

## Determining the Main Factors Involved in Alleviating Poverty in the Organization of Islamic Cooperation (OIC) Countries

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### ABSTRACT

The purpose of this paper is to determine the main factors involved in alleviating poverty in 16 OIC countries over the period 2009-2019. Using System GMM (Generalized Method of Moments) as the best estimation method, the general findings are first that the main factors contributing to the alleviating of poverty are the previous poverty level, economic growth, trade openness, and government spending. These have been proven by all the variables to have a statistically significant effect on poverty alleviation. Second, the empirical findings also suggest that an increase in foreign direct investment and the inflation rate will increase the level of poverty. However, the remaining variables have an empirically insignificant impact on alleviating poverty. The conclusions are confirmed to be sound by the robustness tests. Policy recommendations are also provided to the countries examined and also the academics literature on the research topic of poverty. The research findings contribute input for policy formulations to achieve the sustainable development goals (SDGs) developed by the United Nations, especially goal 1 (no poverty).

### ملخص

يهدف هذا البحث لتحديد العوامل الرئيسية التي ينطوي عليها التخفيف من حدة الفقر في 16 دولة من دول منظمة التعاون الإسلامي خلال الفترة 2009-2019. واستنادا إلى أسلوب اللحظات المعمم (GMM)، كأفضل طريقة تقديرية، خلصت النتائج العامة إلى استنتاجين. أولا: يعد مستوى الفقر السابق، والنمو الاقتصادي، والانفتاح التجاري، والإنفاق الحكومي من العوامل الرئيسية التي

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تساهم في التخفيف من حدة الفقر. حيث أثبتت كل المتغيرات أن لكل هذه العوامل أثرا مهما من الناحية الإحصائية على التخفيف من حدة الفقر. ثانيا، تشير النتائج التجريبية أيضا إلى أن زيادة الاستثمار الأجنبي المباشر ومعدل التضخم سيزيدان من مستوى الفقر. ومع ذلك، فإن المتغيرات المتبقية لها تأثير ضئيل من الناحية التجريبية على التخفيف من حدة الفقر. كما أكدت اختبارات القوة صحة هذه الاستنتاجات. ويقدم هذا البحث توصيات متعلقة بالسياسات للبلدان قيد الدراسة، كما أنه يغني أدبيات البحث الأكاديمي بشأن موضوع الفقر. وبذلك تكون نتائج البحث قد أسهمت في صياغة السياسات لتحقيق أهداف التنمية المستدامة التي وضعتها الأمم المتحدة، ولا سيما الهدف 1 (القضاء على الفقر).

#### ABSTRAITE

L'objectif de ce document est de déterminer les principaux facteurs impliqués dans l'allégement de la pauvreté dans 16 pays de l'OCI au cours de la période 2009-2019. En utilisant le système GMM (méthode généralisée des moments) comme la meilleure méthode d'estimation, les conclusions générales sont d'abord que les facteurs principaux contribuant à l'allégement de la pauvreté sont le niveau de pauvreté précédent, la croissance économique, l'ouverture commerciale, et les dépenses du gouvernement. Toutes les variables ont prouvé qu'elles avaient un effet statistiquement significatif sur la réduction de la pauvreté. Deuxièmement, les résultats empiriques suggèrent également qu'une augmentation de l'investissement direct étranger et du taux d'inflation augmentera le niveau de pauvreté. Cependant, les autres variables ont un impact empiriquement non significatif sur la réduction de la pauvreté. Les tests de robustesse confirment le bien-fondé des conclusions. Des recommandations politiques sont également formulées à l'intention des pays examinés et de la littérature universitaire sur le thème de la pauvreté. Les résultats de la recherche contribuent à la formulation de politiques visant à atteindre les objectifs de développement durable (ODD) élaborés par les Nations unies, en particulier l'objectif 1 (pas de pauvreté).

**Keywords:** Alleviating Poverty, Sustainable Development Goals (SDGs), System GMM, OIC Countries.

**JEL Classification:** C33, I3, O10.

## **1. Introduction**

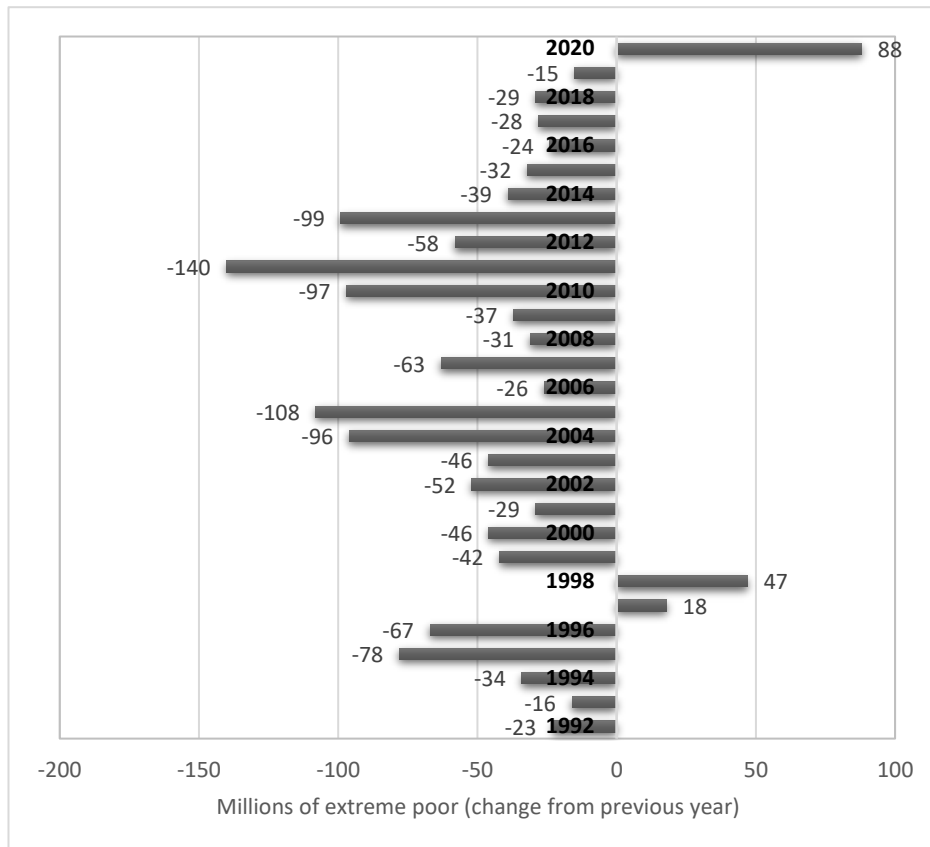
### **1.1. Background**

In 2015, the United Nations General Assembly established 17 Global Goals, or SDGs, with 169 targets to be achieved by 2030. SDG 1 is the ending of poverty (UNDP, 2021). According to Dhahri and Omri (2020), the SDGs are intrinsically linked to each other, and are inseparable elements of sustainability, including the eradication of poverty. For instance, no poverty (Goal 1) is also linked to good health and well-being (Goal 3), quality education (Goal 4), clean water and sanitation (Goal 6), energy (Goal 7) and climate (Goal 13) as well as industry, innovation and infrastructure (Goal 9).

