# The Nexus Between Financial Inclusion and Economic Growth in The Organization of Islamic Cooperation (OIC) Countries

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***Abstract***

*This study aims to examine the relationship between financial inclusion and economic growth in 22 OIC countries from 2005-2018 using a panel regression model, especially the REM model. There are three financial inclusion indicators as independent variables considered in this research: the financial inclusion index, the financial outreach index, and the financial usage index. We use GDP per capita as a proxy measure for economic growth. Using a random effect model (REM), our empirical results show that financial inclusion positively and significantly affects national economic growth in OIC countries. It is proven by all the proxy variables of financial inclusion, i.e., the financial inclusion index, financial outreach index, and financial usage index, positively correlate with the GDP per capita as a proxy for national economic growth. Other empirical results from control variables show that inflation is found significant to decrease OIC's economic growth. Trade also has significant effects on economic growth in OIC countries. Besides, in this study, unemployment has positively effects to increase economic growth in OIC countries. The main hypotheses in this study are accepted. Therefore, it could be concluded that financial inclusion positively contributes to increasing economic growth in Muslim countries. Furthermore, this finding will implicate the government to enhance and promote financial inclusion programs massively and provide access to financial services formally, such as insurance, saving, or credits/financing for the underprivileged community, especially for SMEs in all rural areas in OIC countries.*

***Keywords**: Financial inclusion; Financial services; Economic growth; OIC countries*
***JEL Classification:** G28, O16*

## A. INTRODUCTION

There have long been discussions in the literature about economic issues, such as low growth and inequality. Despite the constant efforts of policymakers and practitioners, they have not yet been resolved (Erlando et al., 2020). Recent literature has studied these issues and questioned why some countries are still poor while others are developing rapidly, which has raised concerns about growing inequality (Breunig & Majeed, 2020). For example, some countries of the Organization of Islamic Cooperation (OIC) have witnessed tremendous growth, and the level of poverty in these countries is significantly more moderate compared to other OIC countries with similar income (Slesman et al., 2015). For this reason, economic scholars believe that economic integration within finance, especially financial inclusion, will help fill these gaps and reduce income inequalities (Huang et al., 2021).

Financial inclusion has been recognized as the main engine of economic growth and an excellent tool for eradicating poverty and the gap between rich and poor (Haini, 2021; Sethi & Acharya, 2018). It has appeal to significant attention from the government, practitioners, and scholars. Financial inclusion is usually explained as the process of assuring that vulnerable groups

(such as low-income and disadvantaged groups) obtain timely financial services and sufficient credit when needed at an affordable cost (Vo et al., 2020).

Related to financial inclusion, based on the 2011 Global Partnership for Financial Inclusion and the 2013 Population Reference Bureau report, more than 2.5 billion people were denied access to financial services, and about 30% of the world's population was denied economically and financially (Kim et al., 2018). Evidence from developing countries shows that half of the population officially lacks access to financial services (Gitaharie et al., 2017), and according to Demirguc-Kunt et al. (2018), an estimated 1.7 billion adults in 2017 had no access to financial transaction accounts. It is confirmed that most of the population excluded from the financial system cannot obtain accounts or find accounts suitable for their low-income lifestyle. Therefore, the financial inclusion literature emphasizes the significance of a comprehensive financial system because, over time, finance can help improve income distribution and reduce poverty, thereby promoting economic growth (Haini, 2021).

Over time, the role of financial access on economic growth became one of the widely researched topics. Several previous and recent studies have found that financial inclusion positively affects economic growth (Haini, 2021; Huang et al., 2021; Kim et al., 2018; Sethi & Acharya, 2018; Sharma, 2016). However, there is limited literature investigating the nexus empirically between financial inclusion especially using the financial inclusion index and economic growth in OIC countries. For instance, Kim et al. (2018) suggested for future researchers to attempt use the financial inclusion index for financial inclusion measurement. Therefore, this study fills the gap by employing the current financial inclusion index, including the financial outreach index and financial usage index from Gutiérrez-Romero & Ahamed (2021). The following is data on the development of financial inclusion indicator data from several OIC countries.

Figure 1 shows that Turkey, Malaysia, Brunei Darussalam, Indonesia, Azerbaijan, Albania, and Saudi Arabia have FUI, FOI, and FII data that are quite high compared to other OIC countries, such as Chad, Comoros, and Guinea, which are below 0.05. This means that in OIC countries there are still problems related to access to formal finance.

This research mainly aims to focus on determining whether financial inclusion plays a role in promoting economic growth in OIC Countries by employing the financial inclusion index, financial outreach index, and financial usage index. We pay attention to these countries because they have similar religious beliefs and cultures, primarily in the Middle East and Africa, and their institutional quality and development experience vary greatly. Besides, these countries often encounter internal, ethnic, and religious, and external conflicts, which hinder economic development. Such an environment is not conducive to the vigorous development of productive investment (Slesman et al., 2015). Accordingly, this group of countries presents an uncommon sample for evaluating the relative impact of different institutional sizes on financial inclusion and economic growth. Besides, considering the OIC is an appropriate choice because it provides an ideal platform for studying the proposed research topic. In this study, we focus on a panel of 22 OIC countries over the period 2005–2018.

This study contributes to the financial inclusion literature by adding specific evidence on the nexus between financial inclusion and economic growth in OIC countries, employing three financial inclusion indexes with the most up-to-date dataset. Understanding the link between financial inclusion and economic growth at the country level will help policymakers to persevere policies that will permit them to accomplish the ultimate outcomes from financial supervision and financial inclusion, especially by designing and

implementing programs that will widen access to financial services, leading to reduction of the poverty rate and income equality.

