



Exploring the Relationship between Islamic Financial Development, Energy Consumption, and Environmental Quality

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ABSTRACT

The relationship between financial development, energy consumption and the environment has been a popular topic in the last three decades. However, a minimal number of studies have been done within the Islamic finance framework despite its fifty years of establishment. This study aims to fill that gap by exploring the impact of Islamic financial development on energy consumption and environmental quality. Total financing and financial access are the two variables to represent Islamic financial advancement while millions tonnes of oil equivalent and CO₂ emission as the proxy for energy consumption and environmental quality respectively. Focusing on six world top Islamic finance countries from 2013 to 2018, the findings show that Islamic financial development contributes significantly to the increase in energy consumption and the degradation of environmental quality.

Keywords: Islamic Finance, Energy Consumption, Environmental Quality

JEL Classifications: O13, P47, Q53, Q43

1. INTRODUCTION

Energy is an essential component in supporting the lives of the people. We need the energy to produce goods and services for people's consumption. Energy is divided into renewable and non-renewable energy. Today, the world is still dependent much on the use of non-renewable energy like oil and natural gas to support life. For its limited amount and sources, and the significant role played upon human life, studies on the determinant of energy consumption, particularly non-renewable energy, have received attention from many researchers. One reason is that by understanding the factors affecting the energy demand, we will better understand how energy consumption will change towards the desired direction.

To date, many articles are showing the significant relationship between income and energy consumption in both developed and developing countries (Godil et al., 2021; Rafindadi and

Ozturk, 2017; Khan and Ozturk, 2021). However, there is no consensus among them upon the direction of the relationship. Soytas and Sari (2006), for example, investigated the relationship between income and energy consumption in G-7 countries during the period of 1960 to 2004 and found different directions of the relationship between the two. In the case of Canada, Italy, Japan and the UK, the result shows a bi-directional relationship while with France and US; the direction is from energy consumption to income. However, in Germany, the order of the relationship is from income to energy consumption.

As for some Asian countries, Asafu-Adjaye (2000) examined the relationship between energy consumption and income for India, Indonesia, the Philippines, and Thailand using annual data covering the period 1971-1995. The results have shown that a unidirectional relationship between energy consumption and income appeared for India and Indonesia, while a bi-directional relationship was evidenced for the Philippines and Thailand. Other

studies that focused on the relationship between income and energy consumption such as Lee (2006) in the G-11 countries and Fuinhas and Marques (2012) in selected European countries also evidenced different relationship directions for the countries investigated.

Another interesting variable that potentially influences energy consumption is financial development. Financial development which refers to activities such as foreign direct investment as well as banking and stock market activities presents a potential opportunity to stimulate growth in the economy and eventually affects the energy demand. Studies like Karanfil (2009) and Sadorsky (2010) have provided evidence of how financial variables such as foreign direct investment, stock market capitalisation, and banking development can be a good predictor for energy consumption.

In addition, many studies have concluded that financial development is also a significant predictor of environmental quality. For example, Raghutla and Chittedi (2021) studied the impact of financial development upon CO₂ emission in five emerging economies, i.e. Brazil, Russia, India, China and South Africa and used balanced panel data for the period between 1998 and 2016. The study confirmed that financial development helps reduce carbon (CO₂) emissions and ensure an improved environmental quality in the long run. On the other hand, Sehrawat et al. (2015) investigated the same variables in the context of India using data span from 1971 to 2011. The study has confirmed that financial development appears to increase environmental degradation in India.

However, existing studies talk about the impact of financial developments upon energy consumption and environmental quality are within the conventional finance framework. A very limited number of studies are done within the Islamic finance framework. Hence, by focusing on six world top Islamic finance countries, this study aims to explore the impact of Islamic financial development on energy consumption and environmental quality. We structure the rest of the paper as follows. Section two discusses the rationale behind the topic and the existing literature on related issues. Data and methods of analysis are elaborated in section three. Section four and five presented the findings and discussion, and conclusion respectively.

2. LITERATURE REVIEW

In the last two decades, study about the financial deepening–growth nexus has received much attention from economists and finance experts. Out of hundreds of research done in many countries for many time-period variations, the relationships between financial development and economic growth can be categorised into three which are supply leading, demand-following, and bi-directional causal relationships. According to Patrick (1966), the supply leading theory leads the financial system to be more efficient in capital allocation and provide growth incentives. Meanwhile, Hermes and Lensink (1996) described the demand-following theory as a continuous widening of markets and product differentiation which requires improvement in financial sectors, especially in the form of diversifying the risks and improving the control upon transaction cost. In the situation of bi-directional

relationship exists, finance plays its role as an effective financial intermediary that facilitates the transmission of funds from surplus side to deficit side to stimulate economic growth and at the same time, growth propels more development in the financial sector (Abduh and Omar, 2013). Hence, regardless of the direction of the relationship between finance and growth, all studies evidenced that financial development is one of the essential components for the economy to grow.