The phenomenon of poverty has become a concern and efforts to end poverty have been carried out for long time by many countries. However, the crisis caused by the Covid-19 outbreaks has exacerbated poverty conditions and even increased the number of poor populations, such as ones in parts of Asia region and Sub-Saharan Africa (Lakner, Yonzan, Mahler, Aguilar, and Wu, 2021). A report by the Pew Research Center in 2021 stated that the global poor population had increased by 131 million due to the impact of the pandemic (Lidwina, 2021). The World Bank also predicted that global poor population would have increased by 150 million people by the end of 2021, as shown in Figure 1 (Lakner et al., 2021).

As can be seen in the figure 1, in 1997 and 1998 the Asian financial crisis caused an increase of 18-47 million poor people. Based on 2018 to 2020 projections, poverty would have been reduced by 31 million people; however, as a result of the Covid-19 pandemic in 2020, this figure in fact increased by 88 million people (Lakner et al., 2021). Besides that Suckling, Christensen, and Walton (2021) mentioned the number of people living in extreme poverty is expected to decline during 2021 along the global economy recovers.

**Figure 1:** Annual Changes in the Number of Extremely Poor People (in millions) 1992-2020

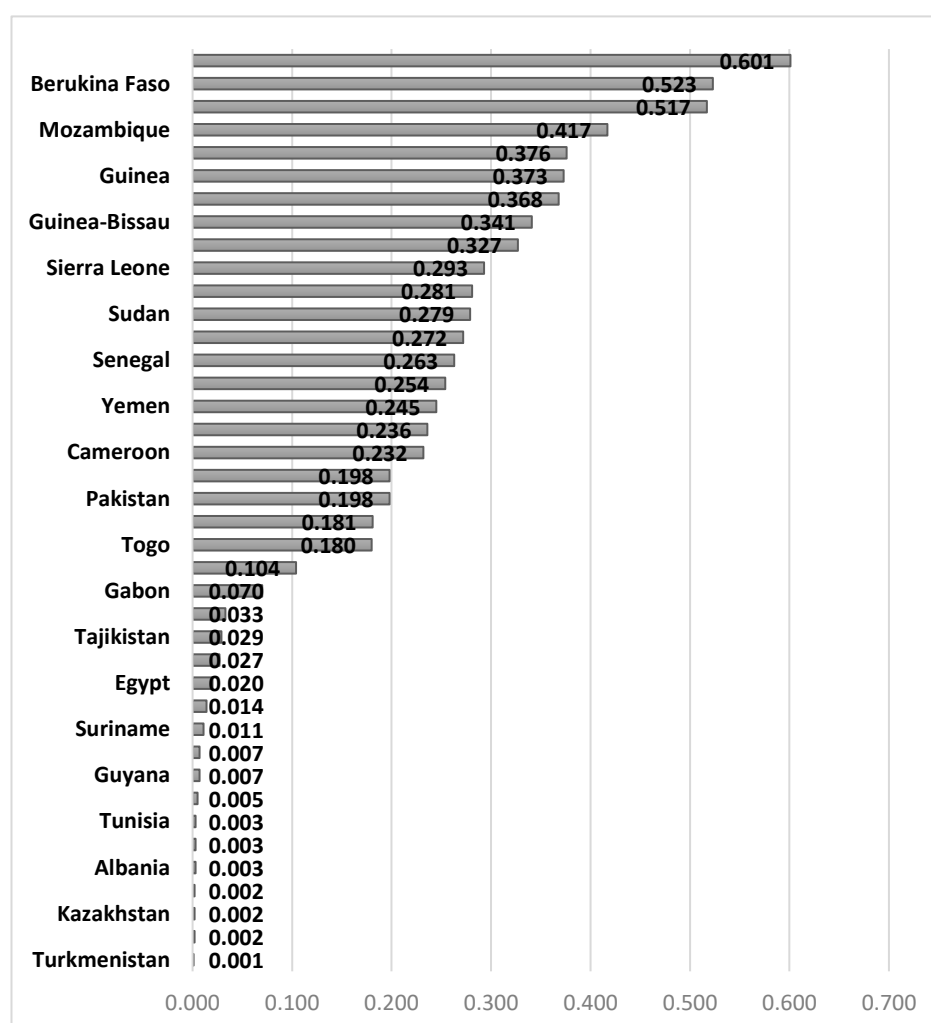


Source: Lakner et al. (2021)

Regarding the goal of achieving poverty alleviation, OIC countries, which represent the majority of developing countries, are important case studies because they suffer from acute poverty. According to the World Bank (2018), in OIC member countries there are 736 million poor people who live on under \$1.90 per day. Based on a latest report from the United Nations Development Programme and Oxford Poverty and Human Development Initiative (2022) , with reference to the multidimensional poverty index (MPI) in the OIC region, it was found that almost two-thirds of OIC member countries were in the poor cluster, including Niger, Mali, Burkina Faso, Somalia, Mozambique and Guinea (Figure 2). For example, people in Kazakhstan who live under multidimensional poverty is only 0.6 percent of the total population, while in Niger this ratio reaches

to 92.4 percent. Hence, the majority of OIC member countries are in the low and lower middle-income groups. In other words, almost 32 percent of OIC population live under multidimensional poverty and almost 22 live under severe multidimensional poverty (World Bank, 2021a).

**Figure 2:** Multidimensional Poverty Index (MPI) Values of OIC Member Countries



Source: the United Nations Development Programme and Oxford Poverty and Human Development Initiative(2022).