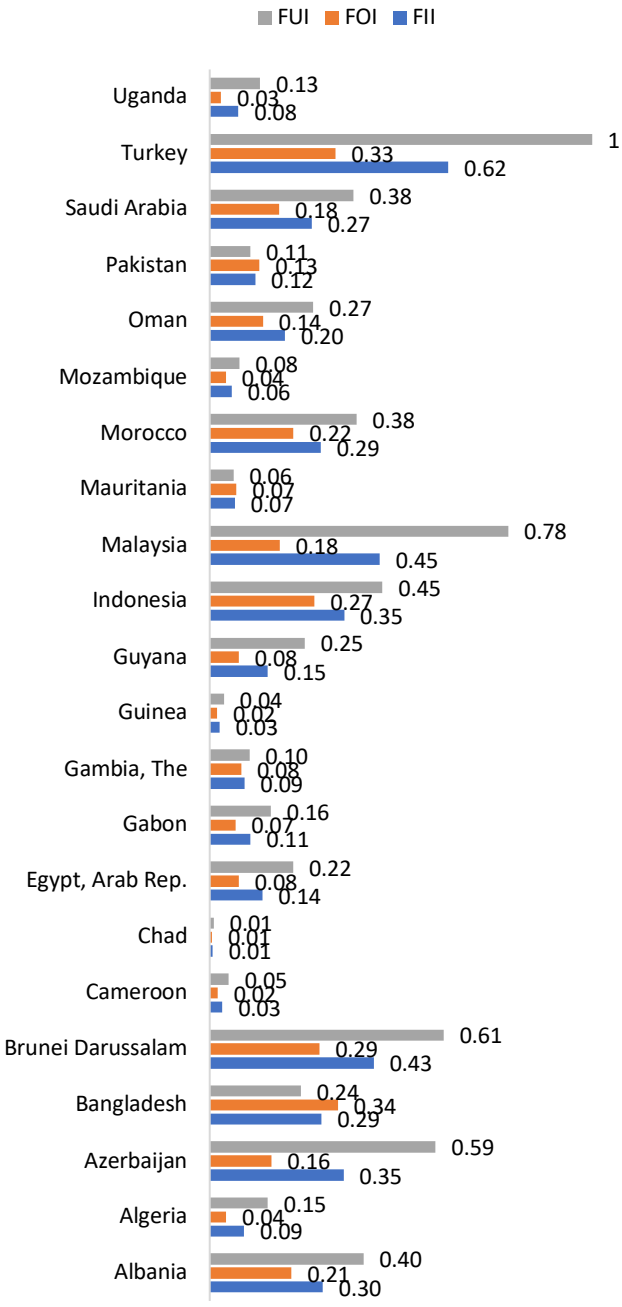


**Figure 1**. The Development of the Latest Financial Inclusion Data for OIC Countries

The paper is organized as follows: Section 2 provides a literature review. Section 3 describes the data and methodology. In section 4, we present and discuss the results of the empirical study. Section 5 presents the conclusions and policy implications of the paper.

## B. LITERATURE REVIEW

### Financial Inclusion

Financial inclusion is one of the nine critical pillars of the global development agenda to improve individuals' socio-economic (Nguyen, 2020; Ozili, 2020). It is a process that assists in removing specific social groups and individual barriers, including the poor and those with disadvantaged access to safe, fair, and low-cost formal financial services (Haini, 2021). The Global Partnership for Financial Inclusion (GPFI) defines financial inclusion: as "where all adults of working age have adequate access to credit, savings, payments, and insurance from formal service providers. Effective access involves convenient and responsible service delivery at an affordable cost for the customer and sustainable for the provider so that financially excluded customers use formal financial services rather than the informal options available" (Anwar et al., 2016).

The literature generally acknowledges that financial inclusion defined as "increasing the poor's access to financial services is one effective tool that can assist in reducing poverty and lower-income inequality" (Williams et al., 2017). In summary, financial inclusion implies that all people are granted access to and use financial services from formal financial institutions in a timely, designed based on their needs and provided at affordable costs, especially for the financially disadvantaged group (Evans, 2018; Jouti, 2018; Le et al., 2019; Raza et al., 2019; Sethi & Acharya, 2018). Financial inclusion focused on improving credit channels and expanded access to financial services such as savings, insurance, and mobile banking (Gutiérrez-Romero & Ahamed, 2021).

### Relationship between Financial Inclusion and Economic Growth

Financial inclusion assures usage, ease of access, and availability of the range of formal financial instruments for all economic members and has been acknowledged as a vital economic growth engine (Haini, 2021). Sethi & Acharya (2018) illustrate how financial inclusion contributes to economic growth in two extensive steps. First, the living standard of the poor can be improved through access to low and affordable financial services. It is because low-cost credit has developed into a low-income country, and disadvantaged groups have initiated systematic production projects in rural areas, leading to more output production. This added value on the ground contributes to the growth of state and national output, leading to high growth at the macro level. This has led to an increase in the income level of these people, thereby improving the living standards of these disadvantaged groups. In this way, while promoting economic growth, financial inclusion also addresses rural areas' poverty.

