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Assessing the Green Growth Impact of Islamic Finance: A Comparative Panel Data Analysis in OIC Countries

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Abstract: The rising global focus on environmental sustainability has intensified interest in the drivers of green growth. This study examines the impact of Islamic finance on green growth in selected Organization of Islamic Cooperation (OIC) member countries from 2013 to 2023 using panel data regression analysis. Islamic finance is represented by Islamic financial assets and Islamic banking financing, while the Green Growth Index (GGI) serves as the primary measure of environmental-economic performance. Control variables include real GDP per capita, foreign direct investment (FDI), renewable energy consumption, forest area, and urbanization. The results reveal that real GDP, urbanization, renewable energy consumption, and forest area positively influence the GGI, whereas Islamic financial assets, Islamic banking financing, and FDI show no significant effects. These findings suggest that while Islamic finance holds potential to support ecological transitions, its contribution remains limited due to its concentration in traditional sectors and the lack of standardized green instruments. Strengthening regulatory frameworks, promoting Sharia-compliant green financial products, and aligning foreign investment with sustainability objectives are critical for advancing green growth in OIC economies.

Keywords: Green Growth Index, Islamic finance, renewable energy, OIC countries, sustainability

JEL: Q56, O11, O13, O16, O53

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Introduction

Environmental and energy challenges remain critical global concerns. Since the United Nations first addressed these issues through the 1997 Kyoto Protocol, which tackled climate change on a global scale, environmental sustainability has become central to both local and global efforts to promote sustainable development. Economic growth, green economy initiatives, and energy consumption are frequently cited as primary environmental concerns. In general, economic expansion is often linked to a decline in environmental quality. When economic development relies on natural resources, environmental sustainability must be prioritized, as profit-driven growth at the expense of ecological balance ultimately harms both the environment and human well-being (Febriana et al., 2019). Therefore, it is essential for governments to receive support in balancing economic growth and environmental preservation to encourage lifestyles that minimize negative environmental impacts (Alfred, 2021).

The concept of a green economy emerged as a strategy to maintain environmental quality. A green economy regulates the use of natural resources while reducing harmful outputs such as pollution and environmental degradation. According to the United Nations Environment Programme (UNEP, 2011), a green economy must promote human well-being and social equity while mitigating environmental risks and resource constraints. Various metrics have been developed to assess the environmental sustainability of national economic activities, reflecting the growing integration of environmental considerations into economic studies.

In industrialized countries, economic expansion is often accompanied by rising energy consumption, which leads to higher emissions and contributes to environmental degradation. Carbon emissions—primarily from the combustion of fossil fuels such as coal—are the main driver of the greenhouse effect, with a direct correlation to industrialization and economic growth (Irfany et al., 2015). The Global Green Growth Institute (GGGI), an international treaty-based organization, has proposed a green growth model that integrates economic development with environmental sustainability. GGGI provides technical assistance, research, and stakeholder engagement to support green growth strategies, particularly in developing countries. To evaluate national progress toward sustainability objectives such as the SDGs, the Paris Climate Agreement, and the Aichi Biodiversity Targets, GGGI introduced the Green Growth Indicator (GGI)—a composite index that measures four dimensions of green growth: resource efficiency, natural capital conservation, green economic opportunities, and social inclusion. By aligning with global sustainability goals, the GGI enhances its relevance at both national and international levels (Global Green Growth Institute, 2020).

Islamic teachings emphasize humanity's obligation to preserve nature and warn of the consequences of environmental neglect, including natural disasters such as floods, landslides, global warming, and climate change, all of which impose severe hardships. Islam underscores the interdependence between economic and environmental systems. As Suhada and Setyawan (2016) note, economic and environmental considerations are inseparable. Through the framework of Islamic economics, Islamic principles have contributed to global economic development. According to the *State of the Global Islamic Economy Report 2022*, 1.9 billion Muslims spent over US$2 trillion in 2021 on ethically motivated consumption in sectors such as food, cosmetics, pharmaceuticals, fashion, travel, media, and leisure (DinarStandard, 2022). As highlighted by Rusydiana and Bahri (2022), Islamic economics is rooted in principles of environmental conservation and balance, emphasizing the need to implement Sharia-based economics in line with Islamic teachings on sustainability.

The expanding Sharia-compliant economic market holds significant potential to support green economy growth through its diverse transaction opportunities and increasing investment. Recent studies indicate that investment in the Islamic economic sector across Organization of Islamic Cooperation (OIC) member countries and selected non-OIC markets rose by 118%, from US$11.8 billion in 2019 to US$25.7 billion in 2020–2021, demonstrating substantial growth even amid the COVID-19 pandemic. Small and medium-sized enterprises (SMEs) in the halal sector, in particular, have shown resilience and contributed positively to state revenue (Yudha & Kafabih, 2021).

