	1
	Liputan6	2
Impact on other philanthropy institutions and stakeholders	Liputan6	2
	Suara.com	3
	Kompas.com	2
Non-compliances regulatory	The Conversation	1
	Antara.com	2
	Suara.com	7
	CNN Indonesia	9
	Liputan6	4
	Kompas.com	1
Legal consequences	Suara.com	4
	Republika Online	1
	CNN Indonesia	3
	Liputan6	1
	Kompas.com	4

Source: Author's Documentation (2024)

Most of the ACT reports discuss nonconformity between regulations of government and practices carried out by the ACT and regarding regulations, government number 29 of 1980, concerning implementation paragraph (1), stated that 'financing for business collection donation maximum 10% of results collection donation' (Government of Indonesia, 1980). In this case, the violation committed by ACT is financing business collection donations, which is more than 10%. The Amil Zakat Agency (BAZNAS) emphasized that operational funds for zakat institutions should not exceed 12.5% (BAZNAS, 2022). Meanwhile, ACT got 13.7% of donations as operational funds. It indicates that ACT, as an Islamic institution, uses religion as a tool to gain several commercial benefits that could result in losses (Levianto, 2024). Moreover, these cases contradict the governance principle that ACT had applied before (Sektiono & Nugraheni, 2017).

Meanwhile, some research on several decisions and objectives proved that mass online media has a significant impact on public trust (Wu, 2014; Sultoni, 2019; Zhu, 2020; Nunneley, 2022; Fei, 2023), which indicates that the mass media plays a role in disseminating information. However, this influence has never been studied on the trust of the zakat payer (muzakki) of paying Zakat, Infaq, and Shadaqah (ZIS) in Islamic philanthropy institutions (LAZ). So, this research will explore the impact of mass online media on LAZ institutions in the context of ACT case reporting.

In addition, transparency and fraud management factors are also involved in this research as previous research proved that the accurate and transparent reporting on how

Zakat, Infaq, and Sadakoh (ZIS) funds are collected, managed, and distributed also could enhance public trust and satisfaction (Hasiara, 2019; Gultom & Soemitra, 2022). If the public knows that Zakat funds are well-managed and distributed to rightfully entitled people, they will be more loyal to pay their zakat in Zakat institutions. Moreover, transparency in the Zakat institution affected the muzakki's trust and increased the muzakki's loyalty to LAZ, especially to BAZNAS (Roziq et al., 2021). Therefore, this research will define the major factors that affect public trust in paying zakat in LAZ among the online mass media, the transparency of the LAZ, or the fraud management, primarily after ACT cases were published in online media.

METHODS

This study set zakat payers in Bogor City as the population. As the population size was undefined, the sample size was defined using Lemeshow, counted to 100 respondents, and purposively restricted to the criteria of zakat payers in LAZ, which operated in Bogor City.

Data was collected during 2023-2024 using an online questionnaire. Quantitative analysis was carried out to analyze the impact of independent variables on the dependent variables, which involved testing validity, reliability, assumptions classic, test partial, simultaneous, and multiple linear regression analysis to interpret the hypothesis test. This study is expected to give a comprehensive explanation about factors that influence public trust (PT) in paying ZIS at the Islamic philanthropy: adverse reporting (NR), transparency (TR), and fraud management (FR), using the following estimation model:

$$PT = \alpha + \beta_1 NR + \beta_2 TR + \beta_3 FR + e$$

Negative reporting was measured through three indicators: the frequency of muzakki accessing online mass media, the attention given by news readers to the media, and the duration of accessing the media each day (Ardianto & Erdinaya, 2005). Transparency was related to funds management reporting provided by institutions, which is measured by the information availability and accessibility, the clarity and completeness of the information, including the regulation governing those matters (Kristiansen, 2016). Meanwhile, fraud management in institutions is measured positively in preventing fraudulent statements or financial statement fraud, asset misappropriation, and corruption (Association of Certified Fraud Examiners, 2024). Lastly, once muzakki trust the institution of paying zakat, infaq and shadaqah, it will reflected in the form of exhibiting trust, achieving results element, acting with integrity, and demonstrating concern (Shaw, 1997).

