







“Islamic banking and sectoral economic growth: Evidence from Indonesia”

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ISLAMIC BANKING AND SECTORAL ECONOMIC GROWTH: EVIDENCE FROM INDONESIA

Abstract

Grounded in the financial development-economic growth nexus, this study aims to explore the role of Islamic banking in shaping sectoral economic growth in Indonesia. Specifically, it examines the effects of Islamic bank financing (IBF) and non-performing financing (NPF) on sectoral GDP to identify variations in their impact across key sectors. Using quarterly time-series data from 2011Q1 to 2024Q3, the Autoregressive Distributed Lag (ARDL) model was employed to examine short-term and long-term relationships. Findings reveal sector-specific variations in the effects of IBF and NPF. In the long run, IBF has a significant positive impact on the education sector (13.13), health (3.95), accommodation (3.30), and construction (2.73). In contrast, IBF shows a significantly negative effect in agriculture (-87.65), fisheries (-21.49), and real estate (-5.04). NPF generally shows negative effects on sectoral GDP, particularly in accommodation (-136.67), education (-1122.11), and manufacturing (-215.75), while showing unexpected positive effects in health (234.46) and real estate (7.50). Short-term analysis highlights both positive and negative effects of IBF and NPF, with notable variations across sectors where IBF boosts GDP in health (2.73) and sales (3.04), but negatively impacts manufacturing (-2.38) and fisheries (-8.04); NPF has a short-term negative effect in accommodation (-90.38) and education (-433.93), with lagged positive adjustments in some sectors. Lagged effects of NPF suggest delayed financial adjustments and sector-specific recovery patterns. These findings provide sector-specific empirical insights that can inform the design of more effective Islamic financial policies and targeted interventions to support inclusive and sustainable economic growth.

Keywords

financing, NPF, economic development, financial inclusion, time series analysis

JEL Classification

G21, O16, C32

INTRODUCTION

The relationship between financial systems and economic growth remains a central issue in economic development studies. In recent decades, Islamic banking has emerged as an increasingly important component of the financial landscape in many Muslim-majority countries. While their role in promoting financial inclusion has been acknowledged, their rapid expansion raises fundamental questions about how Islamic financial institutions contribute to broader economic outcomes, not only at the national level but also across specific sectors that form the backbone of real economic activity.

Given these challenges, there is a growing urgency to investigate how Islamic bank financing contributes to economic growth at the sectoral level. The finance-growth relationship is inherently complex, shaped by diverse institutional, structural, and financial factors that vary across sectors. As each sector exhibits distinct characteristics and responds differently to financial inputs, a one-size-fits-all view of

Islamic banking's impact is insufficient. Sectoral-level research is therefore essential to understand these complexities and to identify where Islamic financing effectively supports growth, and where it does not.

At the same time, rising levels of non-performing financing in Islamic banks introduce further complexities into the finance-growth relationship. These financial inefficiencies may hinder the productive role of Islamic banking, especially if their distribution and consequences vary across sectors. Without a clear empirical understanding of these patterns, it is difficult to evaluate whether Islamic banking truly supports inclusive and sustainable economic development or if its impact is constrained by sector-specific barriers and financial vulnerabilities.

1. LITERATURE REVIEW

The relationship between financial development and economic growth has been explained through four main theories, each offering a distinct perspective: the Supply-Leading Hypothesis, the Demand-Following Hypothesis, the Feedback Hypothesis, and the Neutral Hypothesis. These theories provide valuable insights into the nature of the connection between financial systems and economic progress.

The Supply-Leading Hypothesis argues that financial development serves as a catalyst for economic growth. This theory emphasizes the critical role of the financial sector in mobilizing resources, financing projects, and promoting entrepreneurial activities. By facilitating investments and providing financial support, the financial system drives economic expansion. Proponents of this hypothesis include Schumpeter (1911), McKinnon (1973), Levine et al. (2000), Beck et al. (2000), and Kassim (2016). Their studies propagate and demonstrate a positive causal relationship and highlight the financial sector as a key driver of economic development.

In contrast, the Demand-Following Hypothesis suggests that economic growth stimulates the development of the financial sector. According to this view, as economies expand, businesses and individuals require more financial services to sustain their activities. This growing demand encourages the financial sector to adapt, innovate, and expand its offerings. Robinson (1952), Carby et al. (2012), Furqani and Mulyany (2009), and Pradhan et al. (2017) emphasized that financial development often follows economic progress rather than initiating it and provided several empirical evidence on their theoretical hypothesis.

The Feedback Hypothesis proposes a bidirectional relationship between financial development and economic growth. This theory was brought by Patrick (1966), who argues that the two are mutually reinforcing. Financial development enables economic activities by providing the necessary resources, while economic growth, in turn, creates opportunities for further financial innovation and sectoral expansion. This perspective highlights the interdependence of the two systems. Pradhan et al. (2015) provide empirical evidence supporting this reciprocal relationship, showcasing how financial and economic growth complement each other over time.

The Neutral Hypothesis takes a different stance by asserting that there is no significant connection between financial development and economic growth. This theory suggests that the financial and economic sectors operate independently, and any observed relationship between the two is coincidental or context-specific. Lucas (1988) is the primary proponent of this hypothesis, arguing that financial development does not play a decisive role in influencing economic outcomes. This perspective challenges the assumption that financial systems are a universal driver of economic growth, instead emphasizing the possibility that other factors, such as institutional or structural elements, may have a more dominant role.

The presence of Islamic banks introduces a unique dimension to the finance and economic growth discussion, as they operate under Islamic laws that prohibit interest and emphasize profit-loss sharing mechanisms (Athief et al., 2024). Consequently, their operations, risk types, performance, business effects, and customer preferences differ significantly from conventional banks (Athief et al., 2024; Herianingrum et al., 2019; Ryandono et al., 2022).