The selection of OIC member countries as the focus of this study is grounded in both economic and environmental considerations. These countries comprise a diverse group of emerging and developing economies that are simultaneously expanding their Islamic finance sectors and confronting significant environmental challenges, including deforestation, pollution, and high carbon intensity in energy production (SESRIC, 2023; Irfany et al., 2024a). Many possess abundant natural resources yet struggle with sustainable resource management, making them uniquely positioned to benefit from integrating green economy principles into their financial systems. Furthermore, the OIC and its affiliated institutions have launched several multilateral initiatives to align Islamic finance with sustainability agendas, such as the development of green sukuk and SDG-linked investments (ICD & Refinitiv, 2022), providing a compelling context for examining the intersection of Islamic finance and green growth in these nations.

This study examines the principles of Islamic economics, which, consistent with Islamic teachings, promote harmonious coexistence with the environment by emphasizing low carbon emissions and sustainability. Despite the growing prominence of Islamic finance in global sustainability discussions, few empirical studies have specifically investigated the causal impact of Islamic finance instruments on green growth indicators, particularly within OIC member states. The primary objective of this research is to analyze the relationship between green and Islamic economies in key Islamic nations. Using a panel data regression model, the study explores the connection between the Sharia-compliant economic sector and the Green Growth Index. Although factors influencing green economy and green growth have been extensively studied, empirical evidence on the impact of Islamic economics remains limited. Additionally, this research compares the performance of Islamic nations in implementing green economy practices with that of non-Islamic countries, providing a broader perspective on integrating sustainability within Islamic economies

Literature Review

The theoretical foundation of this study is the Environmental Kuznets Curve (EKC), introduced by Simon Kuznets in the 1950s. The EKC illustrates the relationship between economic growth and environmental degradation, positing an inverted U-shape: in the early stages of economic development, inequality—and often environmental harm—increases, but eventually declines as growth progresses (Figure 1). The World Bank popularized the EKC in its *World Development Report* (1992), emphasizing that unchecked economic growth can negatively affect the environment. According to the EKC, environmental degradation, such as CO_2 emissions, typically rises during the initial phases of development. However, as economies mature, public awareness of environmental issues grows, leading to a decline in emissions after reaching a critical turning point. Identifying this inflection point of CO_2 emissions relative to economic growth is therefore crucial for shaping sustainable development policies.

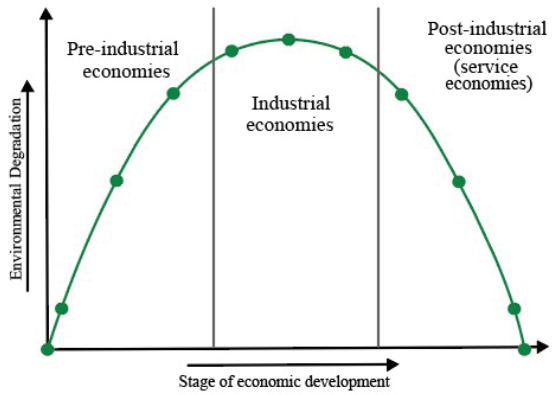

Figure 1: Kuznets Environmental Curve Model (adapted from Panayatou, 1998; Sarkis, 2019; Ozcan & Ozturk, 2019)

Definition of Islamic finance

Islamic finance encompasses Sharia-compliant financial activities, including Islamic money markets, that operate under specific ethical principles. Under Sharia law, money functions solely as a unit of measure rather than an asset, and practices such as interest (usury), excessive uncertainty (*gharar*), and gambling (*maysir*) are prohibited. Additionally, short-term speculative sales and harmful financial activities are avoided. Instead, Sharia-compliant finance emphasizes productive and ethical investment (Hassan et al., 2022). Empirical evidence supports its economic benefits: Hassan et al. (2022) found that Islamic finance fosters economic growth and industrial development in the UAE, while Yüksel and Canöz (2017) reported positive effects of Islamic banking on Turkey's economic and industrial expansion.

Islamic finance and sustainability

The relationship between Islamic finance and environmental sustainability has attracted growing attention in recent years. Moisseron et al. (2015) note that Islamic finance has become an integral part of the global financial system, emphasizing ethics and adherence to Islamic law principles. With its ability to mobilize resources at international, regional, and local levels, Islamic finance can significantly contribute to achieving the Sustainable Development Goals (SDGs). Kader and Asarpota (2007) found that Islamic banks in the UAE outperform conventional banks in terms of financial performance, while Kuanova (2021) focused on the environmental dimensions of Islamic finance, including sustainable investment and corporate sustainability.

Zuhri (2023) highlights the role of Islamic financial institutions in strengthening Islamic public finance through green finance initiatives such as sukuk, underscoring the importance of financing quality to support asset growth in Islamic banks. Similarly, Jan et al. (2019) examined the relationship between sustainable practices and financial performance in Islamic banking, emphasizing its importance for advancing Islamic finance and resource development. In a case study of Indonesia, Malini (2021) identified a significant link between green finance and financing decisions, financial performance, and Islamic bank valuation. Her findings suggest that green finance can enhance energy efficiency and reduce greenhouse gas emissions, thereby contributing both to environmental sustainability and to the financial performance of Islamic banks.