The goal of reducing extreme poverty is one of the biggest challenges faced and great effort is needed to achieve SDG 1. Many researchers and

academics have conducted research related to the factors that cause poverty in order to find solutions and contribute material to help formulate policies that can assist government authorities in developing effective policies to achieve SDG 1. Previous studies related to poverty alleviation factors include those of Affandi and Astuti (2013, 2014), who explored the determinants of poverty in Indonesia, Malaysia, Pakistan and India. Moreover, Fatoni et al. (2019) and Putra and Indra (2016) empirically studied the factors affecting the poverty level in nine OIC countries based on the Ibn Khaldun development theories. In addition, other studies have examined the determinants of poverty reduction by using different poverty variables and econometric methodologies based on varying samples (See Chotia and Rao, 2017; Dhrifi, Jaziri, and Alnahdi, 2020; Erlando, Riyanto, and Masakazu, 2020; Inoue, 2018; Masron and Subramaniam, 2018; Zhang and Ben Naceur, 2019).

## **1.2. Objective**

The study makes a significant contribution to the literature on the factors related to poverty alleviation in OIC countries. First, it provides comprehensive empirical evidence of the real factors involved in alleviating poverty based on various social, economic, political, institutional, and governmental factors. It follows the theory of Chapra (2008) and Duraesa (2016), who propose that poverty is caused by the five factors above, together with the moral dimension. Second, the research also complements previous work that has investigated poverty in majority Muslim population countries (Affandi and Astuti, 2013, 2014; Fatoni et al., 2019; Putra and Indra, 2016). Third, the originality of this paper is to use a large sample i.e. 16 (out of 57) OIC member countries, includes additional factors, and also uses the System GMM (Generalized Method of Moments) approach developed by Arellano and Bond (1991). Consequently, the main objective of this empirical study is to determine the main factors involved in alleviating poverty and thus achieving SDG 1, in 16 OIC member countries using the GMM approach.

## **2. Literature Review**

This section presents an overview of poverty and discusses previous studies on poverty to provide a framework and context for the study.

## 2.1. Overview of Poverty

According to Sadeq (1997), there is no definition of poverty that is widely agreed upon, but in general it relates to people or countries, including Muslim ones, that have low incomes which are inadequate for fulfilling minimum essential consumption needs. In general, the World Bank defines poverty as the inability to achieve an acceptable standard of living as measured by basic consumption needs (Dhrifi et al., 2020).

Girsang (2011) also mentioned that poverty is also defined as the inability to meet the basic consumption needs of family members, such as food and/or non-food. When people are unable to meet their basic needs, they are categorized as poor (Dhrifi et al., 2020). Moreover, Sadeq (1997) explained that basic needs in the Islamic sense are those for *halal* and *thayyib* food, clothing, shelter, education, health services and even a partner. In a broad sense, poverty is a multidimensional phenomenon which is a state of economic deficiency that threatens one's survival (Suryawati, 2005).

### 2.1.1. Factors and Dimensions of Poverty

Todaro and Smith (2012) explain that the factors that cause poverty, especially in developing countries, are low levels of national income, slow economic growth, low income per capita, inequality in income distribution, absolute poverty, limited health facilities and services, and the lack of educational facilities. Several dimensions are directly related to poverty. According to Duraesa (2016), poverty is divided into three aspects:

1. Poverty with an economic dimension, which is related to basic consumption needs; i.e., food, clothing, shelter, health and education;
2. Poverty with socio-cultural dimensions, which is related to the socio-culturally poor with a poor culture, meaning that community weaknesses are caused by inherent bad characteristics such as being apathetic, apolitical, or fatalistic; and
3. Poverty with a political dimension, which means the poor do not have access to, or are not involved in, the political process or do not have political power. Therefore, this has an impact on the living conditions of those with the lowest social status. Consequently, it can be assumed that if the poor do not have

political power, this will have implications for material or economic poverty.

### 2.1.2. Measurement of Poverty

There are two international standard measurements of poverty by the World Bank (2020). The first is based on per capita income, with those below the poverty line surviving on \$1.90 per day. The extreme poor below the poverty line earn only \$1.25 per day, while those whose income level is \$3.1 per day are included in the moderate poverty category. The World Bank (2020) also measures the level of poverty using the poverty gap index. This is the ratio showing that the average income of the poor is below the poverty line; this line is defined as half the average household income of the total population.

## 2.2. Previous Studies

Various studies have attempted to analyze the determinants of poverty reduction based on different samples, methodologies and factors. However, no study has empirically examined OIC countries from the multidisciplinary perspective.

The research of Affandi and Astuti (2013, 2014) investigated the multidisciplinary factors affecting the poverty level in Muslim (Indonesia, Pakistan, and Malaysia) and non-Muslim (India) population countries over the period 1995 to 2010. Their results indicate that the corruption perception index (CPI), human development index (HDI) and foreign direct investment (FDI) have a significant effect on poverty levels in Indonesia. Affandi and Astuti (2013, 2014) also mentioned that only the HDI variable was shown to contribute to reducing poverty in Pakistan. Meanwhile, there is no significant variable on the poverty level in Malaysia and India.

Another study by Fatoni et al. (2019) empirically tested determination of the poverty level in nine OIC member countries during the period 2010-2016. Their empirical findings show that government expenditure on health, the Gini index, GDP growth and unemployment has a significant relationship with the poverty level in these countries. On the other hand, government expenditure on education, HDI and CPI have non-significant relationships with the level.



Putra and Indra (2016) examined the relationship between the variable of Ibn Khaldun's multi discipline model and the poverty level in nine OIC countries from 2003 to 2013. Their empirical findings present that GDP per capita had a relationship with poverty reduction. Unemployment level also contributed significantly to an increase in the poverty level in these countries. On the other hand, the remaining variables, including government expenditure on education, HDI, the Gini index, and the corruption perception index had an insignificant influence on poverty alleviation.

Other research has also investigated empirical evidence for the determination of poverty eradication in other regions or country groups. For example, Erlando et al. (2020) examined the relationship between the variables of financial inclusion, GDP per capita, and poverty reduction in eastern Indonesia over the period 2010-2016. They showed that the financial inclusion variable had a significant negative relationship with the poverty level. In addition, the macroeconomic variables of GDP per capita and education were demonstrated to be able to reduce poverty levels in eastern Indonesia.

Apergis, Dincer, and Payne (2011) investigated the real factors of income inequality and poverty level in 50 states in the US from 1980 to 2004. Their research found that there existed a relationship between income inequality and poverty both in the short and long term. In addition, there was a link between income inequality and unemployment in the short term. Other variables, such as real income per capita and level of education, had a significant effect on reducing poverty levels, although the corruption variable did not contribute to increased poverty.

