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## The relationship between technology and economic growth: The moderating role of human capital

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### ABSTRACT

**BACKGROUND AND OBJECTIVES:** Most economists believe that the lack of investment in manpower is the cause of low economic growth in developing countries, and as long as these countries do not use their knowledge to improve their professional skills, the return on labor and capital will remain at a low level. This study was designed to evaluate the impact of human capital on the relationship between technological advances and economic growth in Southwest Asia within 2000 and 2018. For this purpose, the growth of internet economy in the world and the development of education for strengthening the human capital and its effect on the world economic growth were studied.

**METHODS:** The technological advances were assessed using two Components of the number of... internet users ...and the number of mobile subscribers. The scope of this research is from 2000 to 2018. The Generalized Movement Method and the EViews 10.0 software were used to test the research hypothesis through model.

**FINDINGS:** The first model showed that the significant effect of human capital on the relationship between internet and economic growth. In this model, the internet coefficient was equal to 0.357, implying that the economic growth in the studied countries would increase at a rate of 0.0357 units with the increase of the internet coefficient by one unit. Moreover, the human capital coefficient was equal to 0.0618, implying that the economic growth in the intended countries would be improve by 0.06 units with the increase of the human capital coefficient by one unit. The second model revealed the significant relationship between mobile phones and economic growth in the countries with a higher human capital involving the educated employed people. This was consistent with the results of self-correlation of fixed effects.

**CONCLUSION:** According to the results, it was concluded that human capital would moderate the relationship between internet and economic growth. Moreover, it was confirmed that the effect of education on the relationship between mobile phones and economic growth was significant.

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## INTRODUCTION

Nowadays, human capital is considered as an undeniable factor in the development of countries. Since human capital is deemed as a prerequisite for development, the speed and pace of development are dependent on the quantity and quality of efficient human resources. The effect of human capital on economic growth can be explained from many aspects. Assuming that other conditions are stable, investing in human resources may increase the productivity of individuals. Analyses suggest that this investment can lead to rise in production through transfer of new technology and its application. Thus, higher levels of human capital in the realm of education would provide more necessary grounds for using imported technology (Barghandan *et al.*, 2011). Considering the role of technology in improving the training of human resources aimed at specializing tasks, internet has a potential to make economic activities more efficient and cheaper. It also broadens social interactions while accelerating economic activities. This process can also bring benefits in different forms by promoting the business efficiency obtained through the use of online networks. From a macroeconomic perspective, internet and related technologies reduce the cost of sending and receiving information and enhance both the level of total product and the efficiency of the whole economy. Thus, the expansion of internet has been recognized and introduced as an essential principle in economic development in a knowledge-based economy (Chaharband and Momeni, 2011). Grossman and Helpman (1991) considered the innovation and advances in existing products as drivers of economic growth. Today, most of the economists believe that the lack of investment in human capital is the main reason for low level of economic growth in developing countries, and since these countries do not use their knowledge to improve their professional skills, their returns, labor and capital efficiency would remain at a low level (Souri and Mehregan, 2007). Lucas (1988) examined the relationship between total product and solo growth model and put forward the idea that the level of human capital would directly affect the production. It is also assumed that human capital is produced by different technologies, in which the focus is on manpower training (Mehregan *et al.*, 2012). According to the theoretical foundations of economic growth, Information and Communications Technology (ICT), by improving productivity and reducing costs,

has a positive effect on economic growth (Amin Rashti *et al.*, 2014). In some countries many innovations have been introduced in national accounts in order to better gauge the ICT diffusion impact. This thesis discusses how the use of ICT contributes to economic growth, also provides an insight of results from past studies carried out to confirm the productive relationship between ICT and economic growth. Many papers use industry-level data set to quantify the role of ICT in explaining productivity growth but it isn't the only way for ICT to affect the economic. New ICT makes consumers better informed about available products, product quality and prices, which mitigates problems of asymmetric information, the entry of firms is facilitated, competition and economic efficiency is boosted and the market powers of households increased (Zandieye, 2014). Iran is known as a developing country which has not succeeded to make a significant contribution to the global economic growth due to struggling with many problems such as a low level of manpower productivity, absence of expertise required for production, and failure to export competitive goods. Thus, the economic growth improvement in Iran seems to depend on efficient training of human resources as the most important infrastructure for the promotion of technology. What matters most here, is the potential of human capital to serve as a valuable investment for dynamic economic growth, which in turn improves production functions (i.e., economic growth). The purpose of this study is to investigate the effect of the role of education on the relationship between technological advances and economic growth in Southwest Asia during the period 2000 to 2018. The present study aims to answer the question that "Does human capital moderates the relationship between technology indices and economic growth?"