This distinct operational framework not only sets Islamic banks apart from conventional ones but also plays a pivotal role in shaping their contribution to economic growth. Understanding this relationship is essential for examining how Islamic financial systems align with and support broader economic objectives. Empirical evidence provides substantial support for the Supply-Leading Hypothesis, particularly in the context of Islamic banking. Numerous studies have shown how the development of Islamic financial systems facilitates economic growth by enabling investments, financing productive sectors, and supporting national development goals.

In the United Arab Emirates (UAE), Tabash (2018) and Tabash and Anagreh (2017) demonstrate the critical role of Islamic banking in fostering economic growth. Their studies reveal a significant causal relationship from Islamic banking to economic expansion, emphasizing the importance of Islamic banks in channeling financial resources into productive sectors. The research highlights that Islamic banking contributes to GDP growth by financing infrastructure projects, promoting trade, and supporting other real-sector activities. These findings illustrate how the growth of Islamic finance institutions has been instrumental in advancing the UAE's economy, aligning clearly with the Supply-Leading Hypothesis.

Similarly, Al Fathan and Arundina (2019) explore the finance-growth nexus in Indonesia, with a specific focus on the role of Islamic finance in supporting economic development. Their findings highlight the critical importance of the sukuk market in financing infrastructure and other essential projects. By linking Islamic financial instruments to real economic activities, the study provides empirical support for the Supply-Leading Hypothesis, showing that the growth of Islamic finance drives economic progress in Indonesia.

In Turkey, Atici (2018) investigates the impact of participation banking as a form of Islamic banking on economic growth. The study reveals a unidirectional causal relationship, demonstrating that Islamic banking development stimulates economic activities. Specifically, participation banks in Turkey play a pivotal role in financing SMEs and supporting trade, thereby contributing to broader

economic growth. These findings further validate the proactive role of Islamic banking in driving economic development in emerging markets.

Panel studies also reinforce the supply-leading role of Islamic banking across broader contexts. Jawad and Christian (2019) analyze data from 24 countries and find strong evidence that Islamic banking development leads to significant economic growth. Similarly, Zirek et al. (2016) focus on 14 OIC countries and confirm that Islamic banking consistently drives economic performance. These studies provide robust cross-regional evidence of Islamic banking's contribution to economic growth, demonstrating its universal relevance as a driver of development.

While most evidence supports the Supply-Leading Hypothesis, some research highlights alternative dynamics. Tabash identified demand-following evidence in some Gulf Cooperation Council (GCC) countries, where economic growth drives the development of Islamic banking (Tabash et al., 2017). In other observed GCC countries, however, the relationship aligns with the supply-leading framework. Additionally, some studies indicate a bidirectional causality, suggesting that Islamic banking and economic growth influence each other mutually. Ben Mimoun (2019) identifies a bidirectional relationship in the case of Saudi Arabia, showing the coexistence of both supply-leading and demand-following mechanisms. The study demonstrates that while Islamic banking supports economic growth by facilitating investments and financing productive activities, its own expansion is also shaped by the demands of a growing economy. This dual relationship underscores the reach role of Islamic banking within a dual banking system, where its contributions to economic growth are both proactive and reactive (Abduh & Azmi Omar, 2012; Furqani & Mulyany, 2009).

While the relationship between Islamic banking and economic growth has been explored within the frameworks of supply-leading and demand-following hypotheses, it is also essential to consider how financial development affects specific economic sectors. In manufacturing and services, financial development drives growth but requires a critical financial scale to achieve positive outcomes (Daway-Ducanes & Gochoco-Bautista,

2019). The agriculture sector, however, shows a weaker link as seen in Pakistan, where credit to agriculture had minimal impact on growth. In contrast, the industrial sector heavily relies on financial development, particularly for long-term investments, benefiting significantly from tailored credit policies (Majeed & Iftikhar, 2020). Similarly, the insurance sector supports economic growth, with life insurance positively impacting GDP in developed economies (Haiss & Sümeği, 2008). These findings underscore the importance of examining the financial-growth nexus at the sectoral level to develop more targeted and effective economic policies.

In contrast to the relationship between financing and credits towards economic growth, non-performing financing and non-performing loans have a negative effect on the economy. Katuka et al. (2023), Qolbi et al. (2020), and Agiropoulos et al. (2021) documented the negative relationship of NPF towards economic growth in Zimbabwe and the Eurozone banking system. However, on the other hand, Artenisa and Hyrije (2023), Nasir et al. (2022), and Syed and Tripathi (2020) confirmed the opposite causality direction where economic condition has a negative relationship with NPF.

The literatures above demonstrate that Islamic banking plays an increasingly important role in supporting economic growth, particularly through the supply-leading hypothesis. However, much of the existing research still emphasizes macro-level analysis and lacks sector-specific insights. Moreover, the role of non-performing financing in shaping economic outcomes remains underexplored. This highlights the need for more detailed, sectoral-level studies to better understand how Islamic bank financing and financial risks influence different parts of the economy. Therefore, this study seeks to investigate the role of Islamic banking in influencing sectoral economic growth in Indonesia by examining how Islamic bank financing (IBF) and non-performing financing (NPF) affect sectoral GDP and vary in their impact across different segments of the economy. Based on the research purpose, theoretical framework, and the literature discussed above, the following hypotheses are formulated:

H1: Islamic banks' financing has a positive impact on sectoral GDP growth across different business sectors.

H2: Non-performing financing (NPF) in Islamic banks negatively affects sectoral GDP growth.

