

Examining the Impact of Islamic Social Finance in Alleviating Poverty using Ibn Khaldun's Development Model: Evidence from Indonesia

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ABSTRACT: Despite being the only province in Indonesia that formally implements Islamic law and possesses substantial Islamic social finance potential, Aceh province continues to face persistent poverty challenges. This study, therefore, examines the determinants of poverty across 20 districts in Aceh Province during the period 2015–2019 using Khaldun's Development Model, with particular emphasis on zakat as a proxy of Islamic social finance. Employing a Panel Vector Error Correction Model (VECM), the study investigates the relationships among poverty, regional economic growth, population, education, investment, the Gini index, and zakat. The empirical results indicate that, in the long run, poverty is significantly and negatively associated with regional economic growth, investment, and education, while population growth is positively associated with poverty. Interestingly, although zakat demonstrates a consistent poverty-reducing relationship, its effect is not statistically significant during the observation period. Furthermore, the Granger causality analysis reveals that education and regional economic growth significantly influence poverty. These findings suggest that poverty alleviation in Aceh requires not only stronger economic growth, greater investment, and improved educational outcomes, but also a more effective utilization of Islamic social finance instruments, particularly zakat. This study contributes to the Islamic development literature by empirically testing Khaldun's Development Model in Aceh and highlighting the role of zakat as a proxy of Islamic social finance in addressing poverty, with policy implications for Indonesia and other Muslim-majority countries.

Keywords: Islamic Social Finance, Poverty Alleviation, Ibn Khaldun Model, Impact Case Study, Aceh, Indonesia, Panel VECM.

1. INTRODUCTION

Development is widely understood as a process of planned transformation in social and economic structures, institutions, and patterns of behaviour aimed at improving living standards and promoting social welfare (Hayati, 2021). Within this process, poverty remains one of the most persistent global development challenges (Gaisbauer & Schweiger, 2019). Its persistence in both developing and developed countries suggests that poverty should not be understood merely as low income, but also as the outcome of deeper structural and institutional inequalities.

In Indonesia, poverty remains an important development issue, including in Aceh Province, the only province to formally implement Islamic law. According to the National Statistical Bureau or BPS (2025), the poverty rate in Aceh stood at 12.33% in 2025 (see Figure 1), and the province has continued to rank among the poorest regions in Indonesia, having long recorded the highest poverty rate in Sumatra. This condition makes Aceh an important case

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for examining the determinants of poverty from a broader development perspective.

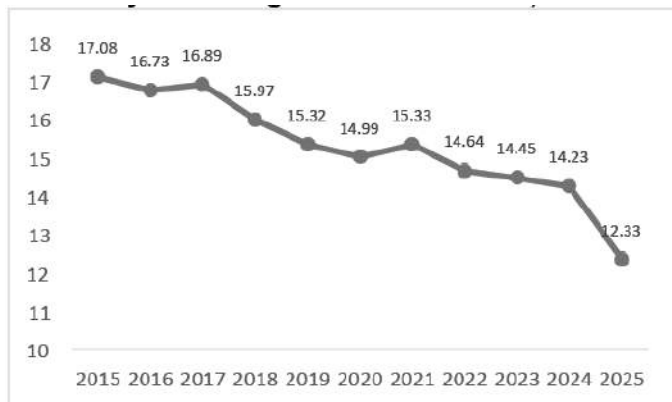


Figure 1: Poverty Percentage in Aceh Province, March 2015–2025.

Source: BPS Aceh Province (2025), Processed by the Author

Poverty alleviation cannot rely solely on economic growth. As Portes (1976) argues, poverty reduction requires transformation not only in the economic sphere but also in social and political life, including wider access to education, healthcare, sanitation, and participation. In line with this, development thinking has evolved from growth-oriented models associated with Nurkse (1953), Hirschman (1958), Rostow (1960), and Kuznets (1955) toward multidimensional approaches that incorporate social, demographic, and political dimensions, as advanced by Myrdal (1957), Sen (1981) and Streeten (1994). This broader view remains relevant because poverty is increasingly understood as a condition shaped by overlapping deprivations and structural constraints rather than income alone.

From an Islamic perspective, one of the most influential multidimensional development frameworks is proposed by Ibn Khaldun in his prominent book *The Muqaddimah*. Ibn Khaldun viewed poverty and wealth, or the rise and decline, of civilisation as shaped by interconnected factors, including wealth, human resources, government, development, justice, and the implementation of sharia (in Huda, 2013). This perspective is consistent with Sen's view that poverty is multidimensional (1993) and with Todaro and Smith's argument that poverty is influenced by economic, social, political, demographic, and institutional conditions (2020). A notable feature of Ibn Khaldun's development thought is its grounding in an Islamic worldview. Unlike conventional development approaches, which tend to be secular, Islamic development does not separate material progress from moral and spiritual values. Its foundations are derived from the Qur'an and Hadith, and its objectives align with

sharia principles (Nurzaman, 2019). Accordingly, development is directed toward achieving *maslahah*, or public benefit, not only in terms of worldly welfare but also broader human well-being (Mahri *et al.*, 2021).

One important moral and spiritual dimension of Islamic development is reflected in the institution of zakat. In Islamic economics, zakat is a primary instrument for poverty alleviation because it facilitates income redistribution to the poor and supports the achievement of *maslahah* (Kasri, 2016; Mahri *et al.*, 2021). Historical evidence frequently associates zakat with its developmental role, including during the period of Muaz bin Jabal in Yemen and the reign of Caliph Umar bin Abdul Aziz, during which the management of zakat successfully eliminated the nation's poverty (Kasri, 2016; Kusumastuti & Ghozali, 2019).

Recent studies also show that zakat plays an important role in reducing poverty and promoting development in Indonesia. The national zakat board's management reports that zakat-based programs helped lift around 577,000 people out of poverty, including approximately 321,000 from extreme poverty (BAZNAS, 2024). Herianingrum *et al.* (2024) identify zakat as an important instrument for poverty alleviation through economic empowerment and welfare improvement, while Hamadou and Jallow (2024) show that distributed zakat is associated with poverty reduction, human development, and economic growth. More broadly, Mohsin and Zulkarnaini (2025) argue that Islamic social finance can contribute to poverty alleviation, education, healthcare access, and economic empowerment, particularly when supported by coherent governance, digital integration, institutional coordination, and impact measurement.