### *Research background*

Shidong *et al.* (2022) in a study examined the moderating role of human capital and renewable energy in promoting economic development in G10 economies: Evidence from the CUP-FM and CUP-BC methods. Thus, this study explores the impact of human Capital, renewable energy, and the interaction of both in realizing higher economic development. For empirical analysis, comparatively new panel estimation techniques were employed including "continuously updated fully modified" (Cup-FM) and "continuously

updated bias-corrected" (Cup-BC) using a panel of G-10 countries. The overall results demonstrate that human Capital and renewable energy stimulate higher economic development. Manifestly, the interaction of both variables reports a more substantial impact on economic development, implying that human capital development is a stimulus to boost the positive effects of renewable energy sources on economic growth. Based on the findings, the stakeholders are recommended to invest in human Capital and renewable energy adoption. [Ficawoyi \(2018\)](#) examined the relationship among communication infrastructures, economic growth, and access to education. Economic growth, technology (internet users and mobile subscribers), and education were assumed as dependent, independent, and moderating variables, respectively. It was finally concluded that, compared to mobile phones, internet could contribute to economic growth in the countries with better access to education. [Samati et al. \(2015\)](#), by examining the effect of industrial accumulation and urbanization on economic growth in Iran, concluded that urban savings in both industrial and non-industrial provinces had a positive and significant effect on labor productivity. [Komijani and Mahmoudzadeh \(2008\)](#) discussed the role of information and communication technology in Iran's economic growth (growth accounting approach). This was accomplished among 30 provinces (obtained from various publications of the Statistics Center of Iran) to estimate the country model and the time period on the panel data. A cross-sectional estimation was carried out on the model equations via the two-stage least squares method (2SLS), and the results showed that focusing on education, as one of the indicators of human capital, had a positive effect on the country's economic growth. [Allmran and Allmran \(2017\)](#) in a study examined the impact of information and communication technology on the economic growth in Member Countries Department of D8. The method used in the research was causal-analytical. The econometric tools used in the research are Eviews software and the econometric method used in the research is the data panel method. Pakistan, Malaysia, Egypt and Nigeria. According to the research findings, the effect of coefficients of variables based on expected theoretical foundations is also statistically significant and information and communication technology has a positive and significant effect on economic growth in these countries. [Almasi and Sepahban Ghara Baba](#)

[\(2009\)](#) studied the relationship among investment in manpower, physical investment and economic growth in Iran during 1982-2012 and reached a two-way Granger causality relationship between economic growth and human capital in short and long terms. [Pourfaraj and Issazadeh Roshan \(2010\)](#) examined the relationship among ICT, income inequality and economic growth. It was found out that the dimension and scope of education and economic growth were very wide and only a small part of them was covered in experimental studies in Iran. [Afzal et al. \(2011\)](#) in a study explored the cointegration and causality between education and economic growth in Pakistan by using time series data on Real Gross Domestic Product (RGDP), labor force, physical capital and education from 1970-1971 to 2008-2009 were used. Autoregressive Distributed Lag (ARDL) Model of Cointegration and the Augmented Granger Causality Approach given by [Toda and Yamamoto \(1995\)](#) were applied. The findings of this study also indicate the existence of the feedback causality between education and all levels of education with economic growth. Among all levels of education, general higher education causes economic growth highly and most significantly while the level of confidence of causing economic growth to school education is found to be the highest. [Chachar and Hassan \(2013\)](#) studied the mobile phone usage among American farmers and showed that mobile phones could save energy and time of the farmers and ultimately improve their income. It was claimed that mobile phones provided the farmers with an opportunity to directly communicate with market brokers and customers in order to sell their product in good price. [Moshiri and Jahangard \(2004\)](#) examined the effect of investment in communications on Iran's economic growth using the state space method. It became evident that investment in communications had a positive and significant effect on economic growth in Iran. [Asari and Aghaei khondabi \(2008\)](#) estimated the empirical growth pattern of Organization of the Petroleum Exporting Member Countries (OPEC). The relationship between ICT and economic growth of the mentioned countries was also examined using the Cobb-Douglas production function obtained from the panel data method within 1998-2004. It was concluded that there was a strong relationship between ICT and economic growth. [Zhang and Zhuang \(2011\)](#) investigated the impact of human capital components on China's economic growth using the Generalized