2. METHODOLOGY

This study employs time-series analysis using quarterly data from 2011Q1 to 2024Q3 to examine the relationship between Islamic bank financing, Islamic bank non-performing financing (NPF), and sectoral GDP growth in Indonesia. Data are sourced from Statistics Indonesia (BPS), the Indonesian Financial Services Authority (OJK), Bank Indonesia, and the Ministry of Investment and Downstream Industry (BKPM). Table 1 provides the details of these variables. There are 10 examined sectors in this study, which are:

- Accommodation and food services (Accm);
- Agriculture, livestock, and forestry (Agri);
- Construction (Constr);
- Education (Edu);
- Fisheries (Fish);
- Health and Social Activity (Health);
- Manufacturing industry (Manfct);
- Real estate and business services (Reals);
- Wholesale and retail trade (Sale);
- Transportation and Warehousing (Wareshs).

The analysis focuses on two primary models: the first investigates the relationship between sectoral GDP and Islamic bank financing, while the second explores the relationship between sectoral GDP and Islamic bank NPF. Control variables, including interest rates, inflation, conventional bank financing, and investment, are incorporated into both models to ensure that macroeconomic dynamics influencing sectoral GDP are adequately accounted for, enhancing the robustness of the analysis.

The Autoregressive Distributed Lag (ARDL) model serves as the primary econometric tool due to its flexibility in handling variables integrated at different orders (I(0) and I(1)). Unlike other cointegration techniques, ARDL does not require all variables to be integrated at the same level, mak-

Table 1. Definition of variables

Variable	Definition	Source	Unit of Measurement
GDP	Sectoral GDP for 11 sectors at current market prices, reflecting nominal GDP	Statistics Indonesia (BPS)	Billion IDR
Islamic Bank Financing	Total sectoral financing provided by Islamic Commercial Banks and Business Units, specifically allocated to economic sectors	Indonesia Financial Authority (OJK)	Billion IDR
Islamic Bank NPF	Total non-performing financing from Islamic Commercial Banks and Business Units, indicating financing at risk of default	Indonesia Financial Authority (OJK)	Billion IDR
Interest Rate	Benchmark interest rate set by Bank Indonesia, used as a monetary policy tool	Bank Indonesia	Percentage (%)
Inflation	Measured by the Consumer Price Index (CPI), indicating changes in price levels over time	Bank Indonesia	Percentage (%)
Conventional Bank Financing	Total sectoral financing provided by Conventional Banks, allocated across economic sectors	Indonesia Financial Authority (OJK)	Billion IDR
Conventional Bank NPF	Total non-performing financing from Conventional Banks, indicating financing at risk of default	Indonesia Financial Authority (OJK)	Billion IDR
Investment	Total domestic and foreign investment across sectors, expressed in monetary terms	Ministry of Investment and Downstream Industry (BKPM)	Trillion IDR

ing it particularly suitable for time-series data where integration orders may vary across variables. ARDL also captures both short-run dynamics and long-run equilibrium relationships simultaneously, providing a comprehensive understanding of how Islamic bank financing and NPF influence sectoral GDP growth. Additionally, the ARDL Bound Test will be applied to determine whether a long-term cointegrating relationship exists between the dependent and independent variables. If cointegration is confirmed, an Error Correction Model (ECM) will be employed to measure the speed of adjustment, capturing how quickly deviations from long-run equilibrium are corrected in subsequent periods. This dual capability of ARDL to accommodate both short-term shocks and long-term stability makes it an ideal choice for addressing the study's primary hypotheses.

In the first model, sectoral GDP is regressed on Islamic bank financing alongside the control variables: interest rates, inflation, conventional bank financing, and investment. The ARDL equation for this model can be expressed as follows:

$$\begin{aligned} \Delta GDP_t = & \alpha + \sum_{i=1}^p \beta_i \Delta GDP_{t-i} \\ & + \sum_{j=0}^q \gamma_j \Delta IBF_{t-j} + \sum_{k=0}^r \delta_k \Delta X_{t-k} + \lambda_1 GDP_{t-1} \\ & + \lambda_2 IBF_{t-1} + \lambda_3 X_{t-1} + \varepsilon_t. \end{aligned} \quad (1)$$

The second model mirrors this structure but replaces Islamic bank financing with Islamic bank NPF and conventional bank financing with conventional NPF. It is specified as follows:

$$\begin{aligned} \Delta GDP_t = & \alpha + \sum_{i=1}^p \beta_i \Delta GDP_{t-i} \\ & + \sum_{j=0}^q \gamma_j \Delta NPF_{t-j} + \sum_{k=0}^r \delta_k \Delta X_{t-k} + \lambda_1 GDP_{t-1} \\ & + \lambda_2 NPF_{t-1} + \lambda_3 X_{t-1} + \varepsilon_t. \end{aligned} \quad (2)$$

The ARDL model's Bound Test for Cointegration will determine whether a long-run equilibrium relationship exists between the dependent and independent variables.

3. RESULTS

3.1. Unit root test

Before conducting the main analysis, it is essential to ensure that the data used in the study are stationary to avoid spurious regression results. Stationarity indicates that the statistical properties of the variables, such as mean and variance, remain constant over time. To test this, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were applied to all variables. These tests are widely recognized for their reliability in identifying whether data are stationary at

level or at first difference. The results show that the variables are integrated at different orders, specifically I(0) and I(1), while none of the variables are integrated at second difference, I(2). This satisfies the requirement for employing the Autoregressive Distributed Lag (ARDL) model, which is capable of handling variables with mixed integration orders. The ARDL method is particularly suitable for analyzing both short-run and long-run relationships between variables. Therefore, the findings confirm the appropriateness of the ARDL approach for examining the relationship between Islamic bank financing, non-performing financing (NPF), and sectoral GDP growth across various sectors.

3.2. Bound testing

The bound test plays a crucial role in analyzing the long-term relationship between Islamic bank financing (IBF), Islamic bank non-performing financing (IB_NPF), and sectoral GDP growth. This test, integrated into the Autoregressive Distributed Lag (ARDL) framework, is widely recognized for its flexibility in dealing with variables that are integrated at different orders, specifically I(0) and I(1). Its primary purpose is to determine whether a stable, long-term cointegration relationship exists between the dependent variable, sectoral GDP growth, and the independent variables, IBF and IB_NPF.