Nevertheless, evidence at the regional level remains uneven. In Aceh, some studies report that zakat significantly reduces poverty (Afifudin & Sari, 2019; Muliadi & Bakar, 2024), whereas others find no short-run relationship between zakat and poverty levels (Nurdin & Haris, 2020). These mixed findings suggest that the impact of zakat may depend on institutional, socioeconomic, and regional conditions and therefore requires further investigation within a broader multidimensional framework.

Aceh Province provides a particularly important setting for examining this issue because zakat occupies a stronger institutional position than in most other provinces in Indonesia. In Aceh, zakat is an obligation and forms part of Regional Own-Source Revenue (PAD) as a source of regional development financing (Wibisono,

2015). It is managed by Baitul Mal Aceh (BMA), a government-authorised Islamic institution responsible for safeguarding, developing, and managing zakat funds for the benefit of the community.

In this institutional context, zakat operates through both formal and informal channels. Formal zakat refers to zakat collected and distributed through official institutions such as Baitul Mal Aceh, while informal zakat refers to direct giving by individuals or communities outside institutional mechanisms. Although this study focuses on formal zakat distribution due to data availability, the poverty-reducing role of zakat may also depend on distribution efficiency, targeting accuracy, institutional quality, and the interaction between formal and informal zakat practices.

Despite growing scholarly interest in poverty and development in Indonesia, several important gaps remain in the literature. Development is fundamentally multidimensional and therefore requires equally comprehensive analytical frameworks (Todaro & Smith, 2020). Moral and spiritual dimensions, in particular, need to be incorporated into development models aimed at achieving *maslahah* (Mahri *et al.*, 2021). However, prior studies on poverty and development in Aceh, including Baihaqi and Puspitasari (2020), Putri (2019), Rizal and Rahayu (2020), Saleh and Rizkina (2021), and Amri (2019), have generally adopted partial and single-dimensional approaches that do not fully capture the complexity of the province's development challenges.

At a broader level, while a number of studies have engaged with Ibn Khaldun's development model (Hanafiah, 2009; Affandi & Astuti, 2014; Putra & Indra, 2016; Rusydiana, 2018; Nugroho, 2020), their scope and coverage remain limited. More critically, none of these studies has applied Ibn Khaldun's framework specifically to Aceh Province, a region of particular scholarly significance as the only province in Indonesia to formally adopt Islamic law as the basis of its governance. Additionally, despite broad agreement that zakat is one of the defining features of an Islamic economic and governance system (Kasri & Yuniar, 2021; Salim & Hossain, 2016), there are limited studies that explicitly incorporate zakat as a moral and spiritual dimension within Ibn Khaldun's development model. Therefore, to the best of the authors' knowledge, the novelty of this study lies in its application of Ibn Khaldun's development framework to Aceh as the first regional Islamic law-based empirical setting, where poverty, zakat, and development are examined within a formal sharia-based institutional context.

This study, therefore, aims to fill these gaps by examining the determinants of poverty, particularly the impact of Islamic social finance in alleviating poverty, in the Aceh Province of Indonesia over the period 2015–2019 using Ibn Khaldun's multidimensional development framework, with zakat explicitly incorporated as an Islamic social finance instrument and a key variable reflecting the moral and spiritual dimension of Islamic governance. It employs a Panel Vector Autoregression/Vector Error Correction Model (Panel VAR/VECM) using variables representing key dimensions of Ibn Khaldun's framework: regional economic growth, population, education, investment, Gini index, and zakat.

Following this introduction, this paper is structured as follows. Section two reviews the literature on poverty and Ibn Khaldun's development framework; section three explains the data and methods; section four discusses the findings and analysis; and the final section provides the conclusions and recommendations of the study.

■ 2. LITERATURE REVIEW

■ Poverty Determinants

Poverty is generally understood as a condition in which individuals are unable to meet their basic needs (Haughton & Khandker, 2009). In the Indonesian context, Bappenas (2004) defines poverty as the inability to satisfy basic rights necessary to maintain a dignified life.

Poverty is typically assessed through monetary measures, such as consumption-based poverty indices, as well as broader multidimensional indicators that capture deprivation in areas such as health, education, and political participation (Haughton & Khandker, 2009). These approaches have significantly enriched poverty analysis, yet they remain primarily focused on material and observable dimensions of deprivation.

Several studies in the development literature have linked poverty to economic growth, employment, education, demographic conditions, investment, public expenditure, and income inequality. For example, Ngubane *et al.* (2023), examining the relationship between economic growth, unemployment, and poverty in South Africa using ARDL and NARDL models and found that economic growth reduces poverty in the long run, whereas unemployment increases poverty. In a cross-country setting, Marrero and Servén (2022) show a consistent negative association between economic growth and poverty, while studies on Indonesia indicate that poverty dynamics are shaped by both structural and household-

level factors. furthermore, Purwono *et al.* (2021), using Indonesian household panel data, show that poverty dynamics vary depending on the measurement approach used, while Sugiharti *et al.* (2022) find that chronic poverty constitutes the largest component of household poverty in Indonesia. At the household level, Kasri (2017), using household-level data on zakat recipients in Greater Jakarta, Indonesia, shows that poverty is associated with socioeconomic characteristics such as age, educational attainment, employment status, household size, and the type of assistance received.

At the provincial level, several studies have examined poverty determinants in Aceh using conventional socioeconomic variables. Putri (2019) found that population size, human development index, and unemployment jointly influenced poverty in eastern Aceh. Rizal and Rahayu (2020) showed that investment promoted economic growth and contributed to poverty reduction in Aceh Barat District. Saleh and Rizkina (2021) further found that the Gini index and population size both had a positive effect on poverty. These studies indicate that poverty in Aceh is associated with demographic pressure, human capital, labour market conditions, investment, economic growth, and inequality.

These previous studies therefore suggest that poverty is shaped by macroeconomic performance, labour market conditions, demographic characteristics, human capital, and distributive factors. This conventional perspective provides an important foundation for understanding poverty as a multidimensional socioeconomic issue, although it remains largely centred on material and observable determinants.

■ Islamic Development Models

Islamic development models generally emphasise that development should not be understood only as material progress, but also as a process of achieving moral, spiritual, and social welfare (Chapra, 2008; Anto, 2011). Unlike conventional development approaches that often focus on income, growth, and observable socioeconomic indicators, Islamic development is grounded in the objective of achieving *maslahah* and preserving human well-being in accordance with sharia principles (Chapra, 2008). This perspective provides a broader foundation for analysing poverty because poverty is not seen merely as a lack of income, but also as a condition related to justice, governance, human capacity, wealth distribution, and moral order. In this context, one of the most influential multidimensional development frameworks is found in the thought of Ibn Khaldun.