Recent studies have expanded the scope of Islamic finance beyond its traditional ethical and religious foundations, highlighting its potential to support sustainability in both broad terms (e.g., SDGs) and specific dimensions (e.g., carbon emissions, green financing, ESG standards). Islamic financial instruments—such as *zakat*, *waqf*, *qard-hasan*, *sukuk*, and *takaful*—have demonstrated meaningful contributions to inclusive development and environmental preservation. Systematic reviews by Dirie et al. (2023) and Harahap et al. (2023) reveal that countries like Indonesia and Malaysia have pioneered the integration of Islamic social finance into 11 of the 17 SDGs, while commercial instruments like sukuk are increasingly used to fund SDG-related infrastructure and energy projects.

Notably, green sukuk and Socially Responsible Investment (SRI) sukuk have emerged as pivotal instruments for channeling investment into renewable energy, sustainable transport, and emission reduction. Malaysia and Indonesia have established themselves as global hubs for Islamic sustainable finance by promoting standardized, Sharia-compliant green investment vehicles (Foglie & Keshminder, 2022; Pathan et al., 2022). Nonetheless, significant challenges persist, including limited standardization, illiquidity in secondary markets, and weak participation from retail investors.

Empirical evidence from OIC countries indicates that Islamic financial assets can contribute to reducing CO_2 emissions, underscoring their potential to support environmental objectives. However, Islamic banking financing must become more directly aligned with green projects to effectively achieve environmental targets (Irfany et al., 2024a). Regional comparisons show that Southeast Asia leads in innovation, employing mechanisms such as the Green Coin Rating (GCR) to evaluate banks' performance on carbon intensity and digital green finance. For example,

Maybank has ranked among the top performers due to its strong commitment to climate-aligned financing (Bimantara et al., 2025). In contrast, GCC countries are gradually embedding Islamic finance within broader sustainability agendas, though their structural reliance on oil remains a constraint (Alhammadi, 2024; Wahyudi et al., 2025).

The integration of Maqasid al-Shariah with the SDGs further strengthens the ethical foundation of Islamic financial products in advancing sustainability, fostering the development of Sharia-compliant financing for clean energy, climate action, and sustainable cities (Rahim et al., 2024; Budiman et al., 2022). As recent scholarship emphasizes, future progress will depend on closing standardization gaps, promoting digital financial inclusion, and enhancing cross-sectoral collaboration across jurisdictions.

Green Growth Index (GGI)

The concept of a green economy, rooted in sustainability discourse, has gained global traction as a framework for addressing environmental challenges and promoting sustainable development (Allen & Clouth, 2012). A green economy seeks to balance economic development with ecological sustainability by fostering long-term growth while minimizing environmental risks (Sulich, 2020).

The Green Growth Index (GGI), developed by the Global Green Growth Institute (GGGI), is a comprehensive composite indicator designed to monitor country-level progress in aligning economic growth with environmental sustainability. It encompasses four interrelated dimensions: efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. Each dimension is further operationalized through multiple pillars and 36 indicators, reflecting a broad spectrum of sustainability objectives drawn from the SDGs, the Paris Agreement, and the Aichi Biodiversity Targets (GGGI, 2020). For example, resource efficiency includes measures such as energy productivity and material footprint per capita, while natural capital protection incorporates indicators like biodiversity coverage and forest biomass stock.

The index uses a scoring system from 1 to 100, where a score of 100 indicates that a country has achieved a specific sustainability target. Performance is classified into five levels: very low (1–20), low (20–40), moderate (40–60), high (60–80), and very high (80–100). To ensure accuracy and policy relevance, the framework is continuously updated through expert consultations across 54 countries. As such, the GGI provides a robust and standardized measurement tool that captures the

multifaceted nature of green growth, enabling benchmarking and targeted policy interventions globally (GGGI, 2020).

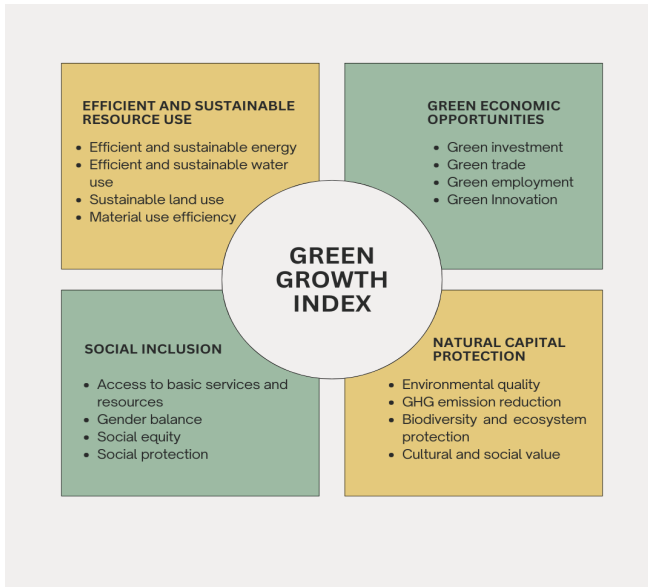

Figure 2: Conceptual Framework for the Green Growth Index (adapted from Green Growth Index, 2023)