Second, marginalized people generally used deposits and insurance products to raise funds in the financial market. It can help people store their savings in the financial system, and then the financial market can ensure that the allocation of these funds is effective for long-term investment projects. In this way, the financial market can ensure liquidity risks caused by insufficient capital inflows into the market and encourage more investment. This process also leads to more output and employment, which leads to an enhancement in the income of distribution and the poor's income (Sethi & Acharya, 2018).

In several empirical studies, the linkages between financial inclusion and economic growth have been conducted. The recent study conducted by Huang et al. (2021) examines whether financial inclusion could promote economic development by covering 27 European Union (EU) nations. The results show that financial inclusion significantly and positively affects economic growth across EU nations. Besides, Gutiérrez-Romero & Ahamed (2021) decompose the financial inclusion index into financial outreach and financial usage to determine the most significant contribution to improving inclusiveness in reducing poverty. They used cross-country data from 79 low- and middle-income countries. Their results show that financial inclusion, especially financial outreach, is the main driving force for poverty reduction in these countries and indirectly impacts.

Similarly, a study by Haini (2021) covered 51 low- and lower-middle-income countries for 21 years, investigating the financial institution's access and depth effect on economic growth. Their empirical result shows that both financial access and financial depth have a positive effect on growth. It also suggests the significance of developing inclusive financial systems that emphasize quality rather than quantity in promoting economic growth. A study on Pakistan during 2010-2015 by Raza et al. (2019) and across 31 (developed and developing) countries globally by Sethi & Acharya (2018) also found a positive relationship between financial inclusion and economic growth.

Another study by Kim et al. (2018) investigates the nexus between financial inclusion and economic growth in the Organization of Islamic Cooperation (OIC) countries. Measuring financial inclusion with several variables to represent financial inclusion using Arrelano-Bond GMM estimation methods, the study found that financial inclusion has a positive contribution to economic growth in OIC countries. Also, Sharma (2016) investigates the linkage between the vast dimensions of financial inclusion and the emerging Indian economy's economic growth for the period 2004-2013. The variables used the three dimensions of financial inclusion used in this study: banking penetration, availability of banking services, and usage of banking services in terms of deposits. The result concludes that financial inclusion positively affects economic growth.

**Relationship between Macroeconomic and Economic Growth**

According to Mohseni & Jouzaryan (2016), the concepts of inflation and unemployment in the economy must be determined and explained in order to make economic decisions. Inflation refers to the continuous increase in the overall price level. Structuralists and monetarists have conducted extensive research and discussion on this issue. Structuralists believe that inflation is necessary for economic growth, while monetarists believe that inflation is harmful to economic growth (Adrián Risso & Sánchez Carrera, 2009). Inflation can affect all aspects of a country by affecting economic growth, employment, investment, income and wealth distribution, and even social and political conditions (Mohseni & Jouzaryan, 2016).

Many empirical studies have aimed to examine the role of macroeconomics, particularly inflation and unemployment to economic growth. Lubis (2020) empirically test the relationship between the level of inflation and economic growth in Indonesia during 1968-2012. Where Consumer Price Index (CPI) is proxied by the inflation variable and the Gross Domestic Product (GDP) is proxied by economic growth. Using the Error Correction Model (ECM) model to find Correlation and Short-run as well as Long-run, the findings of this study indicate that both inflation and economic growth have a correlation. Additionally, the author finds that inflation has a short-run and long-run significant relationship via the probability value of inflation and economic growth.

Panigrahi et al. (2020) also examined the long-run relationship between interest, unemployment, and inflation rates and economic growth in 5 countries in ASEAN. Panel data from 1995 to 2018 was collected from the World Bank.

The findings of this study show that there is a strong long-run dynamic link between interest rates and the inflation rate and economic growth, but the link between the unemployment rate and economic growth is insignificant. Granger's causality test shows that interest rates, unemployment rates, and inflation rates are related to economic growth. Besides, Mohseni & Jouzaryan (2016) employ the Autoregressive Distributed Lag (ARDL) model to investigate and test the impact of inflation and unemployment on economic growth in the short-term and long-term periods from 1996 to 2012 in Iran. The results show that in the long run, inflation and unemployment have a significant negative impact on economic growth, which indicates that inflation and unemployment have reduced economic growth.

**Research Framework and Hypothesis Development**

Based on the relevant theoretical and empirical literature, the research framework is illustrated in **Figure 2.** It is hypothesized that financial inclusion has positive impacts on economic growth in OIC countries. Therefore, the following three main hypotheses are developed and tested in this study:

*H1. The financial inclusion index positively affects the economic growth in OIC countries.*
*H2. The financial outreach index positively affects the economic growth in OIC countries.*
*H3. The financial usage index positively affects the economic growth in OIC countries.*