Ibn Khaldun (1331–1406 AD) was one of the most remarkable intellectual figures in Islamic history as well as Islamic economics and sociology. His ideas on development are most comprehensively laid out in the *Muqaddimah*, the opening volume of his seven-volume historical work *Al-Ibar*. The *Muqaddimah* is an analytical treatise that seeks to identify the underlying forces driving the rise and fall of civilisations, engaging deeply with questions of economics, social organisation, and political governance.

Ibn Khaldun's concept of development deals with the progress or decline of civilisation from an Islamic perspective and is commonly expressed through the Circle of Equity, which reflects the interdependence among sharia, government, society, wealth, development, and justice. These elements are not independent; rather, each influences and is influenced by the others.

In this framework, a strong government depends on the implementation of sharia; sharia requires effective governance; governance depends on society; society depends on wealth; wealth depends on development; and development can only be sustained through justice. Accordingly, civilizational progress or decline is understood as the result of dynamic interaction among these interconnected elements. The circle of equity is shown in Figure 2 below.

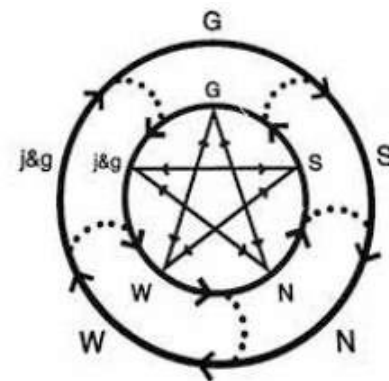


Figure 2: Circle of Equity.

Source: Chapra (2008).

Where:

G = Government (al-mulk)

S = Sharia

W = Wealth (al-maal)

N = Human Resources (ar-rijal)

g & j = Development and Justice (al-adl)

According to Chapra (2008), civilizational progress can be sustained when the Circle of Equity rotates clockwise through stronger adherence to sharia, the development of a capable society, the growth of wealth, just development, and good governance. Conversely, when these elements deteriorate, the circle rotates counterclockwise, indicating civilizational decline. In such conditions, the weakening of one dimension may trigger deterioration in others, eventually undermining welfare and social order. However, improvement in one damaged aspect can also stimulate recovery in the others, allowing the cycle to move back toward progress (Rusydia, 2018).

The function of each variable in Ibn Khaldun's development model is shown in the table below.

Ibn Khaldun's framework also resonates with contemporary Islamic development models that seek to measure development beyond material indicators. A study conducted by Anto (2011), for example, introduced the Islamic Human Development Index (I-HDI) to measure human development in OIC countries by incorporating dimensions derived from maqasid al-shariah. The study argues that the conventional Human Development Index is not fully sufficient for measuring development from an Islamic perspective because it is not grounded in maqasid al-shariah. The I-HDI therefore seeks to capture human development through the protection of faith, life, intellect, posterity, and wealth, reinforcing the view that Islamic development integrates material welfare with moral and spiritual dimensions.

Building on these Islamic development perspectives, several previous studies have examined poverty and development through Ibn Khaldun's framework, although they differ in scope, context, and methodology. For example, Affandi and Astuti (2014) examined poverty in Indonesia, Malaysia, Pakistan, and India using Ibn Khaldun's dynamic model after the 1997 financial crisis. Their findings show that the model significantly explained poverty in Indonesia, while in Pakistan only the human

development index had a significant effect. By contrast, the model did not significantly explain poverty in Malaysia and India, suggesting that the applicability of Ibn Khaldun's framework may vary across countries depending on their socioeconomic and institutional contexts. Putra and Indra (2016) also applied Ibn Khaldun's development model to OIC countries and found that GDP per capita significantly contributed to poverty reduction, while unemployment increased poverty. Fatoni *et al.* (2019) further examined poverty in OIC countries using Ibn Khaldun's model and found that development, government spending on health, justice, national wealth, and unemployment significantly affected poverty, whereas government spending on education, human resources, and sharia variables were not significant.

In the Indonesian context, Rusydia (2018) used VAR and Granger causality methods to examine causal relationships among economic and political variables in Ibn Khaldun's theory of wealth. The study found that wealth and society significantly influenced the level of development, suggesting that economic welfare and human resources play important roles in strengthening national development. More recently, Pratiwi *et al.* (2023) developed an Ibn Khaldun-based socioeconomic development index (I-SDI) for Muslim countries and found that many Muslim countries underperformed in socioeconomic development, while countries with stronger government and institutional dimensions tended to achieve better development outcomes. Overall, these studies confirm the relevance of Ibn Khaldun's framework in analysing poverty and development, but its application remains limited in regional and subnational settings, particularly in regions with formal Islamic legal institutions such as Aceh.

■ Zakat Impact Studies

Zakat has been recognised as one of the most important instruments in Islamic social finance. Beyond its status as a religious obligation, zakat functions as a redistributive

Table 1: Elaboration of the Ibn Khaldun's Development Concept.

Development Concept	Function
Role of Government	As the policymaker
Role of Human Resources	As the conceptual actor possessing knowledge
Role of Wealth	As one of the instruments of development
Role of Development and Justice	As the basis for the welfare and well-being of society
Role of Sharia	As the set of rules guiding social activities in accordance with moral and spiritual values

Source: Arifqi (2019).

mechanism aimed at supporting vulnerable groups, reducing socioeconomic inequality, and improving social welfare. However, its developmental impact does not depend only on the amount of zakat distributed. It also depends on how zakat institutions collect, manage, target, and channel funds to eligible beneficiaries.

Several recent studies have examined the impact of zakat at the recipient and programme levels. Mawardi *et al.* (2023), for example, analyse the impact of productive zakat programmes on the welfare of zakat recipients using data from 137 mustahiqs across seven zakat institutions. Their findings show that productive zakat and business assistance positively affect mustahiq business growth, which subsequently improves recipient welfare. This suggests that zakat contributes to poverty alleviation not only through direct transfers, but also through empowerment, business development, and sustained livelihood improvement.

