Is Islamic Economy as that Green?

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Abstract. Economic growth is widely associated with degradation of environmental quality. Green economy is a term that later emerged to save the environment. In Islamic point of view, the environment and the economy are two things that must support each other. This study discusses Islamic economics that should be associated with sustainability, as in line with the teachings of Islam to coexist with the environment. The method used are correlation analysis and panel data regression to find out the association between Islamic economics and green growth in major Islamic economic countries. The results show that the Global Islamic Economy Indicator (GIEI) is positively correlated to the Green Growth Index (GGI). Based on the panel data regression model, Muslim Modest Fashion sector significantly has a positive effect on GGI. Unfortunately, in general, the GGI achievements of the OIC countries are still very lacking compared to non-OIC countries. It is the government's duty to start implementing environmentally oriented policies in all sectors of the Islamic economy inclusively.

Key words: Islamic economic, green growth, panel data regression.

Abstrak. Pertumbuhan ekonomi banyak dikaitkan dengan degradasi kualitas lingkungan. Ekonomi hijau adalah istilah yang kemudian muncul untuk menyelamatkan lingkungan. Dalam pandangan Islam, lingkungan dan ekonomi adalah dua hal yang saling mendukung. Kajian ini membahas ekonomi Islam kaitannya dengan konsep keberlanjutan, karena hal ini seharusnya sejalan dengan ajaran Islam untuk hidup berdampingan dengan lingkungan. Metode yang digunakan adalah analisis korelasi dan regresi data panel untuk mengetahui hubungan antara ekonomi Islam dan pertumbuhan ekonomi hijau di negara-negara ekonomi Islam utama. Hasilnya menunjukkan bahwa Indikator Ekonomi Islam Global (GIEI) memiliki hubungan positif dengan Indeks Pertumbuhan Hijau (GGI). Berdasarkan model regresi data panel, perkembangan sektor Mode Busana Muslim berpengaruh signifikan terhadap GGI. Sayangnya, secara umum capaian GGI negara-negara Organisasi Kerja Sama Islam (OKI) masih sangat kurang dibandingkan dengan negara-negara non-OKI. Sudah menjadi tugas pemerintah untuk mulai mengimplementasikan kebijakan berwawasan lingkungan di semua sektor ekonomi Islam secara inklusif.

Kata kunci: Ekonomi hijau, ekonomi Islam, regresi data panel.

INTRODUCTION

Economic growth is widely associated with degradation of environmental quality. Economic development that solely refers to an advantage without considering the environmental sustainability will not only have a negative impact on nature but also on humans (Febriana et al., 2019). Economic development based on natural resources that have limits needs to pay attention to environmental sustainability. This is certainly a challenge for policy makers in balancing economic development without excluding environmental conservation. The acknowledgment of environmental challenges and deterioration of this planet ecosystem has led to a global consensus on the need to adopt environment-friendly concepts as corrective and proactive measures to enable the sustainability of human efforts in achieving livelihoods with little or no harm to the environment (Alfred, 2021).

Green economy is a term that later emerged to save the environment. An environmentally oriented economy will properly monitor the process of utilizing natural resources as inputs, and various unwanted outputs such as pollution and environmental damage that may be caused. The United Nation Environmental Programme (UNEP) states that green economy should improve human well-

being and social equity while significantly reducing environmental risks and ecological scarcity (UNEP, 2011). Several indicators have been established to measure how green the various countries in the world are in running their economies.

The Global Green Growth Institute (GGGI) is a treaty-based inter-governmental international development organization to promote green growth, a growth paradigm that is characterized by a balance of economic growth and environmental sustainability. GGGI provides technical support, research, and stakeholder engagement for green growth plans, especially in developing countries. GGGI calculates a composite index called Green Growth Index (GGI) to measuring a country's performance in achieving sustainability targets including Sustainable Development Goals (SDGs), Paris Climate Agreement, and Aichi Biodiversity Targets for four green growth dimensions: efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. To make the Index relevant at the national and international level, it has been imperative for GGGI to align the Index with global sustainability goals and targets (GGGI, 2020). Thus, the GGI can be used as a measure of a country's efforts to continue to achieve sustainability targets in its economic development process.

In the Islamic perspective, human is commanded to always take care of the environment and the nature that has been created by Allah SWT. The word of Allah SWT in Qur'an (11:61): *"...He (Allah) has created you from the earth (soil) and has commanded you to prosper it...* [61]." The verse explains that humans as servants of Allah SWT are obliged to maintain and prosper the earth without exception. In addition, the warning of Allah SWT concerning the effect caused when humans set aside the commands in protecting the environment and the nature expressed in His words also in Qur'an (30:41-42) which means, "*It has been seen that the damage on land and at sea was caused by the deeds of human hands, that Allah may feel to them some of the (consequences of) their deeds, for them to return (to the right path)* [41]. *Say (Muhammad), 'Go on earth and see how the end of the ancients was. Most of them are people who fellowship (Allah)'* [42]."

The verse clearly explains the consequences of human's disobedience in preserving the environment and the nature. Exploitative actions against nature by humans also lead to natural disaster such as floods and landslides that occur in several parts of the world, or global warming and climate change which complicate human life itself. In Islamic point of view, the environment and the economy are two things that must support each other. According to Frankel (2005) in Suhada and Setyawan (2016), humans must concern for both the environment and the economy, not one of them.

Islam itself has taken part in the world economic development through the "Islamic Economy". Based on State of the Global Islamic Economy Report 2022, in 2021, there were 1.9 billion Muslims spent the equivalent of US$2 trillion across the food, pharmaceutical, cosmetics, fashion, travel, and Islamic-themed media/recreation sectors, all of which are impacted by Islamic faith-inspired ethical consumption needs (DinarStandard, 2022). As according to Rusydiana and Bahri (2022), the Islamic economy recognized the same principle with green economy: environmental protection and balance. This shows that the actual application of the Islamic economy should be in line with the teachings of Islam.