Establishing cointegration implies that despite short-term fluctuations or shocks, these variables move together over time in a predictable manner. Conversely, the absence of cointegration suggests

that any observed relationships may be temporary, unstable, or context-specific. This distinction is critical for policymakers because long-term relationships provide a reliable basis for sustainable financial strategies, while short-term associations might lead to misguided interventions.

The bound test compares calculated F-statistics against critical values represented as lower (I(0)) and upper (I(1)) bounds at three significance levels: 10%, 5%, and 1%. If the calculated F-statistic exceeds the upper bound, it confirms cointegration, indicating a stable long-run relationship. If it falls below the lower bound, no long-term relationship exists. If it lies between the two bounds, the result is inconclusive, requiring further analysis.

In the Islamic bank financing (IBF) model, the calculated F-statistics vary across sectors, which indicates differences in the strength of the long-term relationship between IBF and sectoral GDP growth. In general, all sectors have shown that the co-integration in the long term exists, with no sector found below the lower bound, as can be seen in Table 2. In detail, we can find the sectors of Construction (17.89203) and Real Estate (17.69666) display F-statistics well above the upper critical bounds across all significance levels. In contrast, the lowest F-statistic was observed in Agriculture (3.545598).

When examining Islamic bank non-performing financing (IB_NPF), the bound test results highlight a similarly heterogeneous pattern across sectors. Sectors such as Construction (20.17425), Real Estate (15.2464), and Accommodation (13.24599)

Table 2. Bound testing for sectoral Islamic bank financing and GDP equation

Variable	F-Stat	Bound Test IBF					
		10%		5%		1%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Accm	6.674725	2.08	3	2.39	3.38	3.06	4.15
Agri	3.545598	2.08	3	2.39	3.38	3.06	4.15
Constr	17.89203	2.08	3	2.39	3.38	3.06	4.15
Edu	9.076636	2.08	3	2.39	3.38	3.06	4.15
Fish	9.903523	2.08	3	2.39	3.38	3.06	4.15
Health	6.724476	2.08	3	2.39	3.38	3.06	4.15
Manfc	6.049676	2.08	3	2.39	3.38	3.06	4.15
Reals	17.69666	2.08	3	2.39	3.38	3.06	4.15
Sale	6.724476	2.08	3	2.39	3.38	3.06	4.15
Warehs	8.709048	2.08	3	2.39	3.38	3.06	4.15

Table 3. Bound testing for sectoral Islamic bank NPF and GDP equation

Variable	F-Stat	Bound Test NPF					
		10%		5%		1%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Accm	13.24599	2.08	3	2.39	3.38	3.06	4.15
Agri	10.90734	2.08	3	2.39	3.38	3.06	4.15
Constr	20.17425	2.08	3	2.39	3.38	3.06	4.15
Edu	4.656307	2.08	3	2.39	3.38	3.06	4.15
Fish	4.102371	2.08	3	2.39	3.38	3.06	4.15
Health	3.515573	2.08	3	2.39	3.38	3.06	4.15
Manfc	5.060511	2.08	3	2.39	3.38	3.06	4.15
Reals	15.2464	2.08	3	2.39	3.38	3.06	4.15
Sale	9.716674	2.08	3	2.39	3.38	3.06	4.15
Warehs	7.524214	2.08	3	2.39	3.38	3.06	4.15

exhibit high F-statistics, indicating significant long-term relationships between non-performing financing and GDP growth. Conversely, sectors like Health (3.515573) and Fisheries (4.102371) display weaker evidence of cointegration. This implies that while NPF exists in these sectors, it does not significantly disrupt long-term sectoral growth dynamics. The most important note here is that none of the variables fail to show a long-term cointegration, as it is shown in Table 3.

3.3. Long-run estimation

The long-run estimation results, as shown in Table 4, reveal the diverse impact of Islamic Bank Financing (IBF) on sectoral GDP growth across various economic sectors in Indonesia. The findings demonstrate both positive and negative impacts of IBF with varying degrees of statistical significance and coefficient values. In the accommodation sector (3.301882), IBF shows a positive and statistically significant relationship with GDP growth, suggesting that Islamic financing successfully supports activities in tourism, hospitality, and lodging services. Similarly, the construction sector (2.732402) benefits from IBF, which reflects its reliance on long-term financing structures.

The education sector (13.12657) stands out with the highest coefficient value, underlining the critical role of Islamic financing in supporting infrastructure, operational sustainability, and social welfare objectives within educational institutions. Additionally, the health sector (3.951997) also exhibits a significant positive relationship with IBF, indicating financing flows directed towards healthcare facilities, hospital in-

frastructure, and medical service improvements. These positive relationships highlight that sectors requiring long-term financing and social welfare alignment benefit more substantially from Islamic bank financing.

Conversely, IBF demonstrates a statistically significant negative relationship with GDP growth in the agriculture (-87.6473), fisheries (-21.48704), and real estate (-5.04229) sectors. In the agriculture sector, the negative coefficient suggests structural challenges in aligning IBF mechanisms with the seasonal income cycles, risk profiles, and operational needs inherent in agricultural activities. The fisheries sector follows a similar pattern with its negative coefficient, which reflects operational uncertainties, inconsistent income patterns, and a lack of sector-specific Islamic financing instruments. In the real estate sector, the negative coefficient suggests potential mismatches in financing structures, speculative risks, or limited product adaptation to the sector's requirements. These results imply that while Islamic financing mechanisms align well with sectors requiring structured, long-term investments, they face limitations in addressing the financial and operational dynamics of risk-prone and seasonal sectors such as agriculture and fisheries.