Chotia and Rao (2017) empirically examined the relationship between the development of infrastructure and poverty alleviation in India over the period 1991-2015. Using the ARDL testing approach, they indicate that the infrastructure development index has a significant relationship with reducing the poverty level in the country. Furthermore, GDP growth had a significant relationship with poverty alleviation in India both in the short and long term. Other research by Chotia & Rao (2017a) found a nexus between the infrastructure development index and poverty reduction in BRICS (Brazil, Russia, India, China and South Africa) countries using the panel dynamic method.

Using the ordinary least squares (OLS) method, Zhang and Ben Naceur (2019) provided empirical evidence of the link between financial development, income inequality and the poverty level in 143 countries. Their findings show that financial development had a significant effect on reducing poverty in these countries. On the other hand, macroeconomic variables, GDP per capita and trade, were negatively related to poverty levels, and inflation and government consumption were found to have an insignificant impact.

Emara and Mohieldin (2020) analyzed the nexus linking financial inclusion and the eradication of extreme poverty in 34 countries (11 the Middle East and North African or MENA and 23 Emerging Markets or EMs) over the period 1990 to 2017. They indicate a significant relationship between financial inclusion and poverty reduction. In addition, their study also found that there is the impact of GDP per capita, trade openness, population rate, and mobile cellular subscriptions per 100 people on extreme poverty in MENA region.

However, the empirical findings from the studies reviewed above present different conclusions. It is against this background that this study aims to extend the empirical observation by examining the real factors involve in alleviating poverty in the OIC countries examined. It is important to establish the main determinants of alleviating poverty in order to develop policies that will effectively assist in achieving SDG 1 in majority Muslim population countries.

### **3. Research Methodology**

This research empirically determines the real factors involved in alleviating poverty in member countries. Data were collected from 16 out of 57 OIC states during the period 2009 to 2019 (see Table 1).

#### **3.1. Data**

Secondary data were obtained from different sources, such as the World Development Indicator (WDI), United Nations Development Program (UNDP), and International Transparency Reports (IT Report) (see Table 2). There are 57 OIC member countries; however, we have selected 16 countries as research samples based on three reasons, namely: (1) representing OIC member countries are with different income groups; (2)

selected countries representing the different region or continents; (3) limited data availability because not all OIC member countries have complete data. Furthermore, for this study, the type of data is secondary data with the sample period being 2009 to 2019.

**Table 1:** The 16 OIC Member Countries based on World Bank Classification

No.	Country	Region	Income Group
1	Oman	Middle East & North Africa	High income
2	Benin	Sub-Saharan Africa	Low income
3	Burkina Faso	Sub-Saharan Africa	Low income
4	Mali	Sub-Saharan Africa	Low income
5	Mozambique	Sub-Saharan Africa	Low income
6	Senegal	Sub-Saharan Africa	Low income
7	Sudan	Sub-Saharan Africa	Low income
8	Bangladesh	South Asia	Lower middle income
9	Indonesia	East Asia & Pacific	Lower middle income
10	Kyrgyz Republic	Europe & Central Asia	Lower middle income
11	Pakistan	South Asia	Lower middle income
12	Algeria	Middle East & North Africa	Upper middle income
13	Gabon	Sub-Saharan Africa	Upper middle income
14	Jordan	Middle East & North Africa	Upper middle income
15	Malaysia	East Asia & Pacific	Upper middle income
16	Turkey	Europe & Central Asia	Upper middle income

Source: World Bank (2021b)

### 3.2. Model Development

The model was developed based on previous studies. Alleviating poverty (lnPOV) was the dependent variable, and foreign direct investment (FDI), financial development (FD), human development index (HDI), inflation rate (INF), corruption perception index (CPI), telecommunication development (TD), trade openness (TO), economic growth (lnGDP) and government spending (GS) the independent variables. The link between

the dependent and independent variables was analyzed using the System GMM (Generalized Method of Moments) approach (see point 3.3).

Table 2 shows all the variable proxies for the measurement of the variables.

**Table 2:** Variable Definition, Measurements and Sources

Variable	Measurement	Source	Exp. Sign
lnPOV	Alleviating poverty: Household final consumption expenditure per capita (based on constant international \$ 2010)	WDI	-
FDI	Foreign direct investment (% of GDP)	WDI	(+)
FD	Financial development: Total domestic credit to the private sector (% of GDP)	WDI	(+)
HDI	Human Development Index	UNDP, WDI	(+)
INF	Inflation rate: Consumer price index	WDI	(-)
CPI	Corruption Perception Index	IT Report	(+)
TD	Telecommunication infrastructure development: Fixed telephone subscriptions (per 100 people)	WDI	(+)
TO	Trade openness: The ratio of export to import services and goods (% of GDP)	WDI	(+)
lnGDP	Economic growth: GDP per capita (based on constant international \$ 2010)	WDI	(+)
GS	Government spending: General government final consumption expenditure (% of GDP)	WDI	(+)

Notes: lnPOV and lnGDP are transformed into natural logarithms.

Source: Authors (2021).

### 3.2.1. Alleviating Poverty (lnPOV)

Alleviating poverty (POV) was represented by households' final consumption spending per person (constant \$2010) (Chotia and Rao, 2017b, 2017a; Dhrifi et al., 2020; Ho and Odhiambo, 2017; Magombeyi

and Odhiambo, 2018; Mahembe and Odhiambo, 2020; Odhiambo, 2009, 2010). The measurement of poverty also refers to the World Bank definition of poverty as the inability of people to fulfil essential consumption needs such as food, clothing, shelter, health and education. The data were transformed into a natural logarithm (lnPOV).

### 3.2.2. Foreign Direct Investment (FDI)

Foreign direct investment (FDI) was measured as direct capital for stimulating economic growth through technology transfer, productivity accumulations, the overflow effect, the implementation of new methods, and managerial abilities. The advantages of FDI for national economic growth can help the government to reduce poverty levels (Dhrifi et al., 2020). In addition, many studies have explained poverty using FDI (Affandi & Astuti, 2013, 2014; Dhrifi et al., 2020; Fatoni et al., 2019; Mariyanti & Mahfudz, 2016; Putra & Indra, 2016).

### 3.2.3. Financial Development (FD)

Financial development (FD) was measured by the percentage of total domestic credit to the private sector by banks (Dhrifi et al., 2020; Emarah & Mohieldin, 2020; Inoue, 2018). This is because domestic credit to the private sector is one aspect of financial development that influences the reducing of poverty by eliminating the problems encountered in accessing financing/credit, especially for the poor and needy.