In an efficient economy, production relies on fewer natural resources while generating more goods and services, thereby promoting economic growth through sustainable ecosystem management. Social inclusion plays a crucial role, as citizens are both beneficiaries and active participants in green growth. Since 2005, the GGGI has tracked progress across 117 countries using the Green Growth Index, offering a comprehensive tool for evaluating sustainability performance. While economic growth supports green growth, factors such as openness and energy consumption also play significant roles. Renewable energy consumption, in particular, holds substantial potential to drive green growth, whereas control variables such as natural resource rent and population tend to exert negative effects. In contrast, forest area positively contributes to green growth.

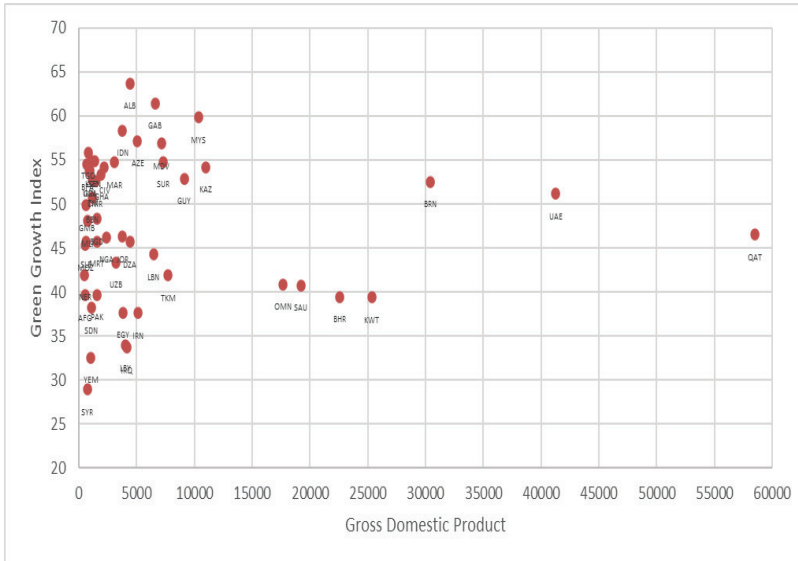

Figure 3: Environmental Kuznets Curve Scatter Plots for OIC Countries (adapted from Green Growth Index, 2023)

Data and Methodology

This study examines the relationship between Islamic finance and the Green Growth Index (GGI) in selected OIC countries from 2013 to 2023. The research sample consists of 11 OIC member states—Bangladesh, Brunei, Indonesia, Jordan, Kuwait, Lebanon, Nigeria, Oman, Pakistan, Saudi Arabia, and Sudan—selected based on three criteria: the availability of consistent data on Islamic finance and the GGI during the study period; their economic and geographical diversity within the OIC; and their significance in the global Islamic finance landscape. According to IFSB (2023), countries such as Saudi Arabia, Indonesia, and Kuwait are among the largest contributors to global Islamic financial assets, while Pakistan, Nigeria, and Jordan represent emerging Islamic finance markets with distinctive policy frameworks and sustainability challenges. Despite the limited sample size, these 11 countries account for over 60% of total Islamic finance assets in the OIC and span multiple regions—Southeast Asia, South Asia, the Middle East, and Sub-Saharan Africa—allowing for a balanced analysis of structural and contextual differences. Prior studies (e.g., Dirie et al., 2023; Harahap et al., 2023) have also emphasized the importance of using representative OIC samples for assessing the sustainability impact of Islamic finance.

To evaluate the association between Islamic finance and green growth, this study employs two primary measures. The first, Islamic Finance Assets per Capita, captures the total assets of both banking and non-banking institutions that provide Sharia-compliant financial services. These assets include financial and non-financial holdings maintained by domestic and foreign-controlled organizations, reflecting the sector's size, economic contribution, and growth potential in each country's economy (SESRIC, 2024). The second measure, Sharia Financing per Capita, represents the value of Sharia-compliant funding provided by Islamic financial institutions, including both banks and non-banking enterprises. This type of financing adheres to Sharia principles, prohibiting interest and speculative investments, and is limited to halal economic activities. Together, these indicators capture the role of Islamic finance in fostering ethical investment and supporting economic development in line with Islamic principles (SESRIC, 2024). These measurements collectively provide a basis for the model used in this study, which is specified as follows:

$$GGI_{it} = \alpha_1 + \alpha_2 LnGDPC_{it} + \alpha_3 LnIFC_{it} + \alpha_4 FDI_{it} + \alpha_5 URBAN_{it} + \alpha_6 RES_{it} + \alpha_7 LnFOREST_{it} + e_{it}$$