Interestingly, IBF does not exhibit a statistically significant impact on the manufacturing (-0.76186), sales (-0.693619), and warehousing (4.681435) sectors. The insignificance of these coefficients indicates either marginal contributions from Islamic financing to these sectors or dominance of other unobserved influencing factors.

Table 4. Long-run estimation of Islamic bank financing and GDP equation

Variable	Accm	Agri	Constr	Edu	Fish
IBF	3.301882*	-87.6473*	2.732402***	13.12657***	-21.48704***
CB	0.48942	0.486604	0.189629**	0.558126	5.444993***
BI RATE	5165.424***	108160.3***	10833.79***	-1456.26**	-1289.01
INF	2798.893*	-32964.1	866.9449	1654.029**	-561.2387
INV	65.35384*	5705.439*	452.104***	-135.9603***	-27.29382
C	-6662.01	33235.29	131749***	78304.38***	71163.48***
Variable	Health	Manfct	Reals	Sale	Wareshs
IBF	3.951997**	-0.76186	-5.04229*	-0.693619	4.681435
CB	-0.77569	0.315305	0.714998***	0.221299	1.955475
BI RATE	-5404.03***	-7392.19	-5907.92***	-23986.82	14748.97*
INF	-3341.91	-6770.27	1153.245	-1268.005	62706.53
INV	112.7947*	1124.65**	-119.546**	1065.482	-1895.8
C	3.951997***	356078.7**	30003.04**	246002.5	-184242

Note: * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

The long-run estimation results for Islamic Bank Non-Performing Financing (NPF) provide insights into the relationship between non-performing financing and sectoral GDP growth across various economic sectors in Indonesia. Since NPF inherently assumes a negative relationship with economic growth, a negative coefficient aligns with expectations, indicating that higher non-performing financing hinders sectoral growth.

The results reveal a statistically significant negative relationship between Islamic Bank NPF and GDP growth in sectors such as accommodation (-136.672), education (-1122.11), and manufacturing (-215.746). In the accommodation sector, the coefficient of -136.672 suggests that rising non-performing financing significantly hampers growth, potentially due to poor loan repayment performance or mismanagement in financing allocations. Similarly, in the education sector, the -1122.11 coefficient indicates a substantial negative impact, which implies that defaults or delays in financing repayments within educational projects have an adverse effect on growth outcomes. The manufacturing sector, with a coefficient of -215.746, also reflects the detrimental effect of non-performing financing on industrial output and productivity.

In contrast, the health sector (234.4618) and real estate sector (7.501261) display statistically significant positive coefficients, which suggests

an unexpected relationship where higher NPF correlates with improved GDP growth. In the health sector, the positive coefficient of 234.4618 might reflect unique financing structures or government interventions that mitigate the adverse effects of non-performing financing. Similarly, the positive coefficient in real estate (7.501261) suggests that sectoral growth continues despite rising non-performing financing, potentially due to speculative investments or external support mechanisms that create adverse effects. These results require further investigation to understand the underlying sector-specific dynamics driving these positive relationships.

For other sectors, including agriculture (-260.127), construction (2.848679), fisheries (9.748475), sales (0.779250), and warehousing (12.06694), the coefficients are either statistically insignificant or show no clear pattern. In agriculture, although the coefficient is negative (-260.127), it is not statistically significant, which suggests that NPF may not have a measurable impact on agricultural GDP growth. The construction and fisheries sectors show coefficients of 2.848679 and 9.748475, respectively, which indicates minimal relationships with NPF that lack statistical significance. Similarly, the sales and warehousing sectors display coefficients close to zero (0.779250 and 12.06694), which implies negligible relationships with non-performing financing.

Table 5. Long-run estimation of Islamic bank NPF and GDP equation

Variable	Accm	Agri	Constr	Edu	fish
IBF	-136.672***	-260.127	2.848679	-1122.11**	9.748475
CBF	4.232726***	-67.0726***	10.56626***	20.49592	285.7577
BI RATE	540314.5***	8037621***	-483013	1790.121	821852.1
INF	-191896**	-1012399	273583.8	-3003.629	-121292
INV	176.5837***	596.2167	808.6417***	142.8216***	-16.6044
C	44756.43***	678451.4***	159182.2***	55079.16***	35487.89
Variable	Health	Manfct	Reals	Sale	Wareshs
IBF	234.4618*	-215.746	7.501261***	0.779250	12.06694
CBF	-17.4854	11.83437	-9.586154**	7.344051	0.545276
BI RATE	301680.4	-146767	7543.525	-15727.22	17053.22***
INF	157.5119***	750944.3	-844.7235	1816.787	3648.362
INV	-576155***	2054.452*	-44.05914**	1206.304***	605.0708***
C	26533.94***	423287.1	50453.60**	89443.39	-27545.98

Note: * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

3.4. Short-run estimation

Table 6 presents the short-run relationship between sectoral GDP and Islamic bank financing (IBF) using the Akaike Information Criterion (AIC) to ensure statistical efficiency by retaining only significant variables. This approach explains why IBF is absent from certain sectors, reflecting either a lack of statistical significance or the dominance of other factors in influencing short-term GDP growth.

In sectors where IBF remains in the model, its impact varies considerably. In the health sector, IBF has a positive and significant coefficient (2.727066), showing that Islamic financing effectively supports growth in healthcare-related activities in the short run. This could indicate that Islamic banks are successfully allocating resources to critical health infrastructure, services, or medical enterprises. A similar pattern emerges in the sales sector, where IBF demonstrates a positive and significant effect (3.038313), suggesting that Islamic bank financing boosts trade and retail activities by providing adequate capital for inventory, distribution networks, and short-term operational needs.