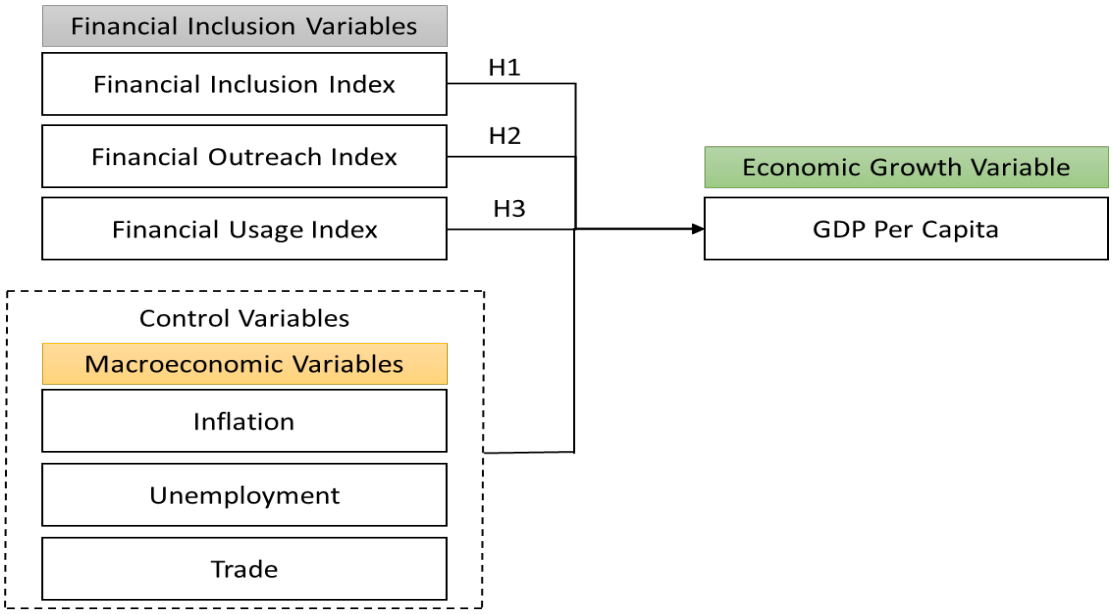


**Figure 2**. Research Framework

## C. DATA AND METHODOLOGY

### Data and Sources

The study uses data from 22 OIC countries (See **Table 1**) for the period 2005 to 2018. The sample only covers 22 out of 57 OIC countries. This is because there are much incomplete data on 57 OIC countries. The data used in this study is secondary data collected from Gutiérrez-Romero & Ahamed (2021) and the World Development Indicator of Bank (https://databank.worldbank.org).

**Table 1**. The selected OIC countries based on geographic regions and income group

| No. | Country | Region | Income Group |
|---|---|---|---|
| 1 | Albania | Europe & Central Asia | Upper middle income |
| 2 | Algeria | Middle East & North Africa | Upper middle income |
| 3 | Azerbaijan | Europe & Central Asia | Upper middle income |
| 4 | Bangladesh | South Asia | Lower middle income |
| 5 | Brunei Darussalam | East Asia & Pacific | High income |
| 6 | Cameroon | Sub-Saharan Africa | Lower middle income |
| 7 | Chad | Sub-Saharan Africa | Low income |
| 8 | Egypt | Middle East & North Africa | Lower middle income |
| 9 | Gabon | Sub-Saharan Africa | Upper middle income |
| 10 | Guinea | Sub-Saharan Africa | Low income |
| 11 | Guyana | Latin America & Caribbean | Upper middle income |
| 12 | Indonesia | East Asia & Pacific | Lower middle income |
| 13 | Malaysia | East Asia & Pacific | Upper middle income |
| 14 | Marocco | Middle East & North Africa | Lower middle income |
| 15 | Mauritania | Sub-Saharan Africa | Lower middle income |
| 16 | Mozambique | Sub-Saharan Africa | Low income |

| No. | Country | Region | Income Group |
|---|---|---|---|
| 17 | Oman | Middle East & North Africa | High income |
| 18 | Pakistan | South Asia | Lower middle income |
| 19 | Saudi Arabia | Middle East & North Africa | High income |
| 20 | The Gambia | Sub-Saharan Africa | Low income |
| 21 | Turkey | Europe & Central Asia | Upper middle income |
| 22 | Uganda | Sub-Saharan Africa | Low income |

**a. Variables Selection**

The selection of the variables is summarized in **Table 2**.

**Dependent Variable**

GDP per capita (constant 2010) US dollars is the dependent variable. Many researchers used this variable for a proxy national economic growth, such as Chikalipah (2017); Hajilee et al. (2017); Kim et al. (2018); Sehrawat & Giri (2016); Sethi & Acharya (2018); Sharma (2016), and so on.

**Table 2.** Data and Variable Selection

| Variable | Definition | Sources |
|---|---|---|
| **Dependent Variable** | | |
| *Economic Growth | GDP per capita (constant 2010) | World Bank |
| **Independent Variables** | | |
| Financial Inclusion | Financial Inclusion Index<br>Financial Outreach Index<br>Financial Usage Index | Gutiérrez-Romero & Ahamed (2021) |
| **Macroeconomic Variables** | | |
| Inflation | Consumer prices (annual %) | World Bank |
| Unemployment | Unemployment rate (annual %) | World Bank |
| *Trade | Ratio of export & import services % goods (%GDP) | World Bank |

Note: *The variables of economic growth is transformed into a natural logarithm

**Independent Variables**

- *Financial Inclusion*

The measurement of financial inclusion in various measures. In this study, the authors used constructing the financial inclusion index as measured by Gutiérrez-Romero & Ahamed (2021), in which the index of financial inclusion decomposes into two sub-indices of financial outreach and financial usage. The sub-index of financial usage includes the number of bank accounts per thousand people (which is the sum of loan and deposit accounts) and is used to measure the depth of financial access. The sub-index financial outreach is used to capture demographic penetration (the number of bank branches and the number of ATMs per 100,000 people) and geographic penetration of bank branches. Gutiérrez-Romero & Ahamed (2021) developed the all-financial inclusion index through Principal Component Analysis (PCA) to weigh the financial outreach and financial usage. The following PCA equation is determined as follows:

$$Financial\ Inclusion\ Index_i = \sum_{i=1}^{n} W_{ij} X_i$$

Where:
$W_{ij}$ = the component's loadings or weights, and
$X_i$ = the dimensions of financial outreach and financial usage dimensions.