(Equation 1)

$$GGI_{it} = \alpha_1 + \alpha_2 LnGDPC_{it} + \alpha_3 LnIFC_{it} + \alpha_4 FDI_{it} + \alpha_5 URBAN_{it} + \alpha_6 RES_{it} + \alpha_7 LnFOREST_{it} + e_{it}$$

(Equation 2)

The empirical model uses these measures to estimate the impact of Islamic finance on the Green Growth Index. In both models, the GGI serves as the dependent variable. Model 1 incorporates the natural logarithm of Islamic finance assets per capita (LnIFC) as the primary independent variable, while Model 2 uses the natural logarithm of Sharia financing per capita (LnSF). Additional explanatory variables, expressed in natural logarithms, include real GDP per capita (LnGDPC), foreign direct investment (LnFDI), urbanization (LnURBAN), renewable energy consumption (LnRES), and forestry land (LnFOREST). These variables together provide a comprehensive framework for identifying the drivers of green growth. The error term, denoted as e, accounts for unexplained variation in the models.

Table 1

Variable Definition

Variables	Definition	Measure
Green Growth Index (GGI)	Composite index measuring a country's performance in achieving sustainability targets including Sustainable Development Goals (SDGs).	score
Gross domestic product per capita (GDPC)	Gross domestic product divided by midyear population.	USD per capita
Islamic Finance Asset per capita (IFAC)	Total assets of banking and near-banking entities providing Islamic financial services, including all financial and non-financial assets under domestic and international control.	USD per capita
Islamic Banking Financing per capita (IBFC)	The value of outstanding Shari'ah-compliant financing for banking and near-banking entities providing Islamic financial services.	USD per capita
Foreign Direct Investment (FDI)	Net investment inflows from foreign investors to acquire a long-term managerial interest in the reporting economy, divided by GDP.	percent
Urban population (URBAN)	National statistical offices identify people who live in urban regions.	percent
Renewable Energy Sharing Used (RES)	The final energy used comes from renewable energy sources.	percent
Forest Land (FOREST)	Land covered by natural or planted stands of trees of at least 5 meters in situ, whether productive or not, and excluding tree stands in agriculture.	meter

This study further examines the causal relationship between Islamic finance and green growth, measured by the Green Growth Index (GGI). Model 1 applies the natural logarithm of Islamic finance assets per capita (LnIFA) as the independent variable, while Model 2 uses the natural logarithm of Islamic financing per capita

(LnSF). Both models incorporate control variables, also expressed in natural logarithms, including real GDP per capita (LnGDPC), foreign direct investment (LnFDI), urbanization rate (LnURBAN), renewable energy usage (LnRES), and forest land area (LnFOREST).

The GGI data were sourced from the Global Green Growth Institute (GGGI). Macroeconomic indicators—GDP, FDI, urbanization, and forest land area—were obtained from the World Bank, while data on Islamic finance assets and Islamic banking financing were acquired from the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC). The use of natural logarithms for both independent and control variables allows the estimated coefficients to be interpreted as elasticities, representing the percentage change in the GGI associated with a 1% change in each respective independent variable.

Descriptive statistics for the variables used in the analysis are summarized in Table 2, which presents the measures of central tendency (mean), dispersion (minimum and maximum values), and distribution of the key variables employed in the regression models.

Table 2

Descriptive statistic

Variable	Mean	Min	**Max**
GGI	44,71	37,03	58,38
GDPC	10855,15	1267,70	32341,75
IFAC	202,29	0,86	3050,21
IBFC	1183,93	0,35	7038,92
FDI	20,65	0	24,06
URBAN	67,165	32,76	100,00
RES	22,599	0,00	81,81
FOREST	2,49367E+12	7,27	1,9794E+14
Obs	121		

Note: *GGI = Green Growth Index; GDPC = GDP per capita (USD); IFAC = Islamic Finance Assets per capita; IBFC = Islamic Banking Financing per capita; FDI = Foreign Direct Investment (% of GDP); URBAN = Urbanization Rate (% of total population); RES = Renewable Energy Usage (% of total energy consumption); FOREST = Forest Land Area (hectares).*

Results

In panel data regression analysis, selecting the appropriate model is essential to ensure accurate and reliable results. Three diagnostic tests were conducted to determine the most suitable model: the Hausman Test, the Chow Test, and the Lagrange Multiplier (LM) Test. The Hausman Test, which compares the Fixed Effects Model (FEM) to the Random Effects Model (REM), produced a cross-section probability value of 0.00, leading to the rejection of the null hypothesis (H_0). Thus, the FEM was deemed more appropriate. Similarly, the Chow Test was employed to evaluate whether the Common Effects Model (CEM) or FEM should be used. The test results showed cross-section F and cross-section chi-square probability values of 0.00, again rejecting the null hypothesis and confirming FEM as the preferred model. Based on these findings, the Fixed Effects Model (FEM) was selected as the most suitable estimator for this panel data regression analysis.