Other studies examine zakat from a broader macroeconomic and cross-country perspective. For example, Hamadou and Jallow (2024), using a Vector Error Correction Model (VECM) with Indonesian time-series data from 2001 to 2020, examine the relationship between distributed zakat and three development outcomes, which are poverty rate, human development index, and economic growth. Their study provides evidence that zakat distribution is linked to development outcomes in both the short and long run, indicating that zakat may function not only as a social assistance instrument but also as part of a broader development mechanism. Similarly, using data from 42 OIC member countries over the period 2007–2019, Rusydiana *et al.* (2025) find that zakat significantly reduces poverty and unemployment while promoting income equality. These findings reinforce the view that zakat can support poverty alleviation through redistribution, empowerment, job creation, and income improvement.

Recent cross-country evidence also highlights the importance of institutional conditions in shaping zakat effectiveness. In this context, Riani and Indra (2026), examining 41 OIC countries from 2010 to 2023 in analysing multidimensional poverty by incorporating zakat and the Islamic Human Development Index (IHDI). Their findings show that zakat significantly reduces multidimensional poverty, although its effect varies across regions and income groups. The study further suggests that zakat tends to generate stronger poverty-reducing effects in countries with stronger institutional capacity and more formalised economies. This indicates that zakat effectiveness is shaped not only by the volume of funds

distributed, but also by the broader governance and institutional environment in which zakat operates.

Closer to the focus of the present study, several studies have examined the relationship between zakat and poverty in Aceh. Amri (2019) aims to analyse the effect of zakah revenues and job creation on poverty rates in Aceh. Using panel data from 23 districts/cities in Aceh over the period 2011–2017, the study applies a fixed-effect panel regression model and Granger causality test. The findings show that zakah revenue and job creation have negative and significant effects on poverty rates, although the poverty-reducing effect of job creation is larger than that of zakah revenue. Additionally, Baihaqi and Puspitasari (2020) also examine the impact of unemployment, human development index, zakat, and gross regional domestic product (GRDP) on poverty in Aceh Province. Using district/city-level panel data, the study analyses how these socioeconomic variables affect poverty across Aceh. The findings show that ZIS, together with unemployment, GRDP, and HDI, significantly influences poverty levels across 23 districts/cities in Aceh. More recently, Muliadi and Bakar (2024) aim to analyse the effect of zakat, infaq, and sadaqah (ZIS) on poverty in Aceh Province. Using panel data from 23 districts/cities in Aceh over the period 2014–2023, the study applies panel data regression and selects the Random Effect Model (REM) as the best estimation model. The findings show that ZIS has a negative and significant effect on poverty, suggesting that greater ZIS distribution is associated with lower poverty levels across districts and cities in Aceh. These studies provide important evidence that zakat-based instruments are relevant for poverty reduction in Aceh.

However, several previous studies mentioned previously generally examine zakat or ZIS as separate determinants of poverty, rather than linking them to a broader Islamic development framework. Therefore, further analysis is needed to examine zakat within Ibn Khaldun's framework, alongside other development dimensions such as wealth, human resources, government, development, and justice.

■ 3. RESEARCH METHODS

This study adopts Ibn Khaldun's development framework, particularly the Circle of Equity, as the conceptual foundation for examining poverty in Aceh Province. The framework views development as an interdependent process in which wealth, human resources, government, development, justice, and sharia jointly shape social welfare outcomes. In this study, the framework is not only

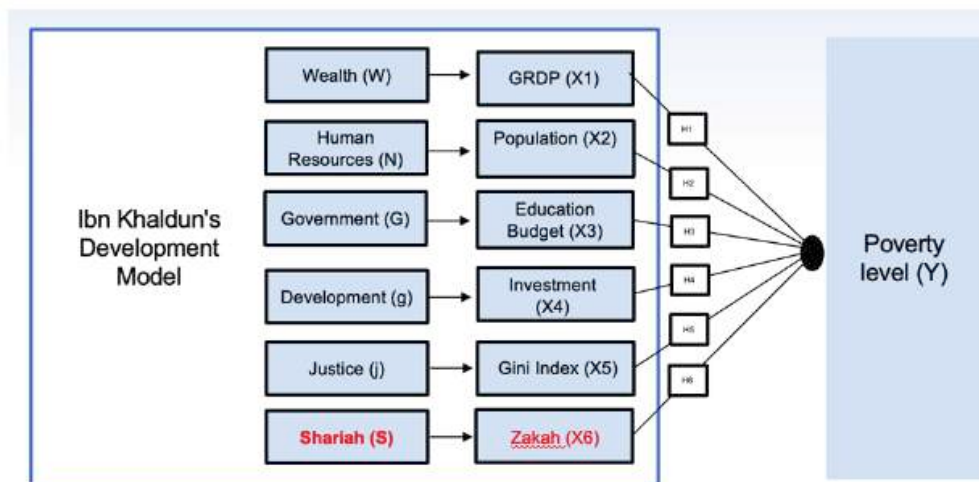


Figure 3: Conceptual Framework.

Source: Adopted and modified from Hanafiah (2009), Affandi & Astuti (2014), Putra & Indra (2016), and Nugroho (2020).

used as a conceptual background, but also as the basis for structuring the empirical model. As illustrated in Figure 3, each dimension of Ibn Khaldun's framework is translated into a contemporary measurable indicator and linked to poverty as the outcome variable. Thus, Figure 3 serves as the conceptual bridge between Ibn Khaldun's theoretical framework and the empirical model developed in the subsequent section.

Figure 3 illustrates how each empirical variable is positioned within Ibn Khaldun's Circle of Equity causality system. GRDP represents wealth, as it reflects the economic capacity of a region to generate income and support welfare. Population represents human resources, capturing the demographic base that may contribute to development, but may also increase pressure on poverty when not accompanied by sufficient economic opportunities. Education expenditure represents the role of government, particularly through public investment in human capital. Investment represents development, as it reflects capital formation and productive economic activity. The Gini index represents justice, since income inequality indicates the extent to which economic benefits are distributed across society. Zakat distribution represents sharia, reflecting the Islamic redistributive mechanism aimed at supporting vulnerable groups and reducing poverty. Therefore, the variables in this study are derived from the main elements of Ibn Khaldun's framework and are used to examine how the Circle of Equity operates in the context of poverty in Aceh Province.