In a typical scenario, when the economy is growing and the volume of production increases, manufacturers run at their maximum capacity or even more to produce, which requires more energy from electricity, water, and petroleum. Hence, there is a link between financial development and energy consumption. About the relationship between financial development and energy consumption, using a sample of 22 emerging countries, Sadorsky (2010) found that financial development impacts energy consumption positively when it is measured using stock market variables. Sadorsky (2011) expanded the earlier study to 9 Central and Eastern European frontier economies and utilised more proxies for financial development. The conclusion has shown that financial development has a significant and positive impact on energy consumption.

Another challenge from the improved production level, resulting from the advancement of finance and the growing economy, is a damaged environment or increase in pollution level; air, water, and land, due to the industrial waste. He et al. (2014) investigated the long-run cointegration between energy consumption, economic growth and environment in China using data period of 1983–2010. Empirical results have shown that energy consumption, economic growth, and environmental pollution are cointegrated in the long run. However, the causality test indicated economic growth as the cause for energy consumption and environmental pollution, while bidirectional causality happened between energy. Cetin and Bakirtas (2019) studied the long-term interactions between carbon dioxide (CO₂) emissions, real gross domestic product, fossil fuel consumption, and financial development. The findings reveal that fossil fuel energy consumption has a significant negative impact on the environmental quality.

One of the reasons that these happened is because other than maximising profit, there are no obligations in conventional finance to put certain conditions such as preserving the environment and saving the energy and natural resources from the projects they have selected. Only recently some of them are promoting environment-friendly or green finance. Islamic finance, on the other hand, has an obligation to observe the objectives of shariah i.e. preservation of life, including preserving the environment and saving the energy and natural resources, to ensure that the life of our next generation is unharmed from unwanted disaster due to our negligence.

3. DATA AND METHOD OF ANALYSIS

3.1. Data

Data for this study are obtained from reports provided by various organisations' database. Islamic banking total financing and

financial access are proxies for Islamic financial development. The total financing is obtained from Islamic Financial Services Board (IFSB) database while the authors calculate financial access by using the number of Automated Teller Machine per 100,000 population in the country. The World Bank database is used to collect the data for CO₂ emission and total population, and the enerdata database contains the data of energy consumption (millions tonnes of oil equivalent). Due to some data availability issues, this study uses six world top Islamic finance countries as its focus: Indonesia, Kuwait, Malaysia, Saudi Arabia, Turkey, and United Arab Emirates. The period is from 2013 to 2018.

3.2. Method of Analysis

Yaffee (2003) mentioned that panel data analysis is usually used when studying a particular subject within multiple sites that is periodically observed over a defined time frame. The data are combined between time series and cross-sectional. According to Gujarati (2003), the mixture of time series with cross-sections could improve the quality and quantity of the data as compared to if only using either time-series or cross-sectional. Panel data analysis allows the researcher to explore the dynamics of change within the time series through the repeated observations of the cross-sections. The constant coefficients, fixed, and random effects models are the three types of panel data models generally used by researchers.

In panel data analysis, fixed-effects regressions and random effects regression are the two main methods in fitting the models. Dougherty (2007) explained that the random-effects model is more attractive because observed characteristics that remain constant for each individual are retained in the regression model. However, in fixed-effects model, they must be dropped. Furthermore, as opposed to the fixed-effects model, the n degrees of freedom are not dropped with random effects. The data can be pooled and run an ordinary least squares regression with neither significant country nor significant temporal effects. This study tests the relationship between Islamic financial development with energy consumption and environmental quality described earlier, and the following is the estimated linear regression model:

$$y_{ijt} = \delta_t + \alpha_{jt} lfin_{jt} + \beta_{jt} lfa_{jt} + \gamma_{jt} Growth_{jt} + \varepsilon_j \quad (1)$$

where i refers to dependent variable, j refers to country, and t refers to year; i equals to 1 refers to the CO₂ emission and i equals to 2 refers to energy use (millions tonnes of oil equivalent). Variable $lfin$ is total financing; lfa is Islamic financial access within the country; and $Growth$ is the GDP growth per-capita.