- *Macroeconomic (Control) Variables*

The authors used the unemployment rate, trade, and inflation to capture macroeconomic stability. It is because the variables have a significant impact on economic growth in OIC countries. Where unemployment rate is the percentage rate of the total labor force using the International Labor Organization (ILO) methodology. The consumer price index is used as a proxy inflation using the International Financial Statistics (IFS) database. The ratio of export & import services and goods (the percentage of GDP) is used as proxy trade.

**Econometric Model**

In this study, the empirical models are followed based on a previous study, using the financial inclusion index, financial outreach index, and financial usage index, and macroeconomics as control variables, e.g., inflation, trade, and unemployment all the variables are as the independent variables (see **Table 2**). The data are analyzed using a panel regression model (Gujarati & Porter, 2012b). The following model is as follows:

$$LogEconomicGrowth_{it} = \beta_0 + \beta_1 Financial\ Inclusion_{it} + \beta_2 Macroeconomic_{it} + \varepsilon_{it}$$

Where t = time periods, i = each country in OIC countries in the panel, $\beta_0$ = constant term; $\beta_1, \beta_2$ = the regression model when the dependent variable change will change the unit change in the independent variable; and $\varepsilon$ = error term. In the panel regression model, there are three approaches usually used, namely: Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). The Chow test and Hausman test are shown in **Table 4**, and the best model is the Random Effect Model (REM) based on the results of the Chow and Hausman test for this study.

## D. RESULTS AND DISCUSSION

**Descriptive Statistics**

The summary descriptive statistics of all variables used in this study are presented in **Table 3**. During the 14 years of 22 OIC countries, the natural log of income per capita as a proxy for economic growth has a mean of 8.0181, ranging from 5.93 to 10.53. The independent variable, the financial inclusion index, has a mean of 0.1667 and ranges from 0.00 to 0.62; the financial outreach index has an average value of 0.1131, ranging from 0.00 to 0.36. The mean of the financial usage index is 0.2356 and ranges from 0.00 to 1.00. Additionally, the macroeconomic variables are from 8.97 to 34.70 for inflation, from 0.40 to 20.46 for unemployment, and from 3.23 to 5.32, with a mean value of 5.76, 7.24, and 4.23, respective.

**Table 3.** Descriptive Statistics

| Variable | Obs. | Mean | Median | Max. | Min. | Std. Dev. |
|---|---|---|---|---|---|---|
| *Economic growth | 308 | 8.0181 | 7.9750 | 10.5300 | 5.9300 | 1.2103 |
| Financial inclusion index (FII) | 308 | 0.1667 | 0.1100 | 0.6200 | 0.0000 | 0.1512 |
| Financial outreach index (FOI) | 308 | 0.1131 | 0.0800 | 0.3600 | 0.0000 | 0.0953 |
| Financial usage index (FUI) | 308 | 0.2356 | 0.1500 | 1.0000 | 0.0000 | 0.2389 |
| Inflation | 308 | 5.5759 | 4.3300 | 34.7000 | -8.97000 | 5.2088 |
| Unemployment | 308 | 7.2381 | 5.6550 | 20.4600 | 0.4000 | 4.5905 |
| *Trade | 308 | 4.2319 | 4.3000 | 5.3200 | 3.2300 | 0.4088 |

Note: *the variables are transformed into a natural logarithm

**Empirical Results**

The panel regression results based on the balanced panel allow us to exploit cross-country and time-series variations in the data. The random-effect model (REM) shows variations in economic growth. REM approach better analysis than PLS *(Pooled Least Square)* in balanced panel data (Juanda & Junaidi, 2012). Therefore, from the results of the REM model in **Table 4**, we have three-panel regression models, namely:

a. Equation Model 1: Effect of Financial Inclusion Index (FII) on Economic Growth

$\ln EconomicGrowth_{it} = 4.1994 + 4.7757FII_{it} + 0.6534\ln Trade_{1t} - 0.0273\ln flation_{it} + 0.0566Unemployment_{it} + \varepsilon_{it}$

b. Equation Model 2: Effect of Financial Outreach Index (FOI) on Economic Growth

$\ln EconomicGrowth_{it} = 2.6935 + 6.9426FOI_{it} + 1.0026\ln Trade_{1t} - 0.0257\ln flation_{it} + 0.0607Unemployment_{it} + \varepsilon_{it}$

c. Equation Model 3: Effect of Financial Usage Index (FUI) on Economic Growth

$\ln EconomicGrowth_{it} = 4.9694 + 2.9951FUI_{it} + 0.5016\ln Trade_{1t} - 0.0319\ln flation_{it} + 0.0550Unemployment_{it} + \varepsilon_{it}$

**Partial Analysis**

Based on the three models above, all equation models can be described as follows:

- ***Financial Inclusion Variables***

1. The financial inclusion index (FII) shows the value of the coefficient of 4.7757. It means that any increase in FII of 1% will affect the increased significantly economic growth by 4.7757%, *ceteris paribus*.
2. The financial Outreach index (FOI) shows a value coefficient of 6.9426. It means that any increase in FOI of 1% will affect the increased significantly economic growth by 6.9426%, *ceteris paribus*.
3. The financial Usage index (FUI) shows the value of the coefficient of 2.9951. It means that any increase in FUI of 1 percent will affect the increased significantly economic growth by 2.9951%, *ceteris paribus*.