This study employs a quantitative approach using balanced panel data from 20 districts and municipalities in Aceh Province over the period 2015–2019. This period

was selected because it corresponds to Indonesia's National Medium-Term Development Plan (*Rencana Pembangunan Jangka Menengah Nasional/ RPJMN*) 2015–2019, which served as the main policy reference for both central and regional governments. The period after 2019 is excluded to avoid the structural distortions caused by the COVID-19 pandemic. All data used in this study are secondary data obtained from official sources, including the Central Statistics Agency of Aceh Province (BPS), the Regional Education Balance of the Ministry of Education and Culture (Kemendikbud), the Investment and Integrated One-Stop Services Agency of Aceh Province (DPMPTSP), and Baitul Mal Aceh (BMA).

The dependent variable in this study is the poverty rate, measured as the percentage of the population whose monthly per capita expenditure falls below the poverty line. The independent variables represent the six dimensions of Ibn Khaldun's development framework, namely wealth, human resources, government, development, justice, and sharia, which are proxied by GRDP, population, education expenditure, investment, the Gini index, and zakat distribution, respectively. The operational definitions, measurement units, and data sources for all variables are presented in Table 2. In the empirical estimation, GRDP, population, education expenditure, investment, and zakat distribution are transformed into natural logarithms, while the poverty rate and Gini index are retained in level form.

Based on Ibn Khaldun's multidimensional development framework, this study expects that improvements in wealth, government support, development, and sharia-based redistribution will reduce poverty, while demographic pressure and inequality will increase it.

Table 2: Operational Definition of the Variables.

Variable	Operational Definition	Variable Code	Unit	Source
Dependent Variable				
Poverty Rate	Percentage of the population whose monthly per capita expenditure falls below the poverty line	K	Percent	Badan Pusat Statistik
Independent Variables				
Gross Regional Domestic Product (GRDP)	Regional economic output representing income generated within a district or municipality	GRDP	Percent	Badan Pusat Statistik
Population	Number of individuals residing in a district or municipality for at least six months, or for less than six months with the intention to stay	POP	Percent	Badan Pusat Statistik
Education Expenditure	Government revenues and expenditures in the education sector, including regional funds and intergovernmental transfers	PEN	Percent	Neraca Pendidikan Daerah, Kemendikbud
Investment Realization	Realized domestic and foreign investment based on prevailing investment regulations	INV	Percent	Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu Provinsi Aceh
Gini Ratio	Indicator used to measure the degree of overall expenditure inequality	GINI	Index	Badan Pusat Statistik
Zakat Distribution	Total annual distribution of zakat fitrah and zakat mal in each district or municipality	ZAKAT	Percent	Badan Amil Zakat Nasional

Accordingly, the study tests the following hypotheses regarding the long-run relationship between the explanatory variables and poverty in Aceh Province:

H1: GRDP is negatively associated with poverty levels in the long run.

H2: Population size is positively associated with poverty levels in the long run.

H3: Education is negatively associated with poverty levels in the long run.

H4: Investment is negatively associated with poverty levels in the long run.

H5: Gini index is positively associated with poverty levels in the long run.

H6: Zakat distribution is negatively associated with poverty levels in the long run.

To estimate these relationships, this study employs the Panel Vector Autoregression (Panel VAR) and Panel Vector Error Correction Model (Panel VECM) frameworks. This approach is considered appropriate because Ibn Khaldun's framework assumes that the dimensions of development are interdependent and mutually influential. Unlike conventional panel regression,

Panel VAR/VECM treats all variables as endogenous, allowing the analysis to capture dynamic and potentially bidirectional relationships among them. In particular, Panel VECM is useful for distinguishing between short-run dynamics and long-run equilibrium relationships (Gujarati, 2003; Basuki & Yuliadi, 2015). All estimations are conducted using EViews 12.

The analytical procedure consists of several stages. First, a stationarity test is conducted using the Augmented Dickey-Fuller (ADF) test in order to avoid spurious regression. Second, the optimal lag length is determined using the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ). Third, the system stability is tested using the Roots of Characteristic Polynomials, where the model is considered stable if all roots have a modulus less than 1. After these preliminary tests, the Johansen cointegration test is applied to determine whether a long-run equilibrium relationship exists among the variables. Since the empirical results indicate cointegration, this study proceeds with the Panel VECM specification.

The empirical model is estimated as a system of seven endogenous variables: poverty, GRDP, population, education expenditure, investment, the Gini index, and

zakat. The general Panel VECM specification can be written as follows:

$$\Delta Y_{it} = \alpha_i + \sum_{k=1}^p \beta_k \Delta Y_{it-k} + \lambda ECT_{it-1} + \varepsilon_{it}$$

where is the vector of endogenous variables for district or municipality at time , denotes the first-difference operator, is the selected lag length, is the lagged error-correction term representing the long-run equilibrium relationship, and is the error term. Within this system, the poverty equation is the primary equation of interest, while analogous equations are estimated for the remaining six endogenous variables to capture the interdependencies among all model variables.

4. RESULTS AND DISCUSSIONS

Determination of the Best Model

Before estimating the main mode and discussing the findings, this study first determines the most appropriate empirical specification through three preliminary procedures: the stationarity test, the optimal lag test, and the stability test. These procedures are required to ensure that the data satisfy the assumptions of the Panel VAR/VECM framework and that the selected lag structure is appropriate for dynamic analysis.

1. Stationarity Test

The stationarity test is the first step in the Panel VECM procedure. In this study, stationarity is assessed using

the Augmented Dickey-Fuller (ADF) test, in which a variable is considered stationary if its p-value is below the selected significance level. The results show that all variables are stationary at the first-difference level. The probability values are 0.0066 for poverty, 0.0016 for GRDP, 0.0023 for population, and 0.0000 for education budget, investment, the Gini index, and zakat. Since all probability values are below 0.05, all variables satisfy the stationarity requirement and are therefore suitable for further estimation using the Panel VAR/VECM framework.

2. Optimal Lag Test

After confirming that all variables are stationary, the next step is to determine the optimal lag length. In this study, lag selection is based on several criteria, namely the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ). The results indicate that the optimal lag length is lag 1. This choice is supported by the LR, FPE, and AIC criteria, which all select lag 1 as the preferred specification. Although the SC and HQ criteria suggest lag 0, the majority of the criteria point to lag 1. Therefore, lag 1 is selected as the most appropriate lag structure for the subsequent analysis.

3. Stability Test

The final step in determining the best model is the stability test. In this study, stability is assessed using the Roots of the characteristic polynomial; the model is

Table 3: Stationarity Test Results at First Difference.