4. RESULTS AND DISCUSSION

4.1. Descriptive Analysis

This study uses carbon dioxide (CO₂) emission and millions tonnes of oil equivalent (mtoe) as the dependent variables. The World bank database defines carbon dioxide emissions as those stemming from the burning of fossil fuels and cement manufacture. The data include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. The unit of measurement used for CO₂ emission is kiloton. Meanwhile the enerdata database

explains that the tonnes of oil equivalent (toe) is used to describe large amounts of oil or natural gas in transport or consumption. The unit of measurement used for toe is millions tonnes (mtoe). Table 1 shows that Saudi Arabia and Indonesia are the top two CO₂ emission producers and energy consumers, followed by Turkey, Malaysia, UAE, and Kuwait.

The first and second independent variables are the total financing from Islamic banking and the Islamic financial access. These two variables are the proxies for Islamic financial development used in this study. With regard to the financial access, Malaysia is the highest for the ratio of total number ATM per 100,000 population with 10.49 ATM. This shows that the people in Malaysia have relatively better access to Islamic finance than other countries in this study. Meanwhile, GDP per capita growth, which is defined as the annual percentage growth rate of GDP per capita based on constant local currency, is used as a controlling variable. Table 1 shows that Indonesia, Turkey, and Malaysia are the three countries with the highest average of GDP per capita growth from 2013 to 2018.

4.2. Panel Data Analysis

Table 2 depicts the regression model under the framework of fixed effects and random effects panel data analysis for the energy consumption (millions tonnes of oil equivalent/mtoe) as the dependent variable. It can be seen from the table that the increment in growth per capita and providing greater access to Islamic financial services does not significantly affect energy consumption. However, the increase in total financing provided by Islamic financial institutions significantly affects the consumption level of energy. Table 3 shows the regression model under both frameworks of fixed effects and random effects panel data analysis for the environmental quality (CO₂ emission) as the dependent variable.

Similar to the previous table, the results in Table 3 revealed that income growth and Islamic financial access had no significant effect on CO₂ emission. However, Islamic financial development, proxied by total financing by Islamic financial institutions, has a positive and significant impact on CO₂ emissions.

5. DISCUSSION

Studies have shown that Islamic finance advancement in many countries has positively and significantly impacted economic growth (Abduh and Omar, 2012; Boukhatem and Ben Moussa, 2018; Caporale and Helmi, 2018). With its tiny market share, compared to conventional finance, the significant contribution of Islamic finance towards economic growth can be attributed to its unique feature: avoiding speculative transactions and providing financing only to projects directly linked to real economic activities. This is to improve the allocation of resources in the economy and boost sustainable growth.

As a religion-based finance, Islamic finance is tied up with the law derived from Al-Qur'an and the traditions of the Prophet p.b.u.h. Hence, Islamic financial contracts are by default environment friendly. The contracts, between Islamic financial institutions

Table 1: Six years average (2013-2018) of the value of the observed variables

Country	CO ₂ Emission	Millions Tonnes of Oil Equivalent	GDP Per-capita Growth	Total Financing by Islamic Banks	Number of ATM per 100,000 population
Indonesia	507,703.33	211.5	3.82	168,124.97	1.59
Kuwait	87,656.67	32.33	-3.19	17,528.22	5.81
Malaysia	229,200.00	88.00	3.72	411,394.98	10.49
Saudi Arabia	534,895.00	209.83	-0.14	365,446.57	3.43
Turkey	368,976.67	131.83	3.84	136,732.18	1.94
UAE	194,998.33	75.50	2.62	302,878.58	3.74

Table 2: Summary of the panel data analysis for energy consumption

Fixed Effects (FE)						Hausman Test
<i>y=lmtoe</i>	Coef.	Std.Error	t	P> t	Prob>F	
<i>Growth</i>	0.0053111	0.00584	0.91	0.371	0.0000	Prob> χ^2 =0.2247 ^a
<i>lfin</i>	0.2808803	0.0505935	5.55	0.000		
<i>lfa</i>	0.0706384	0.2224592	0.32	0.753		
<i>cons</i>	1.174869	0.7368202	1.59	0.122		
Random Effects						Hausman Test
<i>y=lmtoe</i>	Coef.	Std.Error	z	P> z	Prob> χ^2	
<i>Growth</i>	0.0063437	0.0058673	1.08	0.280	0.0000	Prob> χ^2 =0.2247 ^a
<i>lfin</i>	0.2770901	0.0487812	5.68	0.000		
<i>lfa</i>	-0.1662042	0.1810598	-0.92	0.359		
<i>cons</i>	1.525652	0.7023996	2.17	0.030		

The Prob> χ^2 of Breusch and Pagan Lagrangian multiplier test for random effects=0.0000^b

^aThis indicates that RE is most appropriate type of effects as compared to FE. ^bThis indicates that RE is most appropriate type of effects as compared to pooled regression