RESULT AND DISCUSSION

All respondents are gender-equally distributed. Most respondents ranged in 20-30 years (61%) as the productive worker (48.5%) who paid zakat as the worker's responsibility when the income gathered meets the *nishab* requirement. Respondents are distributed, as Figure 2 shows. Table 1, the t-test results show that among the three independent

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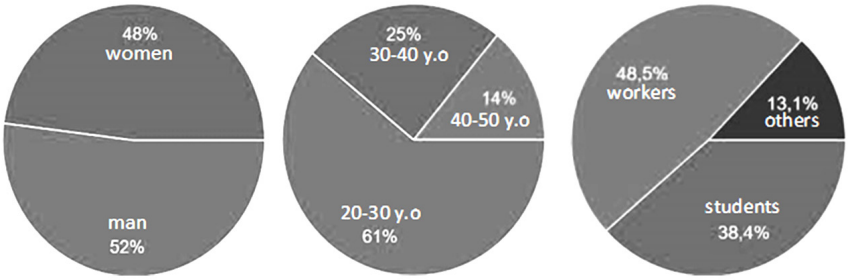
variables tested, transparency and fraud significantly affect the public trust in paying zakat, infaq, and sadaqah, while negative reporting of ACT's cases is on the contrary.

Figure 2. Respondent's Profile



Source: Authors' Calculation Result (2024)

Table 1. The Effect of Environmental Tax on Environmental Quality

Model	T	Sig.
(Constant)	4.971	0.000
Negative Reporting (NR)	1.161	0.248
Transparency (TR)	2.983	0.004*
Fraud Management (FR)	5.288	0.000*

The figures with * represent significance at the level of 5%
Source: Author's Calculation Results (2024).

Using multiple linear regression analysis, a linear equation was found in this study as following:

$$PT = 15.472 + 0.100\ NR + 0.257\ TR + 0.527\ FR + e$$

It shows that in the level of significance 0.05, being transparent and having regulation of preventing Fraud increased the trust level of muzakki in paying zakat, infaq, and shadaqah in LAZ institutions 0.257% and 0.527%, respectively. Furthermore, the negative reporting of ACT institutions did not degrade the level of trust among muzakki to the other Islamic philanthropy institutions; in fact, it was quite the opposite.

Interestingly, negative reporting about ACT in online mass media does not significantly affect the level of trust among muzakki, contrary to the previous research that mass media is commonly used for shaping reader's trust in the institutions (Wu, 2014; Sultoni, 2019; Zhu, 2020; Nunneley, 2022; Fei, 2023). It shows that even if the zakat payer (muzakki) consumed the report of ACT cases and paid more attention to it, it will not affect the trust among muzakki in paying zakat in other LAZ institutions. Look for more detail; due to the respondent's profile of 48.5% of workers, education and financial literacy might be the other factors that encourage a decision to pay zakat, infaq, and sadaqah. At the same time, the fraud cases of ACT were reported. The research led by Elrayah and Tufail (2024) also proved that financial education and literacy positively increased financial capability and behavior.

Therefore, several stakeholders are responsible for providing education, literacy, and awareness of paying zakat, including zakat institutions and religious leaders (Cokrohadisumarto et al., 2019; Thamrin, 2023). Moreover, either zakat is the obligation for a Muslim to carry out religious teachings that encourage paying zakat (Thamrin, 2023), or it also reflects the loyalty of muzakki on the LAZ institutions that affected by other factors, such as credibility, accountability, and transparency as the part of sharia governance (Cokrohadisumarto et al., 2019; Roziq, 2021).

In line with that, transparency significantly impacts public trust in paying zakat, infaq, and shadaqah instead of online media. Research on the preferences of Islamic bank customers also proved that transparency is one of the determining factors (Kontot et al., 2016). In addition, transparency can enhance brand image and reputation and encourage trust among zakat payers and the commitment to paying zakat on LAZ (Yenti et al., 2022). In the other study, citizens' trust is also affected by transparency as the indicator of open governance (Gritzalis et al., 2017). Even though the ACT committed misuse of donation funds, the reason for Muzaki's confidence is that ACT always reports and provides access to documents for all incoming and outgoing ZIS funds so that muzaki can monitor the use of ZIS funds through reports on the collection and distribution of ZIS funds, either via email or ACT's website. ACT also follows the regulations set by the government (BAZNAS). This is proved by the results of ACT's Good Corporate Governance (GCG) reporting, which is improving yearly.