Moreover, the large transaction opportunities and the growing Islamic economic market, should be able to have a greater impact on the implementation of a green economy. The report explained that investments in the Islamic economic sectors across OIC (Organization of Islamic Cooperation) countries and selected non-OIC markets grew by 118% to US$25.7 billion in 2020-2021 from US$11.8 billion in 2019-2020. Even during the Covid-19 pandemic, the Islamic economy can be relied upon in raising the country's fiscal through the halal industry at the small and medium level (Yudha and Kafabih, 2021).

This study discusses Islamic economics that should be associated with sustainability, as in line with the teachings of Islam to coexist with the environment. The aim of this study is to first find out the correlation between Islamic economy and green economy in major Islamic economic countries. Then, using a panel data regression model, an analysis was conducted to determine the role of the Islamic economic sectors on the Green Growth Index. Although there have been many studies on the determinants of the green economy or green growth, the influence of the Islamic economics has not been widely discussed empirically. Furthermore, to capture a wider point of view, this study also reviews the achievements of implementing the green economy in the Islamic countries compared to other countries.

LITERATURE REVIEW

Green Growth

Sustainability is the reason for the birth of the concept of a green economy. According to Allen and Clouth (2012), the concept of a green economy received significant international attention over the past few years as a tool to address the 2008 financial crisis as well as one of two themes for the 2012 UN Conference on Sustainable Development. Green economy can be defined as an economy that aims at reducing environmental risks and ecological scarcities, and whose purpose is sustainable development without degrading the environment (Sulich, 2020). This is a solution to environmentally unfriendly development which has an impact on the worsening of many ecosystems.

As a monitoring and evaluation tool, GGGI made an indicator called the Green Growth Index which aims to measure a country's performance in achieving sustainability targets including Sustainable Development Goals (SDGs), Paris Climate Agreement, and Aichi Biodiversity Targets. This composite index is compiled based on data from 36 indicators in 16 categories (pillars) on four dimensions: efficient and sustainable resource use; natural capital protection; green economic opportunities; and social inclusion. The four dimensions of green growth are closely interlinked (GGGI, 2020).

Production processes in an efficient economy can produce more output of goods and services with less use of natural resources. A well-maintained ecosystem will provide greater economic opportunities. In this process, the community is not only the beneficiary but also the main actor, so that social inclusion is the key to the achievement and distribution of Green Growth. Until 2020, GGGI has estimated the achievement of the Green Growth Index for 117 countries since the period of 2005, which is useful for being a very comprehensive monitor and evaluation material.

Green Growth, which is composed of many complex indicators, can be influenced by various determinants. Khan et al. (2020) in its research found that green economic growth is influenced by national scale-level green practices, such as the existence of renewable energy sources, eco-friendly policies, regulatory pressures, and sustainable use of natural resources. These variables are positively associated with the achievement of green growth. Meanwhile, Odugbesan et al. (2021) show that foreign direct investment, renewable energy, institutional quality, and GDP per capita promotes green growth, while population exerts a devastating effect on green growth in Middle Eastern and North African countries. In detail Tawiah et al. (2021) states countries at a different development level will require different strategies in achieving optimal green growth.

But in general, economic development has a positive effect on green growth. While economic openness is detrimental to green growth, so too is the level of energy consumption. Conversely, renewable energy consumption can improve green growth. In this study, it was also conveyed that it is necessary to have a control variable to improve the accuracy of the model. Based on the modeling results, the control variables that have a significant effect are population and natural resources rent which negatively affect green growth, while forest area has a positive effect.

Islamic Economics

The concept of green economy is in line with Islamic teachings, namely maintaining good interaction between humans and nature (Sarkawi et al., 2016). In running the economy, man should consider every balance that naturally already exists in nature and will account for every decision later. It is on this basis that the Islamic economy emerges as a specific economic sector. The Islamic economic system is a theoretical construct of an economy activity whose members follow the Islamic faith (Pryor, 1985).

Amid the threat of the climate crisis and environmental pressures, the Islamic economy can be a sustainable solution. As is the comprehensive properties of Islam, the Islamic economy is also related to all aspects of life. In general, Islamic values that are the philosophy of the Islamic economy are based on four principles: the principle of willingness, the principle of justice, the principle of mutual benefit, and the principle of help without exploitation (Thian, 2021).

Not only the law of buying and selling process, Islamic economic also talk about the object of the transaction. Islamic religious values create their own space in the economy by forming a classification of new products and services that are in line with Islamic provisions, at least including halal products, ethical finance, and halal lifestyle. The principles on which the sectors of the Islamic economy are based are derived from the Qur'an (the Muslim holy book comprising the word of God) and the Sunnah (the sayings and the traditions of the Prophet Muhammad SAW (DinarStandard, 2022). There are some restrictions and prohibitions such as illicit food, or usury (*riba*) in finance transactions. These boundaries make the Islamic economy pay more attention to consumption ethics, health, and the environment.

The rapidly growing Muslim population makes Islamic economics have a larger market. By 2030 it is estimated that the proportion of Muslims will reach at least 26.4% of the world's population (Pew Forum on Religion & Public Life, 2009). Even in western countries, the Muslim population is estimated to grow rapidly, reaching twice as much as is estimated to be the case in the United States. The increasingly dispersed and inclusive existence of Muslims in various parts of the world can strengthen the economic flow of Islam.

A U.S.-based research institute, Dinar Standard, together with Dubai Economy and Tourism compiled a composite index called the Global Islamic Economy Indicator (GIEI). Main objective of GIEI is to measure the overall development of the Islamic economic sectors by assessing the performance of its parts in line with its broader social obligations. There are six sectors of Islamic economy covered, namely: Islamic finance, halal food, Muslim-friendly travel, modest fashion, Islamic-themed media/recreation, and halal pharmaceuticals/cosmetics. Each of the indicators consists of at least the constituent components as follows: 1) Financial sub-indicators: metrics that gauge the size of the sector; 2) Governance sub-indicators: metrics to gauge the halal certification and shariah regulatory landscape (as applicable); 3) Awareness sub-indicators: metrics to understand the extent of awareness the sector has built through the media as well as through related events; 4) Social sub-indicators: metrics to understand the social impact of the sector, and; 5) Innovation sub-indicators: metrics to understand the innovation landscape of the sector.