To verify that the error term follows a normal distribution, a normality test was conducted using both a histogram and the Jarque-Bera Test, as recommended by Gujarati (2004). The results confirmed that the residuals satisfied the normality assumption, thereby enhancing the reliability of the regression model. Furthermore, Pearson correlation coefficients (r) were calculated to assess the strength of the relationships among the independent variables. All correlation coefficients were below 0.8, indicating weak correlations and suggesting the absence of multicollinearity, which allows for more robust parameter estimation.

The presence of heteroscedasticity was tested using the White Test, which yielded a chi-square probability value of 0.0000, lower than the 0.05 significance level. This result indicates heteroscedasticity in the model. To address this issue, the Fixed Effects Model was estimated using Generalized Least Squares (GLS) weighting. According to Gujarati (2004), applying GLS in the presence of heteroscedasticity improves the precision of parameter estimates by correcting variance inequality and enhancing model robustness.

Table 3

Estimation results for Model 1 (Islamic Financial Assets per Capita)

Variables	**Dependent variable: Green Growth Index**			
	CEM	**FEM**	**REM**	**FEM GLS**
Constant	7.04	14.09	16.19*	11.87*
	(0.3623)	(0.1593)	(0.0933)	(0.0249)
lnGDPC	2.38***	1.60*	1.45	1.74***
	(0.0001)	(0.0895)	(0.1044)	(0.0009)
lnIFAC	-0.41	-0.11	-0.12*	-0.02
	(0.1493)	(0.1029)	(0.0878)	(0.6031)
FDI	0.15*	0.00	0.00	0.01
	(0.0651)	(0.8642)	(0.9348)	(0.2411)
URBAN	-0.05*	0.13***	0.11*	0.14**
	(0.1070)	(0.0072)	(0.0147)	(0.0011)
RES	-0.07***	0.04	0.02	0.03*
	(0.0077)	(0.2531)	(0.3943)	(0.0572)
FOREST	0.54***	0.31*	0.37***	0.31***
	(0.0000)	(0.0056)	(0.0002)	(0.0000)
F-test	17.68***	534.86***	4.41***	2151.47***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R-Squared	0.48	0.98	0.18	0.99
Adjusted R-Squared	0.45	0.98	0.14	0.99
Chow Test (p-value)	*(0.000)*			
Hausman Test (p-value)			(0.000)	

Note: *= 10%, ** = 5%, *** = 1% significance level and P-values are shown in parentheses.

Table 4

Estimation results for Model 2 (Islamic Banking Financing)

Variables	**Dependent variable: Green Growth Index**			
	CEM	**FEM**	**REM**	**FEM GLS**
Constant	6.76	22.52*	21.98**	14.56
	(0.3521)	(0.0462)	(0.0122)	(0.0315)
lnGDPC	4.51***	1.09	1.14	1.47**
	(0.0000)	(0.2737)	(0.1642)	*(0.0307)*
lnIBFC	-1.14***	0.39*	0.39**	0.13
	(0.0003)	(0.0515)	(0.0150)	(0.3835)
FDI	0.22*	0.00	0.00	0.01
	(0.0058)	(0.9167)	(0.9717)	(0.1849)
URBAN	-0.12**	0.03	0.02	0.12***
	(0.0014)	(0.5719)	(0.5819)	(0.0039)
RES	-0.15***	0.01	0.00	0.02
	(0.0000)	(0.6743)	(0.8998)	(0.2015)
FOREST	0.53***	0.34***	0.40***	0.32***
	(0.0000)	(0.0030)	(0.0000)	(0.0000)
F-test	21.51***	540.81***	5.65***	2415.49***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R-Squared	0.53	0.98	0.22	0.99
Adjusted R-Squared	0.50	0.98	0.18	0.99
Chow Test (p-value)	*(0.000)*			
Hausman Test (p-value)			(0.000)	

Note: *= 10%, ** = 5%, *** = 1% significance level and P-values are shown in parentheses.

The regression results for Model 1, which examines Islamic finance assets per capita (LnIFAC), indicate that these assets do not have a statistically significant impact on the Green Growth Index (GGI). However, real GDP per capita (LnGDPC) shows a positive and significant relationship with the GGI at the 1% level, suggesting that economic growth in OIC countries contributes to green economic development. Urbanization (LnURBAN) also exhibits a positive and significant effect at the 5% level, while renewable energy use (LnRES) has a positive effect significant

at the 10% level. Additionally, forest land area (LnFOREST) is positively and significantly associated with the GGI at the 1% level. In contrast, foreign direct investment (LnFDI) does not show a significant influence on the GGI.