Variables	Probability	Notes
Poverty Level (K)	0.0066***	Stationary
Gross Regional Domestic Product (LOGRDP)	0.0016***	Stationary
Population (LOGPOP)	0.0023***	Stationary
Education Budget (LOGPEN)	0.0000***	Stationary
Investment (LOGINV)	0.0000***	Stationary
Gini Index (Gini)	0.0000***	Stationary
Zakah (LOGZ)	0.0000***	Stationary

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Optimal Lag Length Selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	121.8644	NA	5.13e-11	-3.828880	-3.584540*	-3.733305*
1	190.3431	118.6930*	2.71e-11*	-4.478104*	-2.523383	-3.713505

considered stable if all roots have moduli less than 1. The results confirm that the model is stable, as all characteristic roots have modulus below 1, including 0.916904, 0.573362, 0.446415, 0.350562, and 0.160836. Since none of these values exceeds 1, the model satisfies the stability condition and can therefore be used for subsequent analysis, such as cointegration testing.

Table 5: Stability Test Results.

Root	Modulus
0.916904	0.916904
-0.518285 - 0.245201i	0.573362
-0.518285 + 0.245201i	0.573362
-0.140028 - 0.423885i	0.446415
-0.140028 + 0.423885i	0.446415
-0.350562	0.350562
0.160836	0.160836

■ Cointegration Test

After determining the best model through the stationarity, optimal lag, and stability tests, the next step is to examine whether the variables in the system share a long-run equilibrium relationship. In this study, cointegration is tested using the Johansen cointegration test.

The results indicate the presence of five cointegrating equations, as the trace statistics for the hypotheses None, At most 1, At most 2, At most 3, and At most 4 are all greater than their respective 5 per cent critical values and have probability values below 0.05. By contrast, the hypotheses At most 5 and At most 6 are not statistically significant. These findings confirm that poverty, GRDP, population, education expenditure, investment, the Gini index, and zakat are cointegrated and therefore maintain a stable long-run relationship. On this basis, the Panel VECM model is justified for subsequent estimation.

Table 6: Johansen Cointegration Test Results.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.828468	253.4600	125.6154	0.0000
At most 1 *	0.812224	182.9405	95.75366	0.0000
At most 2 *	0.662452	116.0404	69.81889	0.0000
At most 3 *	0.596877	72.59842	47.85613	0.0001
At most 4 *	0.409213	36.25787	29.79707	0.0078
At most 5	0.315086	15.20592	15.49471	0.0552
At most 6	0.001684	0.067428	3.841465	0.7951

From a substantive perspective, the existence of cointegration also supports the underlying logic of Ibn Khaldun's development framework, which assumes that development outcomes are shaped by the interaction of mutually related dimensions, including wealth, human resources, government, justice, development, and sharia. The presence of long-run cointegration among the variables therefore provides empirical support for analysing poverty in Aceh through a multidimensional, interconnected framework rather than isolated partial relationships.

■ Empirical Results

■ 1. Granger Causality Test

After confirming cointegration among the variables, the short-run dynamics were examined using the Granger causality test. The results reveal several significant causal relationships. First, education and poverty exhibit a bidirectional relationship. Both "D(PEN) does not Granger Cause D(K)" and "D(K) does not Granger Cause D(PEN)" are significant, with probability values of 0.0081 and 0.0199, respectively. This indicates that education affects poverty in the short run, while poverty also affects education, suggesting a mutually reinforcing relationship between the two.

Second, zakat and investment also show a bidirectional relationship, with probability values of 0.0584 and 0.0680, respectively, indicating significance at the 10 per cent level. Although zakat does not appear to have a direct long-run effect on poverty, this result suggests that it may still interact with broader economic dynamics, particularly investment activity, in the short run.

Several unidirectional causal relationships are also identified. GRDP Granger-causes poverty (0.0420), investment (0.0242), and population (0.0028), indicating that economic output plays an important short-run role in shaping welfare and broader economic conditions. In

addition, the Gini index Granger-causes education (0.0921), while population Granger-causes the Gini index (0.0653), suggesting that inequality and demographic conditions are also linked to short-run socioeconomic adjustment.

Overall, the Granger causality results show that short-run interactions among the variables are dynamic and interconnected. Poverty in Aceh is closely related to education and economic growth in the short run, while zakat appears to interact more strongly with investment than with poverty directly. These findings reinforce the view that poverty in Aceh cannot be explained by a single factor, but rather by interrelated economic, social, and institutional dynamics.

Table 7: Granger Causality Test Results.

Null Hypothesis	Prob.
D(PEN) does not Granger Cause D(K)	0.0081***
D(K) does not Granger Cause D(PEN)	0.0199**
D(GRDP) does not Granger Cause D(K)	0.0420**
D(GRDP) does not Granger Cause D(INV)	0.0242**
D(ZAKAT) does not Granger Cause D(INV)	0.0584*
D(INV) does not Granger Cause D(ZAKAT)	0.0680*
D(GINI) does not Granger Cause D(PENDIDIKAN)	0.0921*
D(POP) does not Granger Cause D(GINI)	0.0653*
D(GRDP) does not Granger Cause D(POP)	0.0028***

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2. Panel VECM Estimation Results

After establishing short-run causal relationships, the long-run determinants of poverty are estimated using the Panel Vector Error Correction Model (Panel VECM). This approach is appropriate because the cointegration test confirms the presence of long-run equilibrium relationships among the variables. The long-run equation focuses on poverty and examines the effects of GRDP, population, education expenditure, investment, the Gini index, and zakat in Aceh over time.

The estimation results indicate that GRDP has a negative and significant effect on poverty. The coefficient of LOGGRDP(-1) is -9.217938, implying that a 1 per cent increase in GRDP in the previous period is associated with a 9.21 per cent decline in poverty in the current period. This confirms that economic growth remains an important mechanism for poverty reduction in Aceh.

Population, by contrast, has a positive and significant effect on poverty. The coefficient of LOGPOP(-1) is

82.69808, meaning that a 1 per cent increase in population is associated with an 82.69 per cent increase in poverty. This suggests that population growth in Aceh has not automatically been transformed into productive human resources and may instead intensify pressure on household welfare when not supported by sufficient employment opportunities and economic capacity.

Education expenditure and investment are both found to reduce poverty significantly in the long run. The coefficient of LOGPEN(-1) is -2.190281, indicating that a 1 per cent increase in education expenditure is associated with a 2.19 per cent reduction in poverty, while the coefficient of LOGINV(-1) is -0.296412, implying that a 1 per cent increase in investment is associated with a 0.29 per cent decline in poverty. These findings highlight the importance of government intervention and productive development in improving long-run welfare outcomes.