- ***Macroeconomic Variables***

1. Trade shows the value of the coefficient 0.6534, 1.0026, and 0.5016, respectively. The results mean that any increase in the natural logarithm of a trade by 1% will increase the economic growth from 0.50% to 1.0%, *ceteris paribus.*
2. Inflation shows the value of the coefficient -0.0273, -0.0257, and -0.0319, respectively. The results mean that any increase in inflation by 1% will decrease the economic growth from 0.02% to 0.03%, *ceteris paribus.*

Unemployment shows the value of the coefficient 0.0566, 0.0607, and 0.0550, respectively. The results mean that any increase in unemployment by 1% will decrease the economic growth from 0.05% to 0.06%, *ceteris paribus.*

**Simultanous Analysis**

Based on test F (0.000 <0.05) in an overall significant effect of independent variables on the dependent variable. Thus, financial inclusion and macroeconomic variables affect the significantly increased economic growth in 22 OIC countries.

**Table 4.** Panel Regression Model Results – REM Model

| Dependent Variables | Economic Growth | | |
|---|---|---|---|
| Independent Variables | Model (1) | Model (2) | Model (3) |
| Constant (C) | **4.1994(8.7435)*** ** | **2.6935(5.3313)*** ** | **4.9694(9.9347)*** ** |
| Financial Inclusion Index (FII) | **4.7757(15.803)*** ** | | |
| Financial Outreach Index (FOI) | | **6.9426(14.215)*** ** | |
| Financial Usage Index (FUI) | | | **2.9951(14.921)*** ** |
| Trade | **0.6534(5.8387)*** ** | **1.0026(8.7341)*** ** | **0.5016(4.2662)*** ** |
| Inflation | **-0.0273(-3.1009)*** ** | **-0.0257(-2.7763)*** ** | **-0.0319(-3.5491)*** ** |
| Unemployment | **0.0566(5.8991)*** ** | **0.0607(6.0440)*** ** | **0.0550(5.5765)*** ** |
| R-Squared | 0.6226 | 0.5866 | 0.6034 |
| Adj. R-Squared | 0.6177 | 0.5811 | 0.5982 |
| Prop. > F | 0.0000 | 0.0000 | 0.0000 |
| Chow Test | 0.9791 | 0.9797 | 0.9898 |
| Hausman Test | 0.3135 | 0.3539 | 0.4353 |

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

**The Test of Goodness of Model**

A research model's goodness was measured using a coefficient of determination (***R-Squared or $R^2$***). Overall, if it is getting closer to one, it can be said a better research model. According to Raza et al. (2019), the $R^2$ is used to examine the ability of independent variables to determine the dependent variables. The $R^2$ value above 0.5 means that the predictors can explain a significant proportion of variance in the dependent variable. T**able 4** shows that the value of the coefficient on this research model obtained is at 0.6226, 0.5866, and 0.6034, respectively, on each of the above models still relies upon. Then, the magnitude of the total effect of independent variables on the dependent variable is about 62.3%, 58.7%, and 60.3%, and the rest are influenced by other variables that are not incorporated into the models. Additionally, some of this increase in $R^2$ would be simply due to chance variation in that particular sample, and the adjusted $R^2$ attempts to yield a more honest value to estimate the $R^2$ for the population (Raza et al., 2019). Based on **Table 4**, a high value of adjusted $R^2$, which are 61.77% for model (1), 58.11% for model (2), and 59.82% for model (3), further indicates the suitability of the independent variables in predicting the economic growth as dependent variables in this study.

**The Test of Multicollinearity and Heteroskedasticity**

The multicollinearity test and heteroskedasticity test is a requirements in panel data analysis using the random-effect model (REM) by following Gujarati & Porter (2012a). The results of non-multicollinearity testing using a correlation test showed that there is no linear relationship between each independent variable, and it can be said that the assumption of non-multicollinearity on three models is good (<0.85), as shown in **Appendix 1-3**. Furthermore, the results of heteroskedasticity testing show that the probability value is greater than 5% alpha (0.05), and it can be said the regression model meets the assumption of non-heteroskedasticity as shown in **Appendix 4-6**. Therefore, based on both multicollinearity and heteroskedasticity tests, all models met the requirement in the panel regression model.

**Discussion**

This study's main objectives are to empirically examine the relationship between independent variables and dependent variables in 22 OIC countries; thus, a panel regression model is the best analytical model to test the relationships and answer H1, H2, and H3 in this research. **Table 5** summarizes the empirical results of this study. **Table 4** shows the results of the panel regression of financial inclusion on economic growth in 22 OIC countries, where financial inclusion, i.e., financial inclusion index, financial outreach index, and financial usage index, are the independent variable and the GDP per capita as a proxy national economic growth in 22 OIC countries, with inflation, unemployment rate, and trade as the control (macroeconomic) variables. This study uses control variables from macroeconomics, namely inflation, unemployment, and trade. These three macroeconomic variables are used to see the consistency of the analysis results of the three financial inclusion variables used. Based on the results of the empirical analysis, it shows that the control variable makes a significant contribution to the development of economic growth in OIC countries. The first column of **Table 4**, as the model (1), shows the panel regression results of the financial inclusion index, including inflation, unemployment, and trade on economic growth. There is a significant positive relationship between the financial inclusion index and economic growth at the 1% level.