In Model 2, which focuses on Islamic banking financing per capita (LnIBF), no significant causal relationship is found between Islamic banking financing and the GGI. Nonetheless, real GDP per capita (LnGDPC) again demonstrates a positive and significant effect on the GGI at the 5% level, indicating that economic development fosters green growth in OIC countries. Urbanization (LnURBAN) and forest land area (LnFOREST) both have positive and highly significant effects on the GGI at the 1% level. Meanwhile, foreign direct investment (LnFDI) and renewable energy use (LnRES) do not exhibit statistically significant effects, though their coefficients remain positive.

Discussion

The findings indicate that real GDP per capita (LnGDPC) positively influences the Green Growth Index (GGI). Economic advancement typically drives greater green growth through improvements in production, distribution, and consumption systems. For instance, Indonesia experienced an 18% increase in GDP between 2021 and 2024, accompanied by a rise in its GGI from 3.21 to 3.36. Similarly, Malaysia's GDP grew by 4.4%, with its GGI increasing to 3.91 (World Bank, 2024). These results align with Mubarok (2023), who argues that transitioning to a green economy can enhance economic growth by generating employment opportunities, fostering inclusive development, and strengthening social, economic, and environmental resilience. Collectively, these findings confirm a positive relationship between real GDP per capita and green economic development.

Conversely, Islamic finance assets per capita (LnIFAC) do not exhibit a significant effect on the GGI. While Sharia principles emphasize ethical and sustainable investment, much of the capital within Islamic finance remains concentrated in conventional sectors such as real estate and trade, wh€ncial products, institutional policies that prioritize sustainability, and environmentally responsible operational practices. Thus, the results from Model 2 underscore the need for structural reforms to enhance the role of Islamic banking in green growth. These reforms should focus on expanding Sharia-compliant green instruments, strengthening institutional capacity, and introducing more robust regulatory incentives to align financing portfolios with sustainable development goals.

Foreign Direct Investment (FDI) also shows no significant effect on the Green Growth Index (GGI). While foreign capital inflows can contribute to economic growth, they do not necessarily foster green growth in OIC countries. As Shahbaz et al. (2020) note, FDI in developing economies often gravitates toward carbon-intensive sectors such as manufacturing and mining, prioritizing short-term economic gains over environmental sustainability. Furthermore, weak regulatory frameworks in many OIC nations fail to impose stringent environmental standards on foreign investments, reducing their potential to support green growth objectives.

In contrast to financial variables, urbanization (URBAN) exerts a positive influence on the Green Growth Index (GGI) in OIC countries. According to the World Bank (2023), a 1% increase in urbanization can raise GDP by 2.7% and reduce poverty by 1%. For example, Turkey's urbanization rate reached approximately 76% in 2021, with major cities contributing over 60% of national GDP, thereby positively affecting its GGI (Liang et al., 2019). These trends suggest that urbanization stimulates economic growth and facilitates improvements in green growth performance. Urban areas often promote resource efficiency through the adoption of environmentally friendly technologies and the development of sustainable infrastructure. Sarkodie and Strezov (2019) also found that rising urban populations are associated with lower carbon emissions and greater energy efficiency, particularly in transportation and energy sectors. Moreover, urbanization can support green initiatives such as low-emission public transportation and advanced waste management systems. Although urbanization can generate environmental challenges, these findings indicate that effective urban planning and policies emphasizing sustainability can maximize its potential as a driver of green growth.

Renewable energy consumption (RES) also demonstrates a positive relationship with the GGI across both empirical models. In Model 1, the effect is positive and statistically significant at the 10% level, while in Model 2 the coefficient remains positive though statistically insignificant. Despite the variation in statistical strength, the observed relationship aligns with theoretical expectations and prior research. Swales highlights that integrating renewable energy sources not only mitigates environmental harm but also strengthens economic performance. Evidence suggests that expanding renewable energy use could reduce global carbon emissions by up to one-third while supporting long-term green growth. The International Renewable Energy Agency (IRENA, 2024) estimates that a global transition to renewables could add as much as USD 98 trillion to global GDP by 2050, provided

that supportive energy policies are in place. Similarly, Cherni and Jouini (2017) argue that renewable energy enhances productivity by replacing fossil fuels, which are prone to price volatility and carry significant environmental risks. For OIC countries, many of which depend heavily on fossil fuels, investments in renewable technologies can provide a pathway toward cleaner, more secure, and economically stable energy systems, thereby advancing the Sustainable Development Goals (SDGs). Overall, despite differences in significance levels, the positive association across models reinforces the view that scaling up renewable energy use is essential for promoting green growth in OIC nations.

The analysis also shows that forest area (FOREST) positively influences the Green Growth Index (GGI). Forests play a critical role in advancing green growth by acting as natural carbon sinks, preserving biodiversity, and maintaining ecological balance. Apergis and Ozturk (2015) found that effective forest management can significantly reduce greenhouse gas emissions while enhancing environmental quality, thereby supporting green growth. In OIC countries, forest resources are essential not only for environmental stability but also for sustaining forestry and agricultural sectors that contribute substantially to economic development. Expanding and conserving forest areas can thus strengthen their ecological functions while supporting long-term green growth.