Panel Regression Model

Panel data is combination between time-series and cross-sectional data. Time-series data includes multiple periods (daily, monthly, quarterly, or annually). Cross data consists of several or many objects in each period. Combine data gives a richer source of variation which allows for more efficient estimation of the parameters. In addition, panel data can control individual heterogeneity and identify and estimate effects that are completely undetectable in pure cross section or pure time series data (Baltagi, 2005).

Panel data regression analysis is a regression analysis with a data structure that is panel data. Generally, the estimation of parameters in regression analysis with cross section data is carried out using the estimation of the least squares method or called as Ordinary Least Square (OLS). According to Hsiao (1992) the advantages of using panel data regression analysis are that they obtain better estimation results because along with an increase in the number of observations that automatically have implications for increasing the degree of freedom and avoiding omitted variable problem.

According to Baltagi (2005) the stages in the analysis with the Regression Data Panel approach are as follows:

1. The Error Component Model or Common Effects Model (CEM)
    The Common Effect Model is the simplest panel data regression model because it assumes the same individual behavior over a period. The general form of the Common Effect Model is as follows:
    $$y_{it} = \alpha + X'_{it}\beta + u_{it} \tag{1}$$
    Where,
    α : intercept
    β : slope coefficient vector
    X : individually vector
    i : 1, 2, …, N (cross-section)
    t : 1, 2, …, T (time periods)
    u_{it}: error term

2. The Fixed Effects Model (FEM)
    The Fixed Effect Model assumes that behavior between individuals varies over different periods of time. These differences can be seen through the intercept of each individual which is different. The general form of the Fixed Effect Model is as follows:
    $$y_{it} = \alpha + X'_{it}\beta + \sum_{i=1}^{N} \mu_i D_i + v_{it} \tag{2}$$
    Where,
    α : intercept
    β : slope coefficient vector
    X : individually vector
    μ : individually effect
    D : individually dummy (it can be 0)
    i : 1, 2, …, N (cross-section)
    t : 1, 2, …, T (time periods)
    v_{it} : error term

3. The Random Effects Model (REM)
    The Random Effect Model assumes differences between individuals, differences between times, and differences between individuals and time (combined) are accommodated through the error component. The general form of the Random Effect Model is as follows:
    $$y_{it} = \alpha + X'_{it}\beta + (u_{it} + v_{it}) \tag{3}$$
    Where,
    α : intercept
    β : slope coefficient vector
    X : individually vector
    i : 1, 2, …, N (cross-section)
    t : 1, 2, …, T (time periods)
    $u_{it} + v_{it}$: error term

4. The Chow-Test
    The Chow-Test is used to determine the best model between the Common Effect Model and the Fixed Effect Model with the following test hypothesis:

$$H_0 : \mu_1 = \mu_2 = \mu_3 = \cdots = \mu_{N-1} = 0$$
$$H_1 : there\ is\ at\ least\ one\ \mu_1 \neq 0$$

The test statistic is given by:

$$F_0 = \frac{\dfrac{RRSS - URSS}{N-1}}{\dfrac{URSS}{NT - N - K}} \sim F_{N-1, N(T-1)-K} \qquad (4)$$

Where,

N : number of individuals
T : length of time periods
K : number of independent variables
$RRSS$: Residual Sum of Square CEM
$URSS$: Residual Sum of Square FEM

Decision to reject H_0 jika $F_0 > F_{N-1, N(T-1)-K}$ with the conclusion Fixed Effect Model is better than Common Effect Model.

5. The Hausman-Test

The Hausman-Test is used to determine the best model between the Fixed Effect Model and the Random Effect Model with the following test hypothesis:

$$H_0 : cov(u_i, X_{it}) = 0$$
$$H_0 : cov(u_i, X_{it}) \neq 0$$

The test statistic is given by:

$$W = (\hat{b}_{FEM} - \hat{b}_{REM})' [var(\hat{b}_{FEM} - \hat{b}_{REM})]^{-1} (\hat{b}_{FEM} - \hat{b}_{REM}) \qquad (5)$$

Where,

W : Haussman coefficient statistics-test
$\hat{b}_{FEM}$: vector estimation slopes fixed effect model
$\hat{b}_{REM}$: vector estimation slopes random effect model

The decision to reject H_0 if $W > \chi^2_{\alpha,k}$ with the conclusion Fixed Effect Model is better than Random Effect Model.

6. The Breusch-Pagan Test

The Breusch-Pagan Test is used to determine the best model between the Random Effect Model and the Common Effect Model with the following test hypothesis:

$$H_0 : \sigma^2_\mu = 0$$
$$H_1 : there\ is\ at\ least\ one\ \sigma^2_\mu \neq 0$$

The test statistic is given by

$$LM = \left(\frac{NT}{2(T-1)}\right) \left[\left(\sum_{i=1}^{N} e_{i.}^2 \Big/ \sum_{i=1}^{N} \sum_{t=1}^{T} e_{it}^2\right) - 1 \right]^2 \qquad (6)$$

Where,

N : number of individuals
T : length of time periods
e_{it} : OLS residuals on the CEM

The decision to reject H_0 if $LM > \chi^2_{\alpha,1}$ with the conclusion the Random Effect Model is better than the Common Effect Model.

If the chosen one is a Random Effect Model, there is no need for further testing and the estimation method that can be used automatically is Generated Least Square (GLS). This is because the GLS method can overcome the problem of classical regression assumptions, heteroskedasticity of residual and multicollinearity. If the best model selected is the Common Effect Model or Fixed Effect Model, it is necessary to examine the structure of the residual variance-covariance with the following hypotheses and test statistics:

1. Lagrange Multiplier Test (LM Test)

   This test was performed to see the heterogeneity of the residual variance-covariance structure of the model that had been estimated by the test hypothesis as follows:

   $H_0 : \sigma_i^2 = \sigma^2$ for $i = 1, 2, …, N$

   $H_1 : there\ is\ at\ least\ one\ \sigma_i^2 \neq \sigma^2$ for $i = 1, 2, …, N$

   The test statistic is given by

   $$LM = \frac{T}{2} \sum_{i=1}^{N} \left[\frac{\hat{\sigma}_i^2}{\hat{\sigma}^2} - 1 \right] \tag{7}$$

   Where,

   N : number of individuals

   T : length of time periods

   $\hat{\sigma}_i^2$: residual variance of the i-th equation

   $\hat{\sigma}^2$: residual variance system equation

   The decision fails to reject H_0 if $LM > \chi_{(N-1)}^2$ by the conclusion of the assumption of homoskedasticity of the residual variance-covariance structure is met.