### 3.2.4. Human Development Index (HDI)

The human development index (HDI) was used as a proxy variable for human resources. Many studies have used this to represent the quality of the human resources related to poverty (Affandi and Astuti, 2013, 2014; Dhahri and Omri, 2020; Fatoni et al., 2019; Mariyanti and Mahfudz, 2016; Masrizal, Mujahidah, Millatina, and Herianingrum, 2019; Putra and Indra, 2016).

### 3.2.5. Inflation Rate (INF)

The inflation rate (INF), as a macroeconomic variable, was estimated by the consumer price index. The rate of inflation may also play a crucial role in increasing the level of poverty in many states, including developing countries. Numerous researchers have assumed that inflation

determines the level of poverty (Baloch, Danish, Khan, and Ulucak, 2020; Baloch, Danish, Khan, Ulucak, and Ahmad, 2020; Chotia & Rao, 2017b; Emara and Mohieldin, 2020; Inoue, 2018; Masron and Subramaniam, 2018; Zhang and Ben Naceur, 2019).

### 3.2.6. Corruption Perception Index (CPI)

The corruption perceptions index (CPI) was a proxy variable for the institutional variable or government integrity aspect Apergis et al. (2011). Also, CPI is indicators used to reflect systemic corruption problems in a government institution. The CPI uses a scale of 0-100, with 0 representi.ng the highest level of perceived corruption and 100 the lowest level (Transperancy International, 2020). The CPI can be used as a measurement of religiosity or a Shariah variable (Affandi & Astuti, 2013, 2014; Anto, 2009; Fatoni et al., 2019; Mariyanti & Mahfudz, 2016; Putra & Indra, 2016). This is because the Islamic community should not be involved in corruption, fraud or any form of abuse of power.

### 3.2.7. Telecommunication Development (TD)

Telecommunication development (TD) was represented by fixed telephone subscriptions per 100 people. TD is important as the main support service needed for modernization in various economic sectors. Some studies have also used TD in explaining the role of the telecommunications ICT infrastructure and its relation to poverty (for example, Chotia and Rao, 2017b; Evans, 2018; Kelikume, 2021; Mushtaq and Bruneau, 2019).

### 3.2.8. Trade Openness (TO)

Trade openness (TO) captures the benefits of openness to foreign trade. TO has been used as a determinant of poverty in studies by Emara and Mohieldin (2020); Inoue (2018); Zhang and Ben Naceur (2019).

### 3.2.9. Economic Growth (lnGDP)

Economic growth (lnGDP) was represented by GDP per capita. This is because many previous studies have used the GDP per capita as a variable of national economic growth that have an effect on poverty level (see Affandi & Astuti, 2013, 2014; Apergis et al., 2011; Chotia & Rao, 2017b; Dhrihi et al., 2020; Emara & Mohieldin, 2020; Fatoni et al., 2019;

Mariyanti and Mahfudz, 2016; Masron and Subramaniam, 2018; Putra and Indra, 2016; Zhang and Ben Naceur, 2019). lnGDP comprises data transformed into natural logarithms.

### 3.2.10. Government Spending (GS)

Government spending (GS) was measured by the percentage of general government final consumption expenditure to GDP. This is because previous research has used the GS that has an effect on poverty level (see Affandi & Astuti, 2013, 2014; Apergis et al., 2011; Erlando et al., 2020; Fatoni et al., 2019; Mariyanti & Mahfudz, 2016; Putra & Indra, 2016).

### 3.3. Generalized Method of Moments (GMM)

To achieve the main objective of the study, the system GMM (generalized method of moments) testing approach was used, as proposed by Arellano & Bond (1991) and Arellano and Bover (1995). The GMM method is one of the panel data methods that is often used in analyzing the relationship between economic variables. Where each variable is influenced by the variable itself in the previous period which is called dynamic. Dynamic panel data is characterized by the lag of the dependent variable between the regressor variables. The following is the equation of GMM:

$$\begin{aligned}
 y_{it} &= \delta y_{i,t-1} + x'_{it}\beta + \mu_{it} & (1) \\
 i &= 1, 2, 3, \dots, N; \\
 t &= 1, 2, 3, \dots, T
 \end{aligned}$$

Where  $\delta$  is a scalar,  $x'_{it}$  is an independent variable vector with a size of  $1 \times k$ ,  $\beta$  is constant with size of  $k \times 1$ , and  $\mu_{it}$  is error terms.

In dynamic panel data, two types of procedures for estimating linear autoregressive model are generally used, namely: First-difference GMM (FD-GMM) and System GMM (Sys-GMM). Some of the benefits of the Sys-GMM estimation model over other econometric methods are that it can eliminate the autocorrelation of the error term and reduce the relationship between the endogenous and the error terms. In addition, the method can address possible vulnerable instruments in FD-GMM testing method.

As for testing the model specifications based on Arellano & Bond (1991), there are two tests, i.e. (i) Arellano-Bond test (AB test is to test the consistency of estimator by looking at the statistical values of AR1 and AR2, and (ii) Sargan test is to test the validity of instrument which is indicated by the statistical value of Sargan which is not significant at the level of 5% or 0.05

Furthermore, the equation of empirical model in this study is

$$\ln POV_{it} = \sum_{j=1}^p \alpha \ln POV_{i,t-j} + \beta_1 FDI_{it} + \beta_2 FD_{it} + \beta_3 HDI_{it} + \beta_4 INF_{it} + \beta_5 CPI_{it} + \beta_6 TD_{it} + \beta_7 TO_{it} + \beta_8 \ln GDP_{it} + \beta_9 GS_{it} + v_i + \mu_{it} \quad (2)$$

Where *i* describes the 16 cross-sectional OIC member states; *t* is the period of estimation from 2009-2019; *v<sub>i</sub>* represents panel level impact; and  $\mu_{it}$  represents independent and also identically distributed (i.i.d.) overall samples by variance  $\sigma_{\mu}^2$ , and *j* presents the time lag of the empirical model. In this specification model, *lnPOV* is a dependent variable related to alleviating poverty and the nine other variables in the model are independent or explanatory ones for the determination of eradicating poverty in the 16 OIC states examined.

#### 4. Results and Analysis

This section presents the statistical descriptive analysis of the research, together with the main empirical findings and analysis of the real factors related to alleviating poverty and achieving SDG 1 in 16 OIC countries. And then the robustness check is also discussed in this empirical study.