Table 8: Long-Run Panel VECM Estimation Results.

Cointegrating Eq	CointEq1
K(-1)	1.000000
LOGGRDP(-1)	-9.217938 (4.70980)
	[-1.95718]**
LOGPOP (-1)	82.69808 (16.5485)
	[-2.55946]**
LOGPEN (-1)	-2.190281 (0.85576)
	[-2.55946]**
LOGINV(-1)	-0.296412 (0.05739)
	[-5.16455]***
GINI (-1)	8.383171 (6.82394)
	[1.22849]
LOGZAKAT(-1)	-0.347839 (0.33305)
	[-1.04440]
C	-1.494799

Notes: Standard errors are reported in parentheses, and t-statistics are reported in brackets. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

By contrast, the Gini index is not statistically significant in the long-run equation, although its coefficient is positive. This suggests that income inequality, as measured in this

study, does not directly explain long-run poverty variation after controlling for other variables. Similarly, zakat does not have a statistically significant long-run effect on poverty, although the coefficient of LOGZAKAT(-1) is negative (-0.347839). Since zakat is used as a proxy for the Sharia dimension, this finding suggests that its long-run macroeconomic effect on poverty reduction in Aceh was not yet measurable during the study period. One possible explanation is that the actual collection and distribution of zakat fell short of its estimated potential.

Overall, the Panel VECM results show that poverty in Aceh is significantly shaped in the long run by economic growth, population dynamics, education expenditure, and investment. GRDP, education expenditure, and investment reduce poverty, while population increases it. Meanwhile, the Gini index and zakat do not emerge as statistically significant long-run determinants in the estimated model. These findings provide the main empirical basis for the subsequent discussion of the extent to which Ibn Khaldun's development framework is supported in the case of Aceh.

■ Discussions

The empirical findings show that poverty in Aceh province is shaped by interrelated economic, demographic, institutional, and social factors. This result is broadly consistent with Ibn Khaldun's development framework, which views development as the interaction among wealth, human resources, government, investment, justice, and sharia. Thus, the framework is empirically relevant for explaining poverty in Aceh, although not all of its dimensions are equally strong in practice.

Specifically, first, the long-run significance of GRDP suggests that economic growth remains a central mechanism for poverty reduction in Aceh, as the Panel VECM results indicate that an increase in GRDP significantly reduces poverty. This finding is consistent with previous studies that identify wealth or economic output as an important determinant of poverty reduction within Ibn Khaldun's framework, particularly Hanafiah (2009), Putra and Indra (2016), and Nugroho (2020). It also aligns with Baihaqi and Puspitasari (2020), who found that GRDP significantly affected poverty in Aceh. In substantive terms, stronger regional economic activity appears to increase productive capacity, expand income opportunities, and support improvements in welfare. Within Ibn Khaldun's framework, This is consistent with the importance of wealth as a key pillar of development and civilizational progress.

Second, the positive and significant effect of population suggests that demographic growth in Aceh has not automatically been transformed into productive human resources. This result is broadly in line with Rusydiana (2018), who found that population size significantly influenced development in Indonesia, and with Aceh-based studies such as Putri (2019) and Saleh and Rizkina (2021), which also reported a positive relationship between population and poverty. The present finding implies that population growth may intensify poverty when it is not accompanied by adequate employment opportunities, productive economic expansion, and sufficient public services. In this respect, the result can still be interpreted consistently with Ibn Khaldun's model. Rather, it confirms that human resources can only become a positive force for development when they are supported by wealth, effective government, and fair development processes.

Third, education expenditure is associated with lower poverty in the long run, while the Granger causality test indicates a bidirectional relationship between education and poverty in the short run. This finding is consistent with Hanafiah (2009) and Nugroho (2020), both of whom identify education-related government spending as an important determinant within Ibn Khaldun's framework. The result highlights the important role of government in development, particularly through education. Public spending on education improves human capability, increases long-run productivity, and expands access to better economic opportunities. At the same time, the two-way causality indicates that the relationship between education and poverty is recursive: better education can reduce poverty, but poverty can also restrict educational attainment by constraining household resources. In the context of Aceh, this suggests that education is both a policy instrument and a development outcome.

Fourth, investment is also found to have a significant poverty-reducing effect in the long run. This is consistent with Affandi and Astuti (2014), who include investment as part of the development dimension in Ibn Khaldun's framework, and with Rizal and Rahayu (2020), who find that investment promotes economic growth and reduces poverty in Aceh Barat. Although the magnitude of its coefficient is smaller than that of GRDP and education, the result still shows that investment appears to contribute to poverty reduction through the expansion of productive activity and capital formation. The short-run Granger results also indicate that GRDP affects investment and that zakat and investment are linked bidirectionally, suggesting that investment in Aceh is embedded in a broader system of economic interaction

rather than functioning in isolation. From the perspective of Ibn Khaldun's framework, development requires wealth to circulate productively rather than remain idle.

Fifth, the Gini index is not statistically significant in the long-run poverty equation, even though the Granger causality test shows that it affects education in the short run. This result differs somewhat from Hanafiah (2009) and Saleh and Rizkina (2021), both of whom report that inequality-related variables play a significant role in explaining poverty. One possible explanation is that, in the present model and period of observation covered (*i.e.* 2015–2019), the Gini index captures only part of the broader concept of justice in Ibn Khaldun's framework. Justice in Ibn Khaldun's thought is not limited to income distribution, but also includes legal, political, and social fairness. Thus, the non-significance of the Gini index should not be interpreted as evidence that justice is irrelevant, but rather that the proxy may be too narrow to fully reflect the theoretical dimension it is intended to represent.

One of the more important findings of this study concerns zakat. Although zakat is included as a proxy for the sharia dimension and has a negative coefficient in the long-run equation, it does not have a statistically significant effect on poverty reduction. This result contrasts with Amri (2019), Afifudin and Sari (2019), and Muliadi and Bakar (2024), who report that zakat significantly reduces poverty in Aceh, but it is closer to the finding of Nurdin and Haris (2020), who find no short-run relationship between zakat and poverty. More broadly, the result should be interpreted alongside recent studies such as Herianingrum *et al.* (2024), Hamadou and Jallow (2024), and Mohsin and Zulkarnaini (2025), which suggest that while Islamic social finance can contribute to poverty alleviation, its effectiveness depends heavily on governance quality, institutional coordination, digital integration, and implementation strength. In this sense, the weak statistical effect of zakat in Aceh may reflect limitations in implementation, measurement, or institutional effectiveness, rather than necessarily implying that zakat is theoretically irrelevant to poverty reduction.