On the other hand, IBF has a negative and significant effect (-8.036316) in the fisheries sector, which leads to raising concerns about inefficiencies in fund allocation, limited project viability, or operational constraints within the fisheries value chain. A similar negative relationship is evident in the manufacturing sector (-2.380690), where

Islamic financing appears unable to address short-term sectoral challenges, such as capital intensity requirements, supply chain disruptions, or operational inefficiencies.

In the agriculture sector, IBF displays a negative coefficient (-2.592622) but is statistically insignificant, which reflects a weak or inconsistent relationship between financing and output growth in this sector. Factors such as seasonal production cycles, market price volatility, or the nature of agricultural financing may limit its effectiveness. Meanwhile, in the education sector, IBF shows a positive coefficient (2.329509), although it is not statistically significant. This suggests that while Islamic financing is directed toward educational institutions or related projects, its short-term impact on GDP remains inconclusive.

In sectors like accommodation, construction, and real estate, IBF is entirely absent from the model. This absence implies that Islamic bank financing does not play a measurable role in driving short-term GDP growth in these sectors, or its influence is too minimal to register statistical significance. These sectors are often characterized by long-term financing needs, heavy reliance on project timelines, and large-scale capital-intensive requirements, which may not align with short-term financing objectives.

Table 7 presents the short-run relationship between sectoral GDP and Islamic bank non-performing financing (IB_NPF) across various sectors using

Table 6. Short-run estimation of Islamic bank financing

Variable	Accm	Agri	Constr	Edu	Fish	Health	Manfct	Reals	Sale	Warehs
GDP(-1)	-0.2470 **	-	0.34258 ***	0.757792 ***	1.11068 ***	-	-	-	-	-0.85865 ***
GDP(-2)	-	-	-	0.472622 ***	0.683828 ***	-	-	-	-	-0.337240 ***
IBF	-	-2.59262	-	2.329509	-8.03631	2.727066 **	-2.38069 **	0.045940	3.038313 **	-
IBF(-1)	-	-	-	-33.75286 ***	31.19867 ***	-0.508576	-	-	-	-
IBF(-2)	-	-	-	-26.36207 ***	32.6163 ***	4.669591	-	-	-	-
CBF	0.02331	-	0.07254 ***	-0.177433	9.94364 ***	-0.008327	-	-	0.012333*	0.129441 ***
CBF(-1)	-0.15507	-	-	-0.016791	1.26989	0.921971 ***	-	-	-	-0.11290 *
CBF(-2)	-	-	-	0.738830 **	-6.53204 ***	0.45667 ***	-	-	-	0.132744 ***
BI_RATE	3756.38 **	-31035.83	-	-7228.356 **	6106.06 ***	-2174.618	-1856.3	-	62.29852	725.6414 ***
BI_RATE(-1)	-3910.7 **	887661.9 *	-	-4616.351	-	3112.812	15484.5 ***	-	12658.74 ***	-
BI_RATE(-2)	-	-	-	11770.77 ***	-	6677.553 ***	-	-	-	-
INF	346.291	-	-	1008.458	-3614.79 ***	-677.375	-	-	-	-4085.71 *
INF(-1)	-1729.45 **	-	-	-	-	2524.739 **	-	-	-	-12861.2 ***
INF(-2)	-	-	-	-	-	1321.092	-	-	-	-
INVST	140.488 ***	-127.418	-311.594 **	-71.38124	65.8035 ***	-87.7225 *	63.2512	-	-	725.6414 ***
INVST(-1)	-	-	-527.702 ***	-	138.783 ***	-199.078 **	-	-	-	985.5113 ***
INVST(-2)	-	-	-	-	307.286 ***	-	-	-	-	990.2106 ***
Diagnostic Test										
Auto-correlation	0.7585	0.2205	0.6214	0.6786	0.9246	0.8892	0.2107	0.4753	0.3413	0.7604
Normality	0.6905	0.329079	0.49326	0.495339	0.43449	0.764743	0.96916	0.378298	0.3784	0.189
Heteroskedasticity	0.0512	0.7521	0.1049	0.8435	0.6876	0.8878	0.4727	0.2042	0.9868	0.797908
R-squared	0.88250	0.565986	0.843355	0.952831	0.946598	0.845575	0.491674	0.414527	0.724845	0.921942
Adjusted R-squared	0.84334	0.503984	0.820977	0.918765	0.908031	0.718401	0.419056	0.396231	0.685537	0.884771
S.E. of regression	2491.76	77744.19	9501.448	3796.351	2623.674	2379.345	9833.982	668.6413	7769.413	6868.94

Note: * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

the Akaike Information Criterion (AIC) for model selection. This method ensures only important variables are included in each sectoral model. The results reveal variations in the presence, significance, and direction of IB_NPF across sectors.

In the accommodation sector, IB_NPF has a negative and significant coefficient (-90.38397), which indicates a short-term adverse relationship between non-performing Islamic bank financing and

GDP growth. The lagged term IB_NPF(-1) shows a positive and significant coefficient (40.82116). This means that while non-performing financing initially harms the sector, its negative effect starts to reduce after one period. It suggests that actions like restructuring loans or improved management by Islamic banks might have started to show positive results. Similarly, the second lag, IB_NPF(-2), also shows a positive and significant coefficient (58.831). This indicates that the positive impact continues in-

to the second period, suggesting that earlier problems caused by non-performing financing have been partially resolved, and the financing begins to contribute positively to sectoral growth.

In the construction sector, IB_NPF has a negative value (-6.436128), but it is not statistically significant, meaning it does not clearly affect GDP growth in the short term. However, the lagged term IB_NPF(-1) shows a positive and significant value (19.35276). This means that while non-performing financing initially does not show a clear

impact, its effect turns positive in the following period, possibly due to improvements in loan management or restructuring. In the education sector, IB_NPF has a negative and significant value (-433.9346), which shows a clear short-term negative effect on GDP growth. However, the lagged term, IB_NPF(-1), has a positive and significant value (221.3859). This suggests that although non-performing financing initially harms the sector, its negative impact starts to fade in the next period, and recovery efforts or delayed benefits begin to show positive results.