##### 4.1. Descriptive Statistics

Table 3 shows the results of the statistical description of all the research variables used based on 176 observations. Panel 1 indicates that according to the mean, minimum and maximum for the variables, *POV* is found to have a mean of \$2243.486, ranging from \$346.280 to \$8921.720. The independent variable, *FDI*, has a mean of 3.967% and ranges from -3.180% to 39.460%, while *FD* has an average value of 36.899% ranging from 7.140% to 123.100%. The mean *CPI* is 34.490% and ranges from 11% to 55%. *HDI* has a mean of 0.609 and varies from 0.370 to 0.830, while *TD*, ranging from 0.210 to 23.570, has a mean of 5.355. The average



GS is 4.802% and ranges from -18.200% to 22.130%. The range of macroeconomic variables is \$4410.038 for GDP, varying between \$454.780 and \$18925.580; 71.025% for TO with a range between 19.100% and 162.560%, and 5.581% for INF, ranging between -3.230% and 63.290%. In addition, Panel 2 shows that lnPOV has a mean of 7.281%, ranging from 5.847% to 9.096%, while lnGDP has a mean of 7.766% and ranges between 6.119% and 9.848%.

**Table 3: Descriptive Statistics**

Variable	Mean	Std. Dev.	Minimum	Maximum
Panel 1: Level data				
POV	2243.486	2263.135	346.280	8921.720
FDI	3.967	5.846	-3.180	39.460
FD	36.899	27.708	7.140	123.100
CPI	34.494	9.873	11.000	55.000
HDI	0.609	0.140	0.370	0.830
GDP	4410.038	5011.083	454.780	18925.580
TD	5.355	5.970	0.210	23.570
TO	71.025	34.011	19.100	162.560
INF	5.581	8.409	-3.230	63.290
GS	4.802	6.047	-18.200	22.130
Panel 2: Log-transformed data				
lnPOV	7.281	0.911	5.847	9.096
lnGDP	7.766	1.117	6.120	9.848

Notes: POV is poverty alleviation, FDI is foreign direct investment, FD is financial development, CPI is corruption perception index, HDI is human development index, GDP is gross domestic product, TD is telecommunication development, TO is trade openness, INF is inflation rate, GS is government spending, and Std. Dev. is standard deviations.

Source: Authors' calculation using data

## 4.2. Correlation Matrix

Table 4 shows that the correlation between the various variables used is not high enough to cause serious multicollinearity problems.

**Table 4:** Correlation Matri

	<b>POV</b>	<b>FDI</b>	<b>FD</b>	<b>HDI</b>	<b>INF</b>	<b>CPI</b>	<b>TD</b>	<b>TO</b>	<b>GDP</b>	<b>GS</b>
POV	1.0000									
FDI	-0.1652	1.0000								
FD	0.6684	-0.0825	1.0000							
HDI	0.7825	-0.2355	0.6508	1.0000						
INF	-0.0523	0.0359	-0.2067	-0.1080	1.0000					
CPI	0.6323	-0.1281	0.6801	0.5332	-0.5299	1.0000				
TD	0.7762	-0.1765	0.6773	0.7477	-0.0827	0.4901	1.0000			
TO	0.3313	0.3593	0.5441	0.4261	-0.3361	0.4450	0.3934	1.0000		
GDP	0.8871	-0.1449	0.5799	0.7810	-0.0615	0.5741	0.7006	0.3138	1.0000	
GS	-0.0666	0.2201	-0.0254	-0.2059	-0.0610	-0,0266	-0.0777	-0.0533	-0.1551	1.0000

Note: POV is poverty alleviation, FDI is foreign direct investment, FD is financial development, CPI is corruption perception index, HDI is human development index, GDP is gross domestic product, TD is telecommunication development, TO is trade openness, INF is inflation rate, and GS is government spending.

Source: Authors' calculation using data

### 4.3. Empirical Results and Analysis

#### 4.3.1. Results of the Best Estimation Method

In this paper, we used four different estimators from econometric equation (1) above, namely: pooled OLS (ordinary least squares); standard FE (fixed effects); first difference GMM, and system GMM [See Appendix A]. Procedure pooled OLS and standard FE were both applied as benchmark models to consider bias and inefficiency resulting from autocorrelation, heterogeneity and endogeneity.

The estimation results using first difference GMM tend to be biased downwards. The coefficient value of the lag variable of poverty ( $\ln\text{POV}_{t-1}$ ) in the FD-GMM is below the coefficient value of  $\ln\text{POV}_{t-1}$  in the model of standard FE, namely  $0.6859 < 0.7203 < 0.9835$ . Therefore, to overcome the tendency of biased downward estimation results, the best estimation method is to use system GMM. This is because the coefficient value of the lag variable ( $\ln\text{POV}_{t-1}$ ) in the system GMM model is between the values of  $\ln\text{POV}_{t-1}$  in the standard FE and pooled OLS models, namely  $0.7203 < 0.7430 < 0.9835$ . Therefore, the next stage in the estimation procedure is to use system GMM as the best estimation model as it is more efficient than FD-GMM, which contains bias.

#### 4.3.2. Results and Analysis of the System GMM Estimation Method

The main estimation results of the system GMM testing are presented in Table 5. The dependent variable is alleviating poverty ( $\ln\text{POV}$ ), with the remainder being dependent variables. The table shows that the four variables of previous poverty ( $\ln\text{POV}_{t-1}$ ), economic growth ( $\ln\text{GDP}$ ), trade openness (TO) and government spending (GS) have positive effects on alleviating poverty ( $\ln\text{POV}$ ) in the OIC countries. Furthermore, foreign direct investment (FDI) and the inflation rate (INF) indicate that both factors contribute negatively to alleviating poverty. All the variables are in line with the expected sign, except for foreign direct investment (FDI).

A more detailed explanation is that the coefficient value of the lag poverty variable in the previous period, or  $\ln\text{POV}_{t-1}$ , is significant with a fairly high coefficient value (0.7430), implying that the previous poverty level is elastic in relation to alleviating poverty. Therefore, a previous 1% rise in consumption expenditure per capita will increase consumption per

capita in the future by 0.7430% indicating that increasing the consumption expenditure per person is vital for alleviating poverty in the 16 OIC countries. This finding also means that a previous reduction in poverty will influence a future reduction. Therefore, this is a new finding that contributes significantly to how the poverty rate in a previous period is also a very important factor to consider in achieving poverty reduction in the future, and can therefore be used as a poverty alleviation tool.