The second column of **Table 4**, as the model (2), shows the panel regression result of the financial outreach index, inflation, unemployment, and trade on economic growth. The empirical result shows a significant positive relationship between the financial outreach index and national economic growth at the 10% level. The third column of **Table 4**, as the model (3) shows the panel regression result of the financial usage index, inflation, unemployment, and trade on economic growth. The empirical result shows a significant positive relationship between the financial usage index and national economic growth at the 1% level.

Furthermore, the macroeconomic variables in the model (1), (2), and (3) have the same results as the regression model. Trade has a positive impact on economic growth in OIC countries. However, in contrast, from this study, we find that unemployment negatively affects economic growth in OIC countries. Meanwhile, inflation has a negative effect on economic growth in OIC countries. The study's finding is in line with Kim et al. (2018); Mohseni & Jouzaryan (2016); and Panigrahi et al. (2020).

Therefore, this finding indicates that financial inclusion positively contributes to increasing economic growth in 22 OIC countries. In other words, the findings in this paper also indicate that the high level of ease of accessibility and availability of formal financial services and products, such as from many of the bank branches number and the number of ATMs, will implicate society that allows them to benefit from existing financial services and products such as saving, lending, and other. From the analysis results, we can assume that financial inclusion is an influential factor for economic growth in 22 OIC countries. Our results are also consistent with the findings of many researchers, such as Babajide et al. (2015); Haini (2021); Hanivan & Nasrudin (2019); Huang et al. (2021); Kim et al. (2018); Raza et al. (2019); Sethi & Acharya (2018); and Sharma (2016) that there is the existing relationship between levels of financial inclusion and economic growth. Finally, all the results indicate that the financial inclusion index, financial outreach index, and financial usage index positively affect the OIC countries' economic growth, supporting H1, H2, and H3 (as shown in **Table 5**).

**Table 5.** Summary of Results and Compatibility with Main Hypotheses

| No. | Hypothesis | Relationship Tested | Regression Result | Decision |
|---|---|---|---|---|
| 1 | H1 | FII → Economic Growth | (+) Significant | Supported |
| 2 | H2 | FOI → Economic Growth | (+) Significant | Supported |
| 3 | H3 | FUI → Economic Growth | (+) Significant | Supported |

## E. CONCLUSION

The results indicate that the financial inclusion index, the financial outreach index, and the financial usage index positively impact the economic growth of 22 OIC countries. In addition, from the perspective of macroeconomic variables as control variables, inflation has a significant and negative impact on economic growth. In addition, trade has a positive and significant impact on the national economic growth of 22 OIC nations. Meanwhile, unemployment has a significant and positive effect on economic growth.

The findings of the empirical study have several implications. First, we reveal that financial inclusion for all variables in this research positively contributes to economic growth in OIC countries. Therefore, the government and policymakers in OIC countries need to pay attention to and improve the Financial Inclusion Index, Financial Outreach Index, and Financial Usage Index in their respective countries. Besides, in order to increase economic growth in OIC countries, they have an essential role in enhancing banking services and products for underserved segments of the population, such as the poor, people living in remote areas, and SMEs. So, they should optimize the potential role of supporting the program, which will increase financial inclusion in society.

Second, financial institutions (including Sharia financial institutions) such as commercial banks and rural banks should provide good financial products and services, for example, increasing credit services for SMEs activities, especially after the COVID-19 pandemic in OIC countries. Last, this study's contribution is to add to the existing literature on the relationship between financial inclusion and economic growth for scholars and researchers.

This research also has existing suggestions for future research to build some models to examine the relationship of financial inclusion with economic growth by using another advanced quantitative approach, and the next researchers also can attempt to use another proxy of financial inclusion.

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## APPENDIX

### Appendix 1. The result of Correlation Test for Model FII

| | LNGDPPC | FII | INFLATION | LNTRADE | UNEMPLOY... |
|---|---|---|---|---|---|
| LNGD... | 1 | 0.70213353... | -0.3496024... | 0.42658358... | 0.31960099... |
| FII | 0.70213353... | 1 | -0.2446683... | 0.25241298... | 0.09869514... |
| INFLAT... | -0.3496024... | -0.2446683... | 1 | -0.2407083... | -0.1543567... |
| LNTRADE | 0.42658358... | 0.25241298... | -0.2407083... | 1 | 0.12611922... |
| UNEM... | 0.31960099... | 0.09869514... | -0.1543567... | 0.12611922... | 1 |

### Appendix 2. The result of Correlation Test for Model FOI

| | LNGDPPC | FOI | INFLATION | LNTRADE | UNEMPLOY... |
|---|---|---|---|---|---|
| LNGD... | 1 | 0.60365102... | -0.3496024... | 0.42658358... | 0.31960099... |
| FOI | 0.60365102... | 1 | -0.2232059... | 0.05911810... | 0.05413948... |
| INFLAT... | -0.3496024... | -0.2232059... | 1 | -0.2407083... | -0.1543567... |
| LNTRADE | 0.42658358... | 0.05911810... | -0.2407083... | 1 | 0.12611922... |
| UNEM... | 0.31960099... | 0.05413948... | -0.1543567... | 0.12611922... | 1 |

### Appendix 3. The result of Correlation Test for Model FUI

| | LNGDPPC | FUI | INFLATION | LNTRADE | UNEMPLOY... |
|---|---|---|---|---|---|
| LNGD... | 1 | 0.70443423... | -0.3496024... | 0.42658358... | 0.31960099... |
| FUI | 0.70443423... | 1 | -0.2356999... | 0.33457469... | 0.11574877... |
| INFLAT... | -0.3496024... | -0.2356999... | 1 | -0.2407083... | -0.1543567... |
| LNTRADE | 0.42658358... | 0.33457469... | -0.2407083... | 1 | 0.12611922... |
| UNEM... | 0.31960099... | 0.11574877... | -0.1543567... | 0.12611922... | 1 |