2. λ_{LM} Test: Cross-sectional Correlation

   This test is carried out to see if there is cross-sectional correlation or whether errors between individuals of the estimated model meet the assumptions of non-autocorrelation with the following test hypothesis:

   $H_0 : Cov(V_{it}, V_{jt}) = 0$ where i≠j

   $H_0 : Cov(V_{it}, V_{jt}) \neq 0$ where i≠j

   The test statistic is given by

   $$\lambda_{LM} = T \sum_{i=2}^{N} \sum_{j=1}^{i-1} V_{ij}^2 \tag{8}$$

   Where,

   N : number of individuals

   T : length of time periods

   $\hat{\sigma}_i^2$: residual variance of the i-th equation

   $\hat{\sigma}^2$: residual variance system equation

   The decision fails to reject H_0 if $LM > \chi_{(N-1)}^2$ by the conclusion of the assumption of homoskedasticity of the residual variance-covariance structure is met.

METHOD

Research Scope and Data Source

This research uses data of 10 major Islamic economic countries that always being listed in the Top 15 highest Global Islamic Economy Indicator: Bahrain, Indonesia, Jordan, Kuwait, Malaysia, Oman, Pakistan, Qatar, Saudi Arabia, and United Arab Emirates. The dependent variable used in this study is the achievement of the Green Growth Index of these countries. The index used are sourced from the results of estimates and calculations by GGGI.

The main independent variables used in this study is the Global Islamic Economy Indicator score in six sectors: Islamic finance, halal food, Muslim-friendly travel, modest fashion, Islamic-themed media/recreation, and halal pharmaceuticals/cosmetics. Other independent variables used in this study include Energy Consumption, Economic Openness, and Economic Development. The Economic Development is represented by the value of Gross Domestic Product (GDP) per capita. Meanwhile, the population and forest area are also involved in the model as control variables. Details of measurements and sources of variables are shown in Table 1. All data used in this study is panel data covering period for 7 years (2014-2020) in these 10 countries.

Table 1 Data source

No	Variable	Unit	Measurement	Source
1	GGI	Score	Growth Green Index	GGGI
2	Forest	%	Forest area as a share of land area	World Bank
3	Population	people	Total population is based on the de facto definition of population	World Bank
4	Energy per capita	kWh	Energy consumption per capita	World Bank
5	Trade Openness	%	Sum of exports and imports of goods and services measured as a share of Gross Domestic Product.	World Bank
6	GDP per capita	US$	Gross Domestic Product per capita (constant 2015)	World Bank
7	GIEI-Food	Score	Halal Food sector score of GIEI	Dinar Standard
8	GIEI-Finance	Score	Islamic Finance sector score of GIEI	Dinar Standard
9	GIEI-Travel	Score	Muslim-Friendly Travel sector score of GIEI	Dinar Standard
10	GIEI-Fashion	Score	Muslim Modest Fashion sector score of GIEI	Dinar Standard
11	GIEI-Media	Score	Islamic-Themed Media/Recreation sector score of GIEI	Dinar Standard
12	GIEI-Pharma	Score	Halal Pharmaceuticals/Cosmetics sector score of GIEI	Dinar Standard

Analysis Method

This study used descriptive and inferential statistical analysis. Descriptive analysis includes data visualization and correlation analysis to find out an overview of the relationship between green growth and the Islamic economic sectors. To support the results of correlation in inference, a statistical test of Pearson correlation coefficient was also carried out. Furthermore, this study conducted an inference analysis by building a panel data regression model to determine the magnitude of the influence of the Islamic economy on the achievement of green growth.

According to Baltagi (2005), in the regression of panel data, there are three models that can be used, namely the Error Component Model or Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Where the stages in the analysis to build a panel data regression model that will be carried out in this study are as follows:

1. Model Estimation

   There are three types of models that will be used to estimate parameters with panel data, with the first estimation result being the Common Effect Model (CEM) as follows:

$$
\begin{aligned}
GGI_{it} = \alpha &+ \beta_1 Forest_{it} + \beta_2 Population_{it} + \beta_3 Energy\_Capita_{it} + \beta_4 Trade\_GDP_{it} \\
&+ \beta_5 GDP\_Capita_{it} + \beta_6 GIEI\_Food_{it} + \beta_7 GIEI\_Finance_{it} \\
&+ \beta_8 GIEI\_Travel_{it} + \beta_9 GIEI\_Fashion_{it} + \beta_{10} GIEI\_Media_{it} \\
&+ \beta_{11} GIEI\_Pharma_{it} + u_{it}
\end{aligned}
\tag{9}
$$

   Where, $u_{it} = \mu_i + v_{it}$; μ_i's are cross section specific components and v_{it}'s are reminder effect.

   Furthermore, the results of the second estimation for the Fixed Effect Model (FEM) are as follows:

$$
\begin{aligned}
GGI_{it} = (\alpha + \mu_i) &+ \beta_1 Forest_{it} + \beta_2 Population_{it} + \beta_3 Energy\_Capita_{it} \\
&+ \beta_4 Trade\_GDP_{it} + \beta_5 GDP\_Capita_{it} + \beta_6 GIEI\_Food_{it} \\
&+ \beta_7 GIEI\_Finance_{it} + \beta_8 GIEI\_Travel_{it} + \beta_9 GIEI\_Fashion_{it} \\
&+ \beta_{10} GIEI\_Media_{it} + \beta_{11} GIEI\_Pharma_{it} + u_{it}
\end{aligned}
\tag{10}
$$

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Where, μ_i's are individually effect of cross section components;

The third estimation is the Random Effect Model (REM) with the following results:

$$GGI_{it} = \alpha + \beta_1 Forest_{it} + \beta_2 Population_{it} + \beta_3 Energy\_Capita_{it} + \beta_4 Trade\_GDP_{it}$$
$$+ \beta_5 GDP\_Capita_{it} + \beta_6 GIEI\_Food_{it} + \beta_7 GIEI\_Finance_{it}$$
$$+ \beta_8 GIEI\_Travel_{it} + \beta_9 GIEI\_Fashion_{it} + \beta_{10} GIEI\_Media_{it}$$
$$+ \beta_{11} GIEI\_Pharma_{it} + (u_i + v_{it}) \tag{11}$$

Where, $(u_i + v_{it})$'s are error terms.