The empirical results also reveal that the coefficient of  $\ln\text{GDP}$  positively influences poverty alleviation ( $\ln\text{POV}$ ) at the 1% level. The value of 0.2114 means that a 1% rise in GDP growth would result in a 0.2114% increase in consumption per capita; a high rate of GDP per capita is associated with higher individual consumption levels. This finding also confirms the theoretical prediction that GDP growth has the main effect on poverty reduction (Dhrifi et al., 2020). The finding also shows that low income is the cause of a reduction in the level of individual consumption expenditure, meaning that many needs cannot be met as a result of the level of poverty in the community (Fatoni et al., 2019; Putra & Indra, 2016). In addition, per capita income is often used to measure the economic growth or performance of a country. Economic growth can also be an indicator of the achievement of community welfare. Therefore, this empirical result is in line with the results obtained by Apergis et al. (2011); Chotia and Rao (2017b, 2017a); Dhrifi et al. (2020); Mahembe and Odhiambo (2020), who argue that GDP growth has a positive effect on alleviating poverty in many states.

As regards the influence of trade openness (TO), the empirical results also show that the coefficient of TO (0.0011) is statistically significant at the 10% level, as expected, meaning a 1% increase in trade openness will raise consumption per capita by 0.0011%. This finding also indicates that an increase in the ratio of trade openness will alleviate poverty conditions in OIC countries. Our findings are consistent with those of Emara and Mohieldin (2020), Inoue (2018), and Zhang and Ben Naceur, 2019), who show that high trade openness rates are correlated with low degrees of poverty levels in several countries. Moreover, the finding supports previous studies of other nations that trade openness policy promotes not only GDP growth, but also the adoption and diffusion of technological innovation (Dhrifi et al., 2020).

Our empirical findings show that the estimated coefficient of government spending (GS) is negative and statistically significant at the 1% level, as indicated in Table 5. This finding implies that an increase in government consumption expenditure will have a positive impact on increasing individual consumption per capita in OIC countries. This finding is in line with those of the study of Putra and Indra (2016), which indicate that government consumption expenditure in various sectors, especially health and education, is needed to reduce poverty levels. In addition, government spending can be aimed at providing social and economic facilities and infrastructure, ensuring security and order, including the provision of good healthcare facilities to achieve the welfare of all society (Chapra, 2008). This finding is in line with the study of Zhang and Ben Naceur (2019), who state that government spending will capture the benefits of public spending, which in turn can reduce the level of poverty.

Another main factor is the inflation rate (INF). The coefficient value of the inflation variable (-0.0007) is negative and significant at the 10% level. This indicates that an increase in inflation rate will have a negative impact on decreasing individual consumption in OIC countries by around 0.0007%. The result also shows that the poor are adversely affected because the prices of goods and services rise. The empirical finding is similar to those made by Chotia and Rao (2017b, 2017a), who demonstrate that price instability diminishes individual income and subsequently the per capita consumption rate, which leads to rising poverty levels. Dhrifi et al. (2020) state that the inflation rate will negatively influence individual consumption expenditure and will consequently have an impact on reducing the poverty level.

Contrary to the expected sign, we found that foreign direct investment (FDI) is a factor which weakens consumption per capita because it has a negative and significant association with poverty. The coefficient for FDI (-0.0016) is negative and statistically significant in relation to poverty reduction at the 10% level. This finding means that the greater the foreign investment entering OIC member countries, the fewer the benefits the community will gain. Although the results were not expected, they coincide with those obtained by Huang, Teng, and Tsai (2010), who found that FDI had a negative impact on poverty reduction. However, the finding also contradicts those of previous studies; for example, Dhrifi et al. (2020) and Fatoni et al. (2019), who indicated that FDI will decrease the poverty rate in 98 developing countries, including OIC countries. It is

a new finding in related research, with the majority of OIC countries depending on foreign investment to increase domestic investment. Based on these findings, it is possible that FDI in OIC countries is still not effective in improving socio-economic welfare.

On the other hand, we also found that other factors, that is, financial development (FD), the corruption perception index (CPI), the human development index (HDI) and telecommunication development (TD) had no significant influence on alleviating poverty in the 16 OIC member countries. Therefore, our findings conclude that the impact of FD on poverty alleviation does not have a significant effect in OIC countries, especially the 16 sampled in this study. This also contradicts the results of research conducted by Dhrifi et al. (2020) and Inoue (2018), who argue that financial development and the poverty level should have important negative values.

The corruption perception index (CPI) does not have a synergistic impact on alleviating poverty. This means that the corruption factor has a lower impact on poverty reduction in OIC countries. However, our conclusions are in line with the results of previous research Apergis et al. (2011), Fatoni et al. (2019), and Putra and Indra (2016), who found that the corruption factor related to government did not have a significant impact on poverty levels in both Muslim-majority and Muslim-minority countries.

The human development index (HDI) does not have a synergistic influence on alleviating poverty. This suggests that the HDI factor has a weaker influence on poverty reduction in the 16 OIC countries. The results of this study contradict the findings of Affandi and Astuti (2013, 2014). However, other findings (e.g., Fatoni et al. (2019) and Putra and Indra (2016) have shown that the HDI factor does not have a significant effect on reducing poverty levels, especially in OIC countries. The most likely reason for this empirical finding is that life expectancy, education level and standard of living in OIC countries remain low, so the HDI factor does not have a significant influence on poverty alleviation. This is also evidenced by the average HDI value of OIC countries of 0.61. Consequently, the factor does not have a significant influence on the goal of reducing poverty.

Telecommunications development (TD) seems to have no synergistic influence on alleviating poverty. The results of this study contradict the conclusions drawn by Chotia and Rao (2017b, 2017a) who suggest that infrastructure development, including the telecommunications sector, reduces poverty in both the long and short run in India and BRICS countries. Therefore, it can be concluded that the TD factor does not have a positive impact on the goal of alleviating poverty in the 16 OIC countries examined.

**Table 5:** System GMM Estimation Results

Variable	Alleviating Poverty (lnPOV)		
	System GMM Method		
	Coefficient	Standard Error (SE)	Description
lnPOV <sub>t-1</sub>	0.7430	0.1284	(+)Significant***
FDI	-0.0016	0.0008	(-)Significant*
FD	0.0018	0.002	(+)Insignificant
CPI	0.0003	0.0012	(+)Insignificant
HDI	-0.0568	0.1974	(-)Insignificant
lnGDP	0.2114	0.0814	(+)Significant***
TD	0.0046	0.0044	(+)Insignificant
TO	0.0011	0.0006	(+)Significant*
INF	-0.0007	0.0004	(-)Significant*
GS	0.0014	0.0005	(+)Significant***
Constant	0.1107	0.4252	(+)Insignificant
No. of obs.		160	
No. of groups		16	
No. of instruments		64	

Notes: \*\*\*, \*\*, \* are significant at the 1%; 5% and 10% levels. OLS: ordinary least squares; FE: fixed effects; FD-GMM: first differenced GMM; Sys-GMM: system GMM.