Therefore, the findings suggest that Ibn Khaldun's development framework is capable of explaining poverty in Aceh with reasonable empirical strength. The results confirm that poverty is not merely a matter of insufficient income, but a multidimensional condition shaped by wealth, population, government intervention, investment, inequality, and Islamic redistributive institutions.

At the same time, the findings also show that the practical realisation of these dimensions is uneven. Aceh appears to perform more strongly in the dimensions of economic growth and government-related intervention than in the institutional realisation of the sharia dimension through zakat. This explains why the model is only partially supported empirically: the conceptual framework is relevant, but some of its institutional channels remain underdeveloped in practice. From a policy perspective, poverty reduction in Aceh therefore requires a multidimensional strategy that combines sustained economic growth, stronger investment in education, more productive investment, better management of demographic pressure, and improved zakat governance.

■ 5. CONCLUSION

This study examines determinants of poverty and the role of Islamic social finance, particularly zakat in reducing poverty in Aceh Province through Ibn Khaldun's development framework. Using balanced panel data from 20 districts and municipalities during 2015–2019 and applying the Panel VECM approach, the study finds that Ibn Khaldun's model is empirically relevant for explaining poverty in Aceh. In the long run, GRDP, education expenditure, and investment are associated with poverty reduction, while population is associated with higher poverty. In the short run, poverty is primarily influenced by GRDP and education.

These findings confirm that poverty in Aceh is multidimensional and cannot be understood solely as a problem of low income. Rather, poverty is shaped by the interaction of economic growth, demographic pressure, government intervention, productive development, and Islamic redistributive institutions. In this respect, Ibn Khaldun's framework provides a useful analytical lens for understanding the poverty–development nexus in Aceh.

At the same time, the results show that zakat distribution, which is used as a proxy for the sharia dimension, does not have a statistically significant long-run effect on poverty reduction during the study period. This finding does not necessarily imply that the sharia dimension is irrelevant; rather, it suggests that its institutional implementation has not yet been sufficiently effective. Limited collection and distribution, weak public awareness, regulatory constraints, and governance-related issues may have reduced the observable macro-level impact of zakat in Aceh.

Overall, the study suggests that Ibn Khaldun's framework is only partially confirmed empirically. The dimensions of

wealth, government, and development appear to operate more strongly in practice, while the justice and sharia dimensions are not yet fully reflected in measurable poverty outcomes. This indicates that the value of Ibn Khaldun's framework lies not only in its theoretical richness but also in its ability to identify which development institutions remain underdeveloped in practice.

■ Policy Recommendations

The main findings of this study imply that poverty reduction in Aceh should be pursued through a multidimensional policy strategy. First, the government should strengthen education-related policies, as education is found to influence poverty in both the short and long run. This includes expanding access to education, improving the effectiveness of education spending, and strengthening educational assistance for low-income households so that human capital development can contribute more directly to poverty reduction.

Second, given the positive relationship between population growth and poverty, greater attention should be paid to demographic management and labour-market preparation. Family planning programs, workforce training, and employment expansion should be strengthened so that population growth can be transformed into productive human resources rather than becoming an additional source of poverty pressure.

Third, regional development policy should continue to promote productive investment and community empowerment. Since investment is found to reduce poverty in the long run, policies that encourage business expansion, improve the investment climate, and support micro, small, and medium-sized enterprises can play an important role in broadening economic opportunity and improving household welfare.

Fourth, the role of zakat as an Islamic redistributive instrument should be strengthened. Although zakat is not statistically significant in the long-run model, this does not diminish its normative or institutional importance. Instead, it suggests improving zakat governance, increasing public trust, strengthening transparency and accountability, expanding collection and distribution systems, and providing sufficient institutional support for zakat management bodies. Better integration between zakat programs and regional poverty reduction policies may also enhance their effectiveness.

Finally, poverty reduction in Aceh should not rely exclusively on conventional growth-oriented policies. A more effective approach would combine economic growth, educational improvement, productive investment, population management, and stronger Islamic social finance institutions. Such a strategy would be more consistent with Ibn Khaldun's multidimensional conception of development and may offer a more comprehensive framework for reducing poverty in Aceh and in other Muslim-majority regions facing similar development challenges.

■ Limitations of the Study and Suggestions for Future Research

This study has several limitations that should be acknowledged. First, the analysis is based on a relatively small balanced panel, covering 20 districts and municipalities in Aceh Province over the period 2015–2019. Although this period was intentionally selected to avoid the structural disruptions associated with the COVID-19 pandemic, the limited number of observations may constrain the model's ability to capture longer-term structural change and may affect the robustness of the Panel VAR/VECM estimation. Accordingly, the results should be interpreted as evidence of dynamic interrelationships and long-run associations within the available data, rather than as definitive causal effects.

Second, the empirical analysis relies on proxy variables to represent the dimensions of Ibn Khaldun's development framework. Some concepts in Ibn Khaldun's model, particularly justice and sharia, are broader and more complex than the indicators used in this study. Accordingly, the Gini index and zakat distribution may capture only part of these dimensions.

Third, the study focuses exclusively on Aceh Province. Given Aceh's unique institutional and religious context, the findings should be interpreted cautiously and not generalised automatically to other regions.

Finally, the zakat variable is based on formal distribution data and therefore captures the volume of zakat distributed through official institutional channels, rather than the efficiency or effectiveness of zakat distribution. It may not fully reflect informal zakat practices, targeting accuracy, distribution channels, institutional quality, or other forms of Islamic social redistribution outside official institutional mechanisms. Future research may address these limitations by extending the observation period, incorporating broader institutional indicators, comparing Aceh with other provinces or Muslim-majority regions,

and developing a zakat effectiveness index that captures not only the amount of zakat distributed but also its targeting, efficiency, institutional quality, and poverty-reducing outcomes.

■ CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

■ AUTHORS CONTRIBUTION STATEMENT

Rahmatina Awaliah Kasri: Conceptualization, Methodology, Supervision, Writing - Review, Editing, and Proofread.

Adela Natasya: Data curation, Formal analysis, Investigation, Writing – original draft.

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