Table 3: Summary of the panel data analysis for environmental quality

Fixed Effects						Hausman Test
<i>y=lco2</i>	Coef.	Std.Error	t	P> t	Prob>F	
<i>Growth</i>	0.0006876	0.0049855	0.14	0.891	0.0000	Prob> χ^2 =0.5087 ^a
<i>lfin</i>	0.2338184	0.0431908	5.41	0.000		
<i>lfa</i>	-0.1462595	0.1899097	-0.77	0.448		
<i>cons</i>	9.893813	0.629011	15.73	0.000		
Random Effects						Hausman Test
<i>y=lco2</i>	Coef.	Std.Error	z	P> z	Prob> χ^2	
<i>Growth</i>	0.0014729	0.0049137	0.30	0.764	0.0000	Prob> χ^2 =0.5087 ^a
<i>lfin</i>	0.2357746	0.0411949	5.72	0.000		
<i>lfa</i>	-0.2755428	0.1577583	-1.75	0.081		
<i>cons</i>	10.03667	0.6036812	16.63	0.000		

The Prob> χ^2 of Breusch and Pagan Lagrangian multiplier test for random effects = 0.0000^b

^aThis indicates that RE is most appropriate type of effects as compared to FE. ^bThis indicates that RE is most appropriate type of effects as compared to pooled regression

and their customers, are to be evaluated not only from the maximisation of profit per se but also from its impacts on the environment and the society. Theoretically, Islamic finance should have a significant and positive relationship with the quality of the environment as compared to conventional finance. Referring to the objectives of shariah, Islamic financial institutions are forbidden to finance projects that would harm or cause damages towards the environment both physically such as cutting trees illegally or in protected forests, mining exploration and using machinery which may irresistibly pollute the air; and morally or socially, such as inappropriate concerts and events. By doing this, Islamic finance could preserve the environment and eventually slow down climate change better than conventional finance. However, the current practice of Islamic finance may not be in its ideal formation and implementation. Table 3 shows that Islamic financial advancement contributes significantly to the higher level of greenhouse gasses.

Despite its ability to preserve the environment, we must admit that Islamic financial development may not necessarily reduce national energy consumption. In fact, in line with the concept of energy consumption as a sign of economic growth, it does the other way around. As Islamic finance is proven in many studies to be positively and significantly drive economic growth, its development increases the level of national energy consumption (Table 2). There are several reasons to support this view. Firstly, Islamic social finance, i.e. zakat, waqf, and charity, which focused on social inclusion or providing basic (staple) foods and necessities to the poorest community, will definitely create a new demand for energy. Those poor people, who previously used less energy, now demand more such as electricity for lights and gas for cooking. . Secondly, through its financial inclusion concepts, Islamic microfinance is lifting the social status of specific communities by providing them financial aid to run their businesses under the SMEs category, which raises the demand for

energy significantly in the country. Thirdly, Islamic commercial banks via their intermediary financial function and Islamic capital markets are helping the business sector to improve their production capacity. This will obviously increase the level of national energy consumption. Therefore, concerning energy, the main issue is not how to reduce its consumption level but how to improve the efficiency of its utilisation. According to Al-Qur'an Chapter 17 (Al-Isra) verses 26 and 27, Islamic finance must promote activities that use less energy to perform similar tasks and not waste energy.

6. CONCLUSION

Establishing Islamic finance, saving the energy, and preserving the environment is obligatory in Islam. They are all commanded by God Himself as written in Al-Qur'an. Therefore, it feels not right to do one good deed as commanded by God, say practising Islamic finance, but ended up promoting prohibited actions like wasting energy and damaging the environment. After more than 50 years of the establishment of Islamic finance, study about its relationship with energy consumption and environment is still scant. This study intends to fill the gap by empirically exploring the impact of Islamic financial development on energy consumption and the environment.

The study concludes that theoretically, Islamic finance preserves the environment better than conventional finance because it is embedded in the contracts that any activities that negatively impact the environment, physically or socially, is forbidden and thus should not be funded by Islamic financial institutions. However, that is not the reality. Statistics have proven that Islamic finance's advancement still contributes significantly to the degradation of environmental quality. Regarding the energy, the rise of Islamic finance through Islamic social finance, Islamic microfinance, Islamic commercial banks, and Islamic capital markets will increase its level of consumption instead of reducing it. Nonetheless, as commanded by God in Al-Qur'an, Islamic finance must be able to promote the efficiency of energy in all projects funded.

This is among the earliest studies on this topic and thus many limitations can be observed. One of the limitations is the data coverage or scope which leads to the following limitation, i.e., the analysis method. Therefore, it is recommended for future research in this area is to use a wider scope with a longer time span of data to obtain more robust findings.

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