Table 7. Short-run estimation of Islamic bank NPF

Variable	Accm	Agri	Constr	Edu	fish	Health	Manfct	Reals	Sale	Wareshs
GDP(-1)	-0.11104	0.276944 **	0.243377 ***	-0.33884 ***	7.1305	-	-0.2684 **	-	-	-
GDP(-2)	-	-	-0.360762 **	-	-	-	-	-	-	-
IB_NPF	-90.3839 ***	-	-6.436128	-433.934 ***	-	22.7520	-	-3.55866 ***	-	-17.5476
IB_NPF(-1)	40.82116 **	-	19.35276 ***	221.3859 *	-	-104.527 ***	-	-	-	-
IB_NPF(-2)	58.831 ***	-	-	-	-	-	-	-	-	-
CB_NPF	-0.36649	-8.363764	1.445681 ***	69.56693 ***	-	7.553511	0.43806 **	0.563937 ***	0.38178 **	-3.7585 **
CB_NPF(-1)	-3.73571 ***	-	-	110.5859 ***	-	19.6424 ***	0.69880 ***	-0.979543 ***	-	-
CB_NPF(-2)	-	-	-	86.62771 ***	-	-	-	-	-	-
BI_RATE	149117.6	-1957033 ***	-815109.7 **	-891989.6 **	-	-	-329434	-	-4613.711	-
BI_RATE(-1)	-593391 ***	-4617300 ***	-1239020 **	-711531.9 *	-	-	1379595 **	-	11093.59 **	-
BI_RATE(-2)	-565933 ***	-1482211 ***	4042774 ***	1736843 ***	-	-	-	-	-	-
INF	-152942 *	-1139.762	-662.7265 ***	-	-	-	-	-	-	-
INF(-1)	64076.35	-	-8.50E+02 ***	-	-	-	-	-	-	-
INF(-2)	348246.7 ***	-	-	-	-	-	-	-	-	-
INVST	-	-	-	-235.283 **	-102.795	-99.004 **	-216.08	7.189009	-	-
INVST(-1)	-	-	-	-698.032 ***	-	-146.557 ***	-	27.52948 ***	-	-
INVST(-2)	-	-	-	-469.919 ***	-	-	-	28.10252 ***	-	-
Diagnostic Test										
Autocorrelation	0.9628	0.3551	0.2347	0.0886	0.1153	0.1578	0.52	0.2590	0.7392	0.7527
Normality	0.06420	0.75930	0.29484	0.81396	0.60133	0.93527	0.60156	0.44191	0.4975	0.66225
Heteroskedasticity	0.9707	0.8106	0.4275	0.3076	0.4539	0.7431	0.1235	0.2120	0.4455	0.1156
R-squared	0.93518	0.820999	0.95737	0.924999	0.509788	0.66850	0.78824	0.686362	0.643426	0.68389
Adjusted R-squared	0.89425	0.778039	0.93708	0.87763	0.478162	0.59200	0.73937	0.611089	0.606539	0.66350
S.E. of regression	2079.93	63074.71	5711.52	4659.433	6063.499	2820.84	8819.77	550.6689	8690.688	1147.18

Note: * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

In the health sector, IB_NPF does not appear directly, but the lagged term IB_NPF(-1), shows a negative and significant coefficient (-104.527), which indicates a delayed adverse relationship between non-performing financing and GDP growth. In the real estate sector, IB_NPF is absent, but the lagged term IB_NPF(-1) has a negative and significant coefficient (-3.558667), suggesting a lagged adverse relationship. In the warehousing sector, IB_NPF displays a negative coefficient (-17.54769), although it is not statistically significant. However, its lagged term, IB_NPF(-1), is negative and significant (-3.758510), which indicates a delayed adverse effect of non-performing Islamic financing on GDP growth.

In sectors like fisheries and manufacturing, IB_NPF is either absent or statistically insignificant, which suggests that non-performing Islamic bank financing does not exhibit a measurable short-term relationship with GDP growth in these sectors.

The lagged effects observed in several sectors highlight the delayed consequences of non-performing Islamic financing. Positive delayed impacts in sectors like construction (19.35276) and education (221.3859) indicate partial recovery or improved management over time. In contrast, negative delayed effects in health (-104.527), real estate (-3.558667), and warehousing (-3.758510) suggest persistent challenges in addressing non-performing financing issues.

3.5. Diagnostic test

Tables 6 and 7 show the diagnostic tests that evaluate autocorrelation, normality, and heteroskedasticity across sectors after adjusting the data using the median to address normality issues as suggested by many researchers (Ragot, 2021; Zioutas et al., 2017). The autocorrelation test shows that most sectors fall within acceptable ranges, although higher values in sectors like health and accommodation suggest some residual dependency. The normality test indicates improved results after using the median, with most sectors showing acceptable values, though minor deviations persist in a few sectors, like accommodation and warehousing. The heteroskedasticity test reveals no significant concerns across sectors, with stable error

variances observed in most models. Overall, all equations generally pass the diagnostic tests, with any minor irregularities adequately mitigated by the adjustments made.