Although this study does not explicitly estimate the impact of Islamic finance on green growth by geographic region, the sample was intentionally designed to capture diverse OIC contexts across Southeast Asia, the Middle East and North Africa (MENA), and Sub-Saharan Africa. While regional fixed effects were not included in the panel regression due to model constraints, insights from existing literature help explain how regional characteristics shape the integration of Islamic finance and sustainability. In Southeast Asia, for example, Indonesia and Malaysia have made considerable progress in aligning Islamic finance with environmental objectives through initiatives such as green sukuk and green banking frameworks supported by robust regulatory environments (Foglie & Keshminder, 2022; Harahap et al., 2023). By contrast, MENA countries like Saudi Arabia and Oman, despite holding substantial Islamic finance assets, face structural challenges in linking financial systems to ecological priorities due to heavy dependence on hydrocarbon sectors and limited mainstreaming of green policies (Budiman et al., 2022; Alhammadi, 2024). Meanwhile, Sub-Saharan African OIC countries such as Nigeria and Sudan exhibit growing Islamic finance sectors but remain constrained by weaker institutional capacity, which limits the effective deployment of Islamic green financial instruments (Dirie et al., 2023; Irfany et al., 2024).

These regional disparities highlight how institutional readiness, regulatory frameworks, and the integration of environmental policies vary significantly across OIC countries, shaping the extent to which Islamic finance can drive green growth. Strengthening these foundational elements is essential for unlocking the sector's full potential in advancing sustainability objectives. Future research could build on these findings by employing spatial econometric techniques or multi-level modeling approaches to more accurately capture geographic heterogeneity and better explain how regional characteristics mediate the relationship between Islamic finance and green growth.

Conclusion

This study finds that real GDP positively influences the Green Growth Index (GGI) in OIC countries, indicating that economic expansion can drive green growth across sectors such as manufacturing and consumption. However, Islamic financial assets—including Islamic financing and green sukuk—still have a limited impact on green growth, reflecting the sector's incomplete alignment with environmental objectives. In contrast, urbanization and renewable energy use contribute positively to the GGI by enhancing energy efficiency and reducing carbon emissions. Forest area also plays a critical role in carbon absorption and ecological balance, thereby supporting sustainable growth. Meanwhile, foreign direct investment (FDI) does not contribute meaningfully to green growth, as it remains concentrated in carbon-intensive industries.

To advance green growth, OIC countries should prioritize renewable energy investment to reduce dependence on fossil fuels and accelerate the transition to a low-carbon economy. Strengthening regulatory frameworks and infrastructure to support environmentally oriented Islamic financial instruments is essential, alongside efforts to safeguard forest resources as a means of mitigating climate change. Effective urban management requires the integration of sustainable technologies in transportation and energy systems, while FDI policies should be reoriented to ensure that foreign capital supports, rather than undermines, green growth objectives.

In light of these findings, several strategic recommendations emerge. OIC member countries should strengthen institutional collaboration with international and regional bodies—particularly the Islamic Development Bank (IDB) and the Islamic Financial Services Board (IFSB)—to establish standardized frameworks and technical guidelines for green Islamic finance instruments, such as green su-

kuk and ESG-compliant Islamic banking products. These institutions can play a pivotal role in mobilizing capital for climate-focused projects, providing concessional financing, and enhancing technical capacity across member states. Policy harmonization is also essential to facilitate cross-border green investments, supported by incentives for private sector participation in renewable energy and sustainable infrastructure initiatives. Developing green taxonomies aligned with Shariah principles would further bolster investor confidence and improve transparency.

Theoretically, this study contributes to the growing literature at the intersection of Islamic finance and sustainable development by offering empirical evidence from a diverse panel of OIC countries. It extends the application of the Green Growth Index to evaluate macro-financial relationships in Muslim-majority economies, highlighting both the potential and the limitations of Islamic finance in driving ecological transitions. For future research, exploring the geographical heterogeneity of Islamic green finance through spatial econometric techniques or region-specific models could yield deeper insights. Complementary qualitative assessments of institutional capacity, policy readiness, and Shariah compliance mechanisms would provide a more comprehensive understanding of the drivers and barriers to green growth. Additionally, incorporating temporal policy dynamics—such as the evolution of national green finance strategies—may help reveal the long-term interactions between Islamic finance and sustainability outcomes.

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Data availability statement

The data used in this study were obtained from publicly accessible sources, including the Global Green Growth Institute (GGGI) for the Green Growth Index and the World Bank for macroeconomic indicators such as GDP, FDI, urbanization rates, and forest area. Data on Islamic finance assets and financing were sourced from the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC). All datasets are available from the corresponding author upon reasonable request.

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