Additionally, for stakeholders' accountability purposes, corporate transparency should be provided in financial and governance transparency (Bushman et al., 2004; Miliar et al., 2005; Hess, 2007). Therefore, Islamic philanthropy institutions should provide information regularly related to the fund's management and the stakeholders involved and ensure the information is accessible, complete, and understandable. Moreover, for more detail, corporations that distributed their corporate social responsibility (CSR) funds through philanthropy institutions may need information disclosure related to socio-economic, environmental, and sustainability information as critical non-financial reporting (González, De La Poza Plaza, and Guadalajara Olmeda, 2020; Caputo et al., 2021; Băndoi et al., 2021; Van Hoang et al., 2021).

Furthermore, Fraudpreventing regulation also positively influences public trust, indicating that the better the handling and prevention of Fraud carried out by the LAZ institution, the higher the level of public trust in paying ZIS through this institution. This condition shows that the public pays attention to integrity and honesty when managing ZIS funds. LAZ, with a more significant potential for Fraud based on higher deposited cash balances, could affect untrust muzaki. The occurrence of Fraud in Islamic-based institutions such as zakat, waqf, sadaqah, and other charities was analyzed. Despite the noble intention of these philanthropic institutions, elements of Fraud due to unsystematic management, lack of good governance, unethical behaviors, and lack of knowledge were the main determinants influencing the likelihood of Fraud (Ibrahim et al., 2013). Financial statements LAZ follows the PSAK rules to minimize Fraud in the use of ZIS funds. LAZ has an adequate internal control and supervision system

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that minimizes opportunities for corruption. The Regulation of the Minister of Religion (PMA) Number 606 of 2020, Sharia Audit must be carried out comprehensively, accurately, transparent, and accountable. Therefore, Sharia Audit guidelines are needed for reports on the Implementation of the Management of Zakat, Infaq, Charity, and Religious Social others (Umiyati, 2023). Finally, these findings emphasize the importance of LAZ institutions having a robust internal control system, transparency in financial reporting, and effective monitoring mechanisms to prevent Fraud. With these efforts, the community will feel more confident that the ZIS funds they distribute will be managed well and used according to their intended purpose.

Preventing Fraud through escalating transparency as a good governance practice also allows LAZ to manage its risks more effectively and build public trust, legitimacy, and long-term survivability. They should profile the LAZ based on the extent of their governance practices and perform systematic monitoring based on the profiles and capability building to enhance their good governance practices. Concurrently, the individual LAZ can also focus on areas of a governance framework that could be developed further to achieve best practices. Elements of Fraud due to unsystematic management, lack of good governance, unethical behaviors, and lack of knowledge were the main determinants influencing the likelihood of Fraud. Fraud leads to the rights of recipients being denied and wastage, inefficiency, and money laundry crime if left unchecked. (Arshad et al., 2022). This research also shows that LAZ's brand image creates loyalty among muzakis, giving them confidence to continue paying zakat to LAZ. LAZ always maintains the trust of muzakis by providing regular financial reports to muzakis so that muzakis remain loyal to LAZ. However, further studies are needed to provide an overview of the use of funds in Islamic philanthropic institutions and fraud warning signs in order to anticipate and prevent potential Fraud.

CONCLUSION

In conclusion, our study examines the influence of negative reporting of Islamic philanthropy institution ACT, transparency, and fraud on the public trust in paying ZIS in LAZ institution. This study indicates that negative reports have not influenced public trust in paying ZIS in LAZ institutions. Zakat education amongst the respondents explained that well-educated zakat payers and loyalty would mark negative reporting. Meanwhile, transparency and fraud significantly affect public trust in paying ZIS in LAZ institutions. Therefore, ZIS management institutions are encouraged to provide information related to ZIS funds management to increase the trust of the zakat payer/muzakki. Besides, LAZ institutions need to have a strong internal control system to enforce transparency in financial reporting and effective monitoring mechanisms to prevent fraud.

It is recommended that LAZNAS and BAZNAS provide reliable sources of information, including LAZ reporting. The regulator of LAZ institutions also needs to encourage LAZ to upgrade Amil's capacity and knowledge. This might minimize fraud and uplift transparency within ZIS funds management.

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Countries	2010	2020
ASEAN Countries		
Indonesia	5,814 (71)	5,54 (71)
Malaysia	6,608 (36)	6,62 (36)
Thailand	6,436 (42)	5,96 (50)
Filipina	6,403(44)	5,71 (63)
Singapura	7,719 (11)	8,00 (6)
Vietnam	6,080 (61)	5,64 (68)

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