2. Selection of the Best Panel Regression Model

Based on the literature, the process of selecting the best panel regression model and its estimation method in this study is described as follows in Figure 1. The initial estimation method used before determining the chosen model was ordinary least square (OLS). Then a series of statistical tests are carried out to determine the best model and estimation method that matches the characteristics of the data.
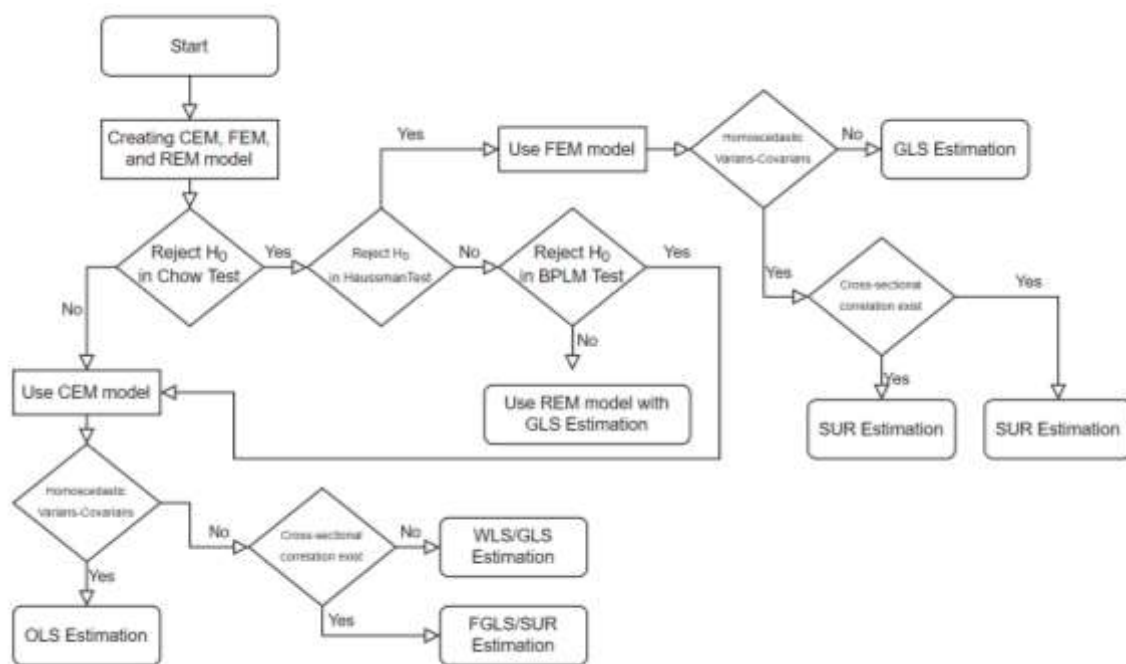
Source: Baltagi, 2005 (processed).

Figure 1 Flowchart of best model selection

RESULTS AND DISCUSSION

Major Islamic Economic Countries

This study was conducted on the main Islamic economic countries that have always been ranked in the top 15 of GIEI since 2014 to 2020. During this period, Malaysia has consistently always been ranked first as the country with the largest Islamic economic development in the world. Malaysia's average Islamic Economy Index score since 2014 stands at 159.77 with an average annual growth of 1.24. Saudi Arabia and the United Arab Emirates have steadily always trailed Malaysia's position.

Meanwhile, Indonesia showed massive development with a high-ranking increase in 2018 and continued to soar in 4th place in 2020. Indonesia's main increase occurred in the halal food and Islamic finance sectors (DinarStandard, 2022). Especially in the halal food sector, If Indonesia can only meet the needs of domestic halal products, it will become a source of enormous potential state revenue (Yudha and Kafabih, 2021). This provides a way for the birth of a new epicenter of Islamic economic development in the Southeast Asian region with Malaysia, to break up the concentration in the Middle East region. In addition, in recent years, it has been seen that global rankings have tended

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to become more volatile, indicating that the Islamic economy has developed rapidly in other countries and is growing evenly.
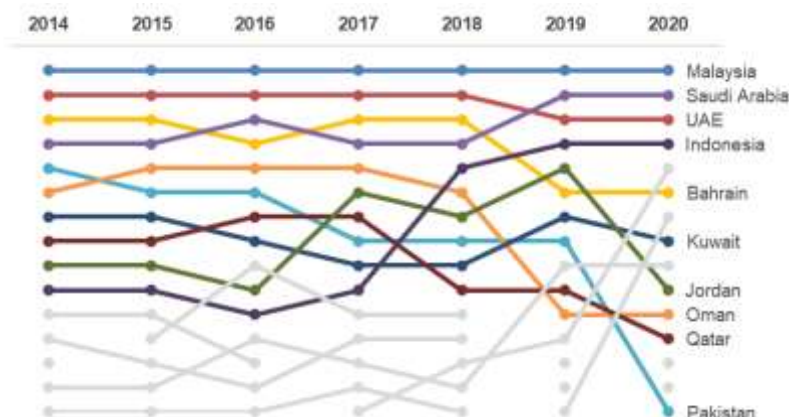

Source: DinarStandard, 2022 (processed).