The CUSUM and CUSUM of Squares tests measure the stability of model parameters over time. While most sectors pass both tests, a few sectors, including Education (Edu) and Manufacturing (Manfc) in the first table, and Construction (Constr), Fisheries (Fish), and Manufacturing (Manfc) in the second table, fail the CUSUM of Squares test. Despite adjustments using the median to address non-normality caused by the COVID-19 pandemic and model optimization through the Akaike Information Criterion (AIC), instability persists in these sectors. This suggests structural breaks, sector-specific volatility, and lagged effects from policy interventions that cannot be fully resolved through statistical adjustments. The pandemic caused deep disruptions, including operational halts, financing reallocations, and market volatility, which continue to impact parameter stability. Additionally, the CUSUM of Squares test is highly sensitive to deviations, and some sectors exhibit unique dynamics that challenge short-term modeling accuracy. While this instability indicates caution when interpreting short-run results in these sectors, it does not invalidate the overall findings regarding the relationship between Islamic bank financing, non-performing financing, and sectoral GDP growth.

4. DISCUSSION

Islamic bank financing (IBF) has shown varied impacts across sectors, and existing research provides logical explanations for these outcomes. In sectors like education and health, IBF aligns well with long-term investment needs and social welfare objectives. Studies suggest that these sectors are less exposed to cyclical risks and benefit from predictable cash flows, making them ideal candidates for Islamic financing (Ashraf et al., 2022).

Conversely, sectors such as agriculture and fisheries exhibit weaker or even negative relationships with IBF. Research identifies structural and operational mismatches as primary causes. Agriculture, for instance, operates on seasonal

income cycles and is highly exposed to natural risks, such as weather patterns and pest infestations. Islamic financing models, often reliant on predictable cash flows and structured repayments, struggle to adapt to these dynamics (Utama et al., 2019). Studies further argue that the lack of sector-specific financial products tailored for agriculture exacerbates this mismatch. However, Islamic banks should not turn away from these sectors, as Osmanovic (2022) has documented that such financing will eventually bring financial benefit to Islamic banks. Incentive of Islamic Bank Indonesia Certificate (SBIS) can help to spur the growth in the agricultural sector (Lestari, 2019)

In the manufacturing sector, the weak relationship with IBF is tied to the sector's reliance on large-scale, capital-intensive investments. Research shows that Islamic banks often adopt risk-averse approaches, prioritizing short-term financing over long-term industrial funding (Saleem et al., 2024). This cautious approach arises from the inherent risk-sharing nature of Islamic financial contracts, which places significant responsibility on banks in the event of business failure. Results from Bougatef et al. (2020) also indicate that Islamic bank profit and loss sharing financing did not have an influence on boosting the industrial sector.

Non-performing financing (NPF) poses another critical issue since it has a negative effect on the growth in the education and accommodation sectors. The negative relationship between sectoral non-performing financing (NPF) and sectoral GDP growth in education and accommodation happens because of specific challenges in each sector. In education, schools and institutions often rely on student fees and government subsidies, which can be delayed or inconsistent. This makes it harder for them to repay loans on time, increasing NPF and limiting funds for new investments (Hatcher & Pourpourides, 2023; Jaiwani & Gopalkrishnan, 2023). In the accommodation sector, businesses like hotels and tourism services are highly affected by seasonal demand, economic slowdowns, and unexpected events like travel restrictions. These factors disrupt their income, making loan repayments difficult and raising NPF levels. When too much mon-

ey gets stuck in non-performing loans, banks become hesitant to provide new financing, slowing down growth in both sectors (Gjeçi et al., 2023). However, in the real estate sector, positive correlations between NPF and GDP growth have been observed. While it seems questionable, studies from Qin and Wang (2017) and Vithessonthi (2016) both documented positive correlation in Japan and some other countries before the 2008 financial crisis.

The bidirectional relationship between IBF and sectoral GDP growth follows a logical pattern supported by the Feedback Hypothesis. Financial growth often drives sectoral development by providing the necessary capital for investment. In turn, economic growth fuels demand for further financial services, which creates a self-reinforcing cycle. Research highlights that this relationship is particularly strong in emerging economies with expanding Islamic financial sectors (Atici, 2018; Belkhaoui, 2023; Furqani & Mulyany, 2009). However, sectors with fragmented financial structures or inconsistent policy support often fail to sustain this cyclical growth dynamic.

Short-term volatility in IBF outcomes across sectors can also be logically explained. Sectors with seasonal income patterns, such as agriculture and fisheries, are naturally prone to short-term financial inconsistencies. Research suggests that financial instruments in these sectors often require longer adjustment periods to yield measurable results (Indrawan & Rahman, 2020). On the other hand, sectors like education and health display more stable short-term relationships with IBF due to their predictable financial structures and operational stability (Indrawan & Rahman, 2020).

The cautious lending behavior of Islamic banks is another logical factor underpinning the observed sectoral patterns. Research suggests that Islamic banks often prioritize sectors with lower risks and quicker returns, such as trade and retail, over capital-intensive industries like manufacturing. This cautious approach stems from the risk-sharing principle inherent in Islamic financial contracts, which increases the potential financial burden on banks in the event of default (Daud et al., 2018; Suzuki & Uddin, 2016).

CONCLUSION

This study seeks to investigate the role of Islamic banking in influencing sectoral economic growth in Indonesia by examining how Islamic bank financing (IBF) and non-performing financing (NPF) affect the growth of ten observed economic sectors. In the long run, Islamic bank financing supports GDP growth in sectors like accommodation, construction, education, and health. However, it negatively affects agriculture, fisheries, and real estate, suggesting mismatches between financing models and sectoral characteristics, while having no significant effect in manufacturing, sales, and warehousing. Non-performing financing reduces growth in accommodation and education due to repayment issues, but shows unexpected positive links in health and real estate. In the short run, IBF boosts growth in health, sales, and fisheries, but weakens manufacturing, indicating inefficiencies. NPF disrupts short-term growth in multiple sectors, though lagged effects in some areas suggest partial recovery. The findings make it clear that Islamic banking can drive economic growth, but its impact is highly dependent on sectoral alignment and effective risk control. Unlocking its full potential requires sector-focused financial strategies from policymakers that respond directly to the unique challenges and opportunities within each part of the economy.

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