Source: Authors' calculation using data

#### 4.4. Robustness Test

Robustness checks in the GMM estimation were conducted using the Sargan and Arellano–Bond (AR) tests. The Sargan test was employed to examine for over-identifying restrictions, while the AR test was used to

measure for the presence of autocorrelation, following I. Kelikume (2021) and Neaime and Gaysset (2018). To see the consistency of the estimator, AR1 and AR2 statistics can be used. This test is basically to test the autocorrelation on the first difference error. The consistency of the estimator is shown by the significant AR1 statistical value and the insignificant AR2 statistic. In the results of the robustness test shown in Appendix A, the diagnostic analyses indicate that the system GMM estimation method is robust. This is because the Sargan analysis for over-identifying restraint shows that it is not significant for the system GMM estimation method. Furthermore, the AR test is to find out the problem of autocorrelation. This GMM estimation model has been free from autocorrelation problems. This is evidenced by p-value AR1 is smaller than 5% (0.05) and p-value AR2 is greater than 5% (0.05) shown in Appendix A. Therefore, there is no proof for the second-order serial association of the error terms.

Besides that, in the robustness check we also add a dummy variable to test the consistency of the GMM system estimation results. The dummy variable used is based on income group where a value of zero (0) indicates that OIC member countries are included in the low income and lower middle income group category and a value of one (1) indicates that OIC member countries are included in the high income and upper middle category. income. The results of estimation by adding dummy variables show that the results are consistent [See in Appendix B]. Therefore, it can be concluded that the results of the analysis using the GMM model system are robust.

## **5. Conclusion**

The main purpose of the research was to empirically examine the real factors affecting poverty alleviation (SDG 1) in 16 OIC countries over the period 2009-2019. To accomplish the research objective, four different models were estimated: pooled OLS, standard fixed effects, first difference GMM, and system GMM. However, the best estimation model was system GMM. Based on the results of the system GMM estimation model, the principal conclusions are first that the main factor to affect the alleviating of poverty is the lagged, or previous poverty level. This contributes positively to alleviating poverty, thus validating that overcoming poverty in the future will depend on poverty in the past. Second, other real factors involved in alleviating poverty are economic



growth, government spending, and trade openness. The research empirically proves that these support poverty alleviation in the OIC countries analyzed. Regarding other factors, namely foreign direct investment and the inflation rate, the variables were found that both will worsen poverty because they have an adverse impact on the poverty level. Finally, financial development, the corruption perception index, the human development index, and telecommunication development are not the main factors in determining poverty alleviation because the empirical evidence does not reveal a significant correlation between them and the poverty level. Furthermore, for further research, we suggest that the researcher consider other factors that affect poverty alleviation such as political risk and/or aid dependency. In addition, it is also necessary to add variables that represent Islamic variables other than the corruption perception index variable.

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**Appendix A: Results of the Four Different Estimation Methods**

Variable	Estimation method			
	Pooled OLS	Standard FE	First Difference GMM	System GMM
lnPOV	0.9835	0.7203	0.6859	0.7430
lnPOV <sub>t-1</sub>	(0.0132)***	(0.0529)***	(0.0825)***	(0.1284)***
FDI	-0.0003	-0.0006	-0.001	-0.0016
	(0.0004)	(0.0007)	(0.0008)	(0.0008)*
FD	0.0003	0.0009	0.0018	0.0018
	(0.0001)**	(0.0004)**	(0.0041)***	(0.0020)
CPI	-0.0013	0.0007	0.0006	0.0003
	(0.0004)***	(0.0006)	(0.0008)	(0.0012)
HDI	-0.0076	-0.5091	-0.1043	-0.0568
	(0.0392)	(0.2145)**	(0.2044)	(0.1974)
lnGDP	0.0074	0.2616	0.2288	0.2114
	(0.0090)	(0.0579)***	(0.0941)**	(0.0814)***
TD	0.0027	0.0020	0.0025	0.0046
	(0.0006)***	(0.0010)*	(0.0017)	(0.0044)
TO	-0.0001	0.0001	0.0009	0.0011
	(0.000)	(0.0002)	(0.0004)**	(0.0006)*
INF	-0.0011	-0.0013	-0.0006	-0.0007
	(0.0003)***	(0.0004)***	(0.0003)**	(0.0004)*
GS	0.0018	0.0011	0.0012	0.0014
	(0.0004)***	(0.0004)***	(0.0004)***	(0.0005)***
Constant	0.1128	0.2533	0.4208	0.1107
	(0.0299)***	(0.2241)	(0.4101)	(0.4252)
No. of Obs.	160	160	144	160
R2	0.9992	0.9287		
Adj. R2	0.9992			
No. of groups		16	16	16
No. of instruments			55	64
<i>Robustness indicators</i>				
AR (1) p-value			0.0323	0.0202
AR (2) p-value			0.7865	0.7415
Sargan p-value			0.0546	0.2249

Notes: Numbers in parentheses are standard errors (SE). \*\*\*, \*\*, \* are significant at the 1%; 5% and 10% levels. OLS: ordinary least squares; FE: fixed effects; FD-GMM: first difference GMM; Sys-GMM: system GMM.

Source: Authors' calculation using data

**Appendix B: Robustness Check**

Variable	Alleviating Poverty (lnPOV)			
	Without Dummy Variable		Add Dummy Variable	
	Coefficient	Standard Error (SE)	Coefficient	Standard Error (SE)
lnPOVt-1	0.7430***	0.1284	0.7418***	0.1448
FDI	-0.0016*	0.0008	-0.0015*	0.0008
FD	0.0018	0.002	0.0019	0.0020
CORR	0.0003	0.0012	0.0002	0.0011
HDI	-0.0568	0.1974	-0.0635	0.2943
lnGDP	0.2114***	0.0814	0.2113***	0.0725
TD	0.0046	0.0044	0.0040	0.0043
TOP	0.0011*	0.0006	0.0011*	0.0007
INF	-0.0007*	0.0004	-0.0005	0.0004
GS	0.0014***	0.0005	0.0014***	0.0005
Dummy_Income Group			-0.0025	0.0979
Constant	0.1107	0.4252	0.1231	0.6137
Observations		160		160
No. of groups		16		16
No. of instruments		64		64



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Notes: \*\*\*, \*\*, \* are the significant at the 1%; 5%, and 10% level. The abbreviations stand for, OLS: ordinary least squares, FE: fixed effects; FD-GMM: first differenced GMM; Sys-GMM: system GMM.

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Source: Authors' calculation using data