Figure 2 Global Islamic Economy Index rank

The GIEI score of the ten countries reached 78.33 in 2020, a decrease of 32.85 compared to the previous year. This is largely due to supply chain disruptions and economic crises faced by the OIC countries and their exporters during the COVID-19 pandemic (DinarStandard, 2022). However, in the long-term period since 2014, on average there has been an increase in the Islamic economy index score reaching 3.73 per year. Of these ten countries, only Pakistan experienced a decline in the index score in the period from 2014 to 2020.

In the achievement of the Green Growth Index (GGI), there are significant differences for two countries, namely Malaysia and Indonesia compared to other countries. Geographically, these two countries are also different, that is, they are located on the territory of Southeast Asia. While the other eight countries are in the Middle East region. According to Abumoghli and Goncalves (2020), the MENA region's mostly semi-arid and arid environment makes it one of the historically most vulnerable to natural stresses. Meanwhile, the Southeast Asian region, which is dominated by tropical rainforest landscapes which are the largest natural balance reserves in the world, should have better GGI conditions.
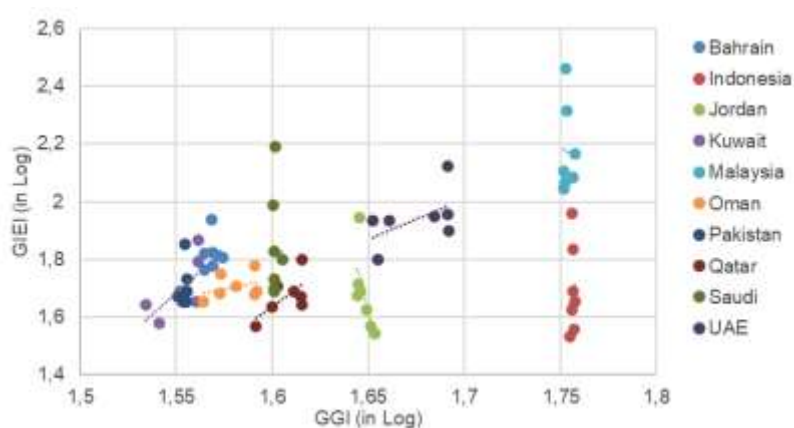
Source: GGGI, 2020 (processed).

Figure 3 Green Growth Index of 10 largest Islamic economic countries

Based on the Pearson correlation test, it was obtained that the correlation between GGI and the Global Islamic Economy Indicator (GIEI) in general is positively associated. There is a similar pattern, that the higher the GIEI achievement, the country tends to also have a high GGI achievement, at least for

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this research period, 2014 to 2020. The full results are shown in Table 2. The correlation of GIEI to GGI is 0.47 and significant at 99.9% confidence level.

In a sectoral context, each sector shows a positive relationship, albeit with varying strength level. Muslim-friendly travel sector has the strongest correlation of 0.64 to GGI. GGI's achievements in major Islamic economic countries tend to be in line with developments in its Muslim-friendly travel sector. These results support the research conducted by Lee and Kwag (2013), that the tourism and hospitality industries turned out to be negatively associated with CO2 emissions in Republic of Korea (South Korea). Meanwhile, Pharma & Cosmetics sector has a weak and insignificant correlation at a 95% confidence level. This correlation analysis only describes intervariable associations.

Table 2 Correlation of GGI to GIEI

Correlation to GGI	GIEI	GIEI-Islamic Finance	GIEI-Halal Food	GIEI-Muslim Friendly Travel	GIEI-Modest Fashion	GIEI-Media and Recreation	GIEI-Pharma & Cosmetics
p-values	4.6e-05***	0.0005***	3.8e-05***	2.0e-09***	0.00389**	1.2e-05***	0.08802'.'
Correlation	0.4667059	0.4035468	0.4715806	0.642535	0.3408	0.4960447	0.2054186
Visualization							

Source: Author, 2022 (processed).

Panel Regression Modelling

To see the effect of GIEI on GGI, as one of the goals of this study, panel data regression modeling is carried out where there are three types of models estimated, it is Common Effect Model, Fixed Effect Model, and Random Effect Model. With the results of the analysis as follows:

Common Effect Model (CEM)

Table 3 Result of CEM

Variable	Estimate	Std. Error	t-value	p-Value	
(Intercept)	4.0665e+01	1.9914e+00	20.4206	< 2.2e-16	***
Forest	3.2591e-01	2.8259e-02	11.5329	< 2.2e-16	***
Population	-1.4837e-08	7.9654e-09	-1.8627	0.067576	.
Energy_Capita	-5.3270e-02	2.1459e-02	-2.4824	0.015966	*
Trade_GDP	-3.2874e-03	1.9183e-02	-0.1714	0.864528	
GDP_Capita	1.5696e-04	7.0757e-05	2.2183	0.030461	*
GIEI_Food	-2.0852e-02	2.4138e-02	-0.8639	0.391224	
GIEI_Finance	-1.9950e-02	9.4726e-03	-2.1060	0.039541	*
GIEI_Travel	4.6243e-02	2.1631e-02	2.1378	0.036757	*
GIEI_Fashion	4.6680e-02	1.3501e-02	3.4574	0.001028	**
GIEI_Media	1.0552e-02	2.7291e-02	0.3866	0.700443	
GIEI_Pharma	-4.1428e-03	3.1889e-02	-0.1299	0.897086	

Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: Author, 2022 (processed).

The result of CEM modeling with the OLS estimation method is shown in Table 3. On this model, there are several significant variables at various levels of confidence level. At a 99%, the Forest Area and Muslim Modest Fashion sector significantly positively affects GGI. At a confidence level of 95%,

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Energy Consumption and the Islamic Finance sector turned out to be detrimental to the achievement of Green Growth. Meanwhile, Economic Development (GDP per capita) and the Muslim-friendly travel sector have a positive effect. Furthermore, when using a 90% confidence level, the Population also has a significantly negative effect on GGI.

This CEM model is significant simultaneously based on F-Statistics of 53.1069. The resulting Adjusted R-Square value indicates that the independent variables in this model have represented 89.25% of the variances of GGI.

Fixed Effect Model (FEM)

The result of FEM modeling is shown in Table 4. At a 95% confidence level, the GDP per capita and Muslim Modest Fashion sector have a significant effect on GGI. The GDP per capita has a negative effect while the Muslim Modest Fashion sector has a positive effect on GGI's achievements.