### Appendix 4. The result of Heteroskedasticity Test for Model FII

Dependent Variable: RESID01
Method: Panel EGLS (Period random effects)
Date: 05/01/21 Time: 08:02
Sample: 2005 2018
Periods included: 14
Cross-sections included: 22
Total panel (balanced) observations: 308
Swamy and Arora estimator of component variances

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| FII | -2.90E-14 | 0.302198 | -9.60E-14 | 1.0000 |
| INFLATION | 2.03E-15 | 0.008796 | 2.30E-13 | 1.0000 |
| LNTRADE | 9.98E-14 | 0.111903 | 8.92E-13 | 1.0000 |
| UNEMPLOYMENT | -7.48E-18 | 0.009599 | -7.79E-16 | 1.0000 |
| C | -4.30E-13 | 0.480289 | -8.95E-13 | 1.0000 |

| Effects Specification | S.D. | Rho |
|---|---|---|
| Period random | 0.000000 | 0.0000 |
| Idiosyncratic random | 0.758759 | 1.0000 |

| Weighted Statistics | | | |
|---|---|---|---|
| Root MSE | 0.742276 | R-squared | -0.000000 |
| Mean dependent var | -1.33E-15 | Adjusted R-squared | -0.013201 |
| S.D. dependent var | 0.743484 | S.E. of regression | 0.748375 |
| Sum squared resid | 169.6997 | F-statistic | -2.54E-14 |
| Durbin-Watson stat | 0.045349 | Prob(F-statistic) | 1.000000 |

| Unweighted Statistics | | | |
|---|---|---|---|
| R-squared | -0.000000 | Mean dependent var | -1.33E-15 |
| Sum squared resid | 169.6997 | Durbin-Watson stat | 0.045349 |

## Appendix 5. The result of Heteroskedasticity Test for Model FOI

Dependent Variable: RESID02
Method: Panel EGLS (Period random effects)
Date: 05/01/21 Time: 08:16
Sample: 2005 2018
Periods included: 14
Cross-sections included: 22
Total panel (balanced) observations: 308
Swamy and Arora estimator of component variances

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| FOI | 5.34E-14 | 0.488415 | 1.09E-13 | 1.0000 |
| INFLATION | 2.90E-15 | 0.009255 | 3.13E-13 | 1.0000 |
| LNTRADE | 1.16E-13 | 0.114792 | 1.01E-12 | 1.0000 |
| UNEMPLOYMENT | 5.30E-16 | 0.010044 | 5.28E-14 | 1.0000 |
| C | -5.17E-13 | 0.505235 | -1.02E-12 | 1.0000 |

| Effects Specification | S.D. | Rho |
|---|---|---|
| Period random | 0.000000 | 0.0000 |
| Idiosyncratic random | 0.794553 | 1.0000 |

| Weighted Statistics | | | |
|---|---|---|---|
| Root MSE | 0.776942 | R-squared | 0.000000 |
| Mean dependent var | -2.25E-15 | Adjusted R-squared | -0.013201 |
| S.D. dependent var | 0.778206 | S.E. of regression | 0.783326 |
| Sum squared resid | 185.9207 | F-statistic | 0.000000 |
| Durbin-Watson stat | 0.043626 | Prob(F-statistic) | 1.000000 |

| Unweighted Statistics | | | |
|---|---|---|---|
| R-squared | 0.000000 | Mean dependent var | -2.25E-15 |
| Sum squared resid | 185.9207 | Durbin-Watson stat | 0.043626 |

## Appendix 6. The result of Heteroskedasticity Test for Model FUI

Dependent Variable: RESID03
Method: Panel EGLS (Period random effects)
Date: 05/01/21 Time: 08:23
Sample: 2005 2018
Periods included: 14
Cross-sections included: 22
Total panel (balanced) observations: 308
Swamy and Arora estimator of component variances

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| FUI | -5.95E-14 | 0.200729 | -2.97E-13 | 1.0000 |
| INFLATION | 3.08E-15 | 0.008987 | 3.42E-13 | 1.0000 |
| LNTRADE | 1.52E-13 | 0.117579 | 1.29E-12 | 1.0000 |
| UNEMPLOYMENT | 5.00E-16 | 0.009863 | 5.07E-14 | 1.0000 |
| C | -6.54E-13 | 0.500206 | -1.31E-12 | 1.0000 |

| Effects Specification | S.D. | Rho |
|---|---|---|
| Period random | 0.000000 | 0.0000 |
| Idiosyncratic random | 0.779094 | 1.0000 |

| Weighted Statistics | | | |
|---|---|---|---|
| Root MSE | 0.760946 | R-squared | 0.000000 |
| Mean dependent var | -3.33E-15 | Adjusted R-squared | -0.013201 |
| S.D. dependent var | 0.762184 | S.E. of regression | 0.767198 |
| Sum squared resid | 178.3438 | F-statistic | 2.41E-14 |
| Durbin-Watson stat | 0.054981 | Prob(F-statistic) | 1.000000 |

| Unweighted Statistics | | | |
|---|---|---|---|
| R-squared | 0.000000 | Mean dependent var | -3.33E-15 |
| Sum squared resid | 178.3438 | Durbin-Watson stat | 0.054981 |