Table 4 Result of FEM

Variable	Estimate	Std. Error	t-value	p-Value	
Forest	1.8846e-01	2.0844e-01	0.9041	0.37035	
Population	1.5499e-08	2.7798e-08	0.5576	0.57968	
Energy_Capita	7.0998e-03	1.5824e-02	0.4487	0.65564	
Trade_GDP	-7.8034e-03	1.1391e-02	-0.6851	0.49653	
GDP_Capita	-2.9175e-04	1.1282e-04	-2.5860	0.01273	*
GIEI_Food	5.3314e-03	6.3619e-03	0.8380	0.40609	
GIEI_Finance	-3.3064e-03	2.8139e-03	-1.1750	0.24566	
GIEI_Travel	-1.3238e-03	5.8214e-03	-0.2274	0.82105	
GIEI_Fashion	2.3676e-02	3.6396e-03	6.5050	3.879e-08	***
GIEI_Media	-1.0835e-02	7.3552e-03	-1.4730	0.14713	
GIEI_Pharma	1.3006e-02	8.7587e-03	1.4849	0.14397	

Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: Author, 2022 (processed).

This FEM model is significant simultaneously based on F-Statistics of 6.09024. The resulting Adjusted R-Square value indicates that the independent variables in this model have represented 40.51% of the variances of GGI.

Random Effect Model (REM)

Table 5 Result of REM

Variable	Estimate	Std. Error	z-value	p-Value	
(Intercept)	4.4543e+01	3.4485e+00	12.9165	< 2.2e-16	***
Forest	2.1330e-01	9.3103e-02	2.2910	0.02196	*
Population	7.4042e-10	1.7254e-08	0.0429	0.96577	
Energy_Capita	-6.4581e-04	1.4949e-02	-0.0432	0.96554	
Trade_GDP	-6.7324e-03	1.1005e-02	-0.6118	0.54069	
GDP_Capita	-1.9546e-04	9.9479e-05	-1.9649	0.04943	*
GIEI_Food	4.6459e-03	6.0810e-03	0.7640	0.44487	
GIEI_Finance	-2.9212e-03	2.7137e-03	-1.0765	0.28172	
GIEI_Travel	1.0034e-03	5.5576e-03	0.1805	0.85673	
GIEI_Fashion	2.3518e-02	3.5249e-03	6.6721	2.522e-11	***
GIEI_Media	-1.1736e-02	-1.1736e-02	-1.6554	0.09785	.
GIEI_Pharma	1.1662e-02	8.4646e-03	1.3778	0.16828	

Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: Author, 2022 (processed).

Furthermore, the results of REM modeling are shown in Table 5. At a 95% confidence level, the Forest Area and Muslim Modest Fashion sector have a significantly positive effect on GGI. Meanwhile GDP per capita has a negative effect on GGI. Furthermore, at a 90% confidence level, the Islamic-Themed Media and Recreation sector negatively affects the achievements of GGI.

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This REM model is significant simultaneously based on a Chi-square value of 74.6571. The resulting Adjusted R-Square value indicates that the independent variables in this model have represented 47.99% of the variances of GGI.

To perform a panel data regression, we are required to choose a suitable model between the CEM, FEM, and REM. To get the best model, several tests were carried out including the Chow test, Hausman test, and BP-LM test. The full test results are in Table 6. On Chow test, the result shows that FEM is better than CEM with the probability (p-Value) of the test is less than α in many confidence levels up to 99%. On Hausman test, a decision was obtained to fail to reject the null hypothesis. This means that REM is a better model than FEM.

Table 6 Serial test for the search for the best model

Test	H-alternative	Statistics	df	p-Value	
Chow Test	Significant individual effects (FEM)	F = 112.61	df1 = 9 df2 = 49	< 2.2e-16	***
Hausman Test	one model is inconsistent (FEM)	Chi sq = 4.1902	df = 11	0.964	
BP-LM Test	significant effects (REM)	Chi sq = 108.6	df = 1	2.2e-16	***

Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: Author, 2022 (processed).

On the BP-LM test, the probability (p-Value) shows the decision to reject null hypothesis. This means that the REM is a better model than the CEM. Based on the three tests that have been carried out, it can be concluded that the REM is the best model compared to the other two models: the CEM and the FEM. So that the Random Effect Model with Generalized Least Square will be used to answer the objectives in this study. The results of the estimated model to be used are as follows:

$$\widehat{GGI}_{it} = 0.44543^* + 0.2133 Forest_{it}^* + (7.4042 \times 10^{-10}) Population_{it}$$
$$- (6,4581 \times 10^{-4}) Energy\_Capita_{it} - (6.7324 \times 10^{-3}) Trade\_GDP_{it}$$
$$- (1.9546 \times 10^{-4}) GDP\_Capita_{it}^* + (4.6459 \times 10^{-3}) GIEI\_Food_{it}$$
$$- (2.9212 \times 10^{-3}) GIEI\_Finance_{it} + (1.0034 \times 10^{-3}) GIEI\_Travel_{it}$$
$$+ 0.023518 GIEI\_Fashion_{it}^* - 0.011736 GIEI\_Media_{it}$$
$$+ 0.01162 GIEI\_Pharma_{it} + (u_i + v_{it}) \tag{12}$$

The estimation result of this chosen model shows an adjusted R-Square value of 0.4798 which means that all independent variables in this model can explain the variance in the Green Growth Index of 47.98% and the rest can be explained by other variables outside the model, in the future research with more comprehensive point of view. Classical assumption tests of regression performed on this model include normality and multicollinearity. Based on the results of the Anderson-Darling normality test, it was obtained that the residual has followed the normal distribution. Meanwhile, the VIFs scores of independent variables in the study have also shown the absence of multicollinearity problems.

Based on the estimated model, all variables in this study simultaneously have a significant effect on the GGI. Partially, only one sector of the Islamic economy has a significant effect on the achievement of the GGI at 95% confidence level which used in this study. It is The Muslim Modest Fashion sector which has a significant positive effect on GGI. Based on the results of model estimates, an increase of 1 point of the Muslim Modest Fashion Sector Indicator score, can increase 0.024 of GGI score, only if there is no change in the value of the other independent variables (ceteris paribus). Later, Muslim fashion has indeed grown to a global level, with the development of the internet and technology that play a vital role in spreading fashions between different parts of the Islamic world (Akou, 2007).

According to Razzaq et al. (2018), the current fashion-conscious Muslim consumer is also environmentally conscious, and during the purchase of their clothes, they sought the green-attributed and sustainable policies based on which the cloth has been manufactured. This sense becomes stronger at the young age group. This is likely to make the development of the Muslim fashion sector

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grow in line with sustainability programs. In general, the performance of this sector is also quite brilliant.

Based on the State Global Islamic Report 2022, when Covid-19 caused a decrease in global consumer spending in the fashion industry to -6.3%, the number of Muslim spending in the Muslim modest fashion sector increased by 1%. With the changing consumer behavior during the pandemic, brands are focusing more on ethical and sustainable sourcing for production.

The potential of sustainable fashion in the Muslim Modest Fashion sector should be put to good use, considering that this sector is the only one that has experienced a trade balance surplus (export-import) of OIC countries reaching more than 40 billion US$. With the changing consumer behavior during the pandemic, brands are focusing more on ethical and sustainable sourcing for production. The potential of sustainable fashion in the Muslim Modest Fashion sector should be put to good use, considering that this sector is the only one that has experienced a trade balance surplus (export-import) of OIC countries reaching more than 40 billion US$.

Another variable that significantly affects GGI is the forest area variable as a control variable. Meanwhile, economic developments approached by GDP per capita has significantly negative effect GGI. An increase of 1000 US$ of GDP value per capita can lead to a fall in the GGI score value of 0.19546 (ceteris paribus). One of the important factors that make economic development hinder Green Growth is the large need for energy to support economic activities. The ten countries covered by the study have not over-used renewable energy that is more environmentally friendly. Six countries even show that their renewable energy consumption is less than 1% of their total energy consumption. This is especially the case in Middle Eastern countries with high oil reserves, as non-renewable energy still dominates the total energy mix of these countries (Nathaniel et al., 2020).

Due to the limited scope of statistics modeling in this study only on the of major Islamic economic countries, a comparison of the GGI score of OIC (Organization of Islamic Cooperation) countries with non-OIC countries was carried out using 2020 data. The aim is to comprehensively describe the achievements of Islamic countries—which are more closely related to Islamic economics—in their effort to achieve sustainability through green growth. On average, the GGI achievement of OIC countries is 47.95, or 11.72 points lower than the achievement of non-OIC countries. At the 95% confidence level, this difference can be said to be statistically significant. This shows that the achievements of GGI of OIC countries not as good as the achievements of non-OIC countries.

Table 7 Pooled 2-sample t-test

	OIC Countries	Non-OIC Countries
Mean	47.95519	59.68228
Variance	52.57851	90.11853
Observation	27	92
Normality Test	Normal	Normal
Hypothized Mean Difference	0	
df	117	
t-stat	-5.9249	
P(≤t) two-tail	$3.217 \times 10^{-8}*$	

Source: Author, 2022 (processed)

Although the Islamic economy has a positive and quite good association with green growth, the achievements of Islamic countries in general have not been good enough with green growth. Apart from the constraints of the landscape in the form of deserts owned by most OIC countries as explained in the previous section, an Islamic economy that holds the principles of sustainability and environmentally friendly should be able to be the key to the success of the Islamic state in running a green economy. But it clearly stated by Vaghefi et al. (2015), multilayer problems that create a hard situation to implement green economy in most of Islamic countries are weak management, increasing poverty, many local and border conflicts, high economic dependency on natural resources, and increasing food insecurity.

In fact, the relationship between Muslims and the environment is clearly conveyed in many parts of the teachings and guidelines including the Qur'an. Islam educates every Muslim to interact well with the surrounding environment (Murtadha, 2007). In a broader context, as mentioned in a sahih Hadith by Muslims from Shahad ibn Aus, that the Prophet Muhammad SAW said: "*Verily Allah obliges to do good to all things*". The meaning of this hadith certainly includes the natural environment and its entirety, which is the basis for humans to carry out their various activities on earth.

CONCLUSION

The purpose of this study was answered using descriptive analysis methods and statistical inference. In the ranks of major Islamic economic countries, Malaysia and Indonesia can become a new epicenter of Islamic economic development in the Southeast Asian region, to break up the concentration in the Middle East region. Moreover, the GGI scores of these two countries are much better than other major countries of the Islamic economy.

Based on the Pearson correlation test, it was obtained that the correlation between GGI and the Global Islamic Economy Indicator (GIEI) in general is positively associated. Muslim-friendly Travel sector has the strongest correlation, reached 0.64. This shows that GGI's achievements are in line with the development of this sector. Panel Regression Modeling was then carried out to determine the influence of the Islamic economic sectors on GGI. The best model selected is the Random Effect Model with the Generalized Least Square estimation method. Based on the estimated model, all variables in this study simultaneously have a significant effect on the GGI.

Partially, Muslim Modest Fashion sector of the Islamic economy significantly has a positive effect on GGI's achievements. In addition to this sector being indeed grown to a global level, this is due to changes in the behavior of Muslim consumers who currently are more environmentally conscious. This shift in the behavior of Muslim consumers can be a potential to make this sector focus on sustainable Muslim fashion. Industry players in the Muslim Modest Fashion sector can start using the concept of sustainability in their production and emphasize this movement at every promotional opportunity. This is expected to meet the high demand in the future.

Unfortunately, in general, the GGI achievements of the OIC countries are still very lacking. Various multilayer socio-economic problems hinder the optimal implementation of the green economy in the OIC countries. It is the government's duty to start implementing environmentally oriented policies in all sectors of the Islamic economy inclusively, not only as an effort to preserve the environment, but as a form of worship to practice Allah's command to always protect the environment. One that can be applied is the expansion of the context of halal products which is not only limited to input materials and manufacturing processes, but also looks at the resulting impact related to their implications for environmental conservation.

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