Method of Moments (GMM) during 1998-2008 and used various data from different provinces of China and finally reported that the effect of education at university level on economic growth was greater than that of the primary and high school education. [Shahnazi \(2012\)](#) investigated the factors affecting the production of industries with superior technology in a knowledge-based economy (panel data approach by generalized least squares method. [Katircioglu \(2009\)](#) evaluated the relationship between higher education and economic growth using the annual data of Cyprus and the Granger causality test. He revealed an indirect causality relationship between higher education and economic growth in the long term. [Najarzadeh and Rahimzadeh \(2012\)](#) measured the impact level of internet on economic growth during 1995-2010. Their results revealed that internet access and per capita expenditure had a positive effect on the GDP growth per capita. [Mohammadzadeh et al. \(2015\)](#) studied the effect of creativity on economic development in Iran, aiming to explain the relationship among science development, technology development and economic growth. The results of their study indicated a two-way relationship among science development, technology development and economic growth. The results also show that economic growth and technology development were the most influential criteria in communication network, respectively. [Tayebi et al. \(2007\)](#) evaluated the effect of foreign trade and human capital on economic growth of the member countries of the Organization of the Islamic Conference. The results indicated the positive and significant effects of human capital growth on economic growth of the member countries of the organization during the study period. Another conclusion that can be stated is that the combined relationship of each trade variable with human capital could have a positive and significant effect on economic growth. [Salmani Bishak and Ashkan \(2014\)](#) studied the effect of the export of industrial goods on economic growth in Iran. Findings show that, contrary to exogenous productivity growth, human capital could be accumulated through investment (i.e., the individuals would choose how long to invest for education by themselves). [Naderi \(2014\)](#) attempted to evaluate the effects of general education and higher education on economic growth in Iran. He employed an endogenous growth model which had been developed using the data from 1959 to 2007. The results his study confirmed that the relationship

between accumulation of human capital and accumulation of physical capital had a positive and significant effect on Iran's economic growth in the long term. [Basir \(2014\)](#) studied the impact of the accumulation of physical, human, and social capitals on economic growth. [Kenny \(2003\)](#) analyzed the effect of internet on economic growth and asserted that internet was a powerful tool with a long-term effect on the quality of life in developing countries. In the present study, it was attempted to determine if human capital, social capital, and physical capital had a two-way relationship with economic growth or not. Then the effect of sudden shocks on economy and the reaction of the above-mentioned variables to these shocks were evaluated. Ultimately, the share of each variable on changing the other variables over time was calculated. Although many studies have investigated the impact of education and technology on Iran's economic growth so far, none of them has addressed the moderating role of human capital on the relationship between technology and economic growth. In this study, the number of employed people with university education was used as an alternative to human capital because: 1) these people were directly involved in the production process, and 2) the use of other indicators, such as government spending on education, could doubtfully lead to accurate results due to the large and growing number of the unemployed people with higher education. The current study has been carried out in Sabzevar in 2020.

## **MATERIALS AND METHODS**

### *Survey design and data collection*

This work is classified as an applied study on economic issues in terms of objective. The methodology used in this study is a descriptive approach of post-event type (using past information). It falls within the correlational research category concerning the content and nature. Normally, a correlational research includes all the studies where it is intended to discover or determine the relationship between different variables using the correlation coefficient. The unit root test (variability) of the data is the first test that researchers use in estimating the model. Mana data is considered to be that over the average time, the variance of that variable is equal during the same intervals. Various tests are used to determine the unit root test, which can be referred to Levin, Lin and Chow test ([Setayesh, 2015](#)) and Augmented Dickey-Fuller(ADF) test ([Paparoditis,](#)

and Politis, 2018). The hypothesis testing model in this study, which is developed based on Ficawoyi (2018), is as Eq. 1:

(1)

$$Growth_{i,t} = \alpha + \theta_i + \phi_1 Growth_{i,t-1} + \phi_2 Techni_{i,t} + \phi_3 h.capital_{i,t} + \phi_4 (Techni * H.Capital)_{i,t} + Xi'_{i,t} \theta + \epsilon_{i,t}$$

Where, *Growth* refers to economic growth obtained through the calculation the logarithm of GDP of the selected countries at a fixed price in 2010; *Growth<sub>i,t-1</sub>* is the economic growth of the past period obtained by subtracting the economic growth of the last year from that of this year divided by the economic growth of the previous period (Lashkari 2009); *H. Capital* is the human capital variable measured using the number of employed people with academic education; *Techni* refers to the technology indices where two indices of number of internet users and number of mobile phones subscribers are used as technology measurement indicators; and *Xi* is the sum of controlling variables including: 1) Government which is the Government Consumption (GC) expenditure obtained from the ratio of final GC expenditure to GDP; 2) Investment which is obtained from the ratio of gross capital formation to GDP (Azarbayjani et al., 2009); 3) Inflation which is the rate of inflation obtained as the consumer price index (annual%) (Laspeyres price index) (Nowruzi, 2014); and 4) Openness to trade which the trade's openness obtained from the ratio of the sum of export and import of the intended country to its GDP (Dadgar and Najimeydani, 2003). The hypothesis followed in this study is as follows:

- Technology and economic growth have a significant relationship with the moderating role of human capital.

#### Data collection method

The data were collected from two library sources and the World Bank Indicators database. The library method was also utilized to collect the theoretical literature and concepts. The data on dependent variable (economic growth) and independent and control variables were extracted from the World Bank's World Development Indicators (WDI) website and then collected in Excel spreadsheets. These data were collected annually. The statistical population used in this study involved 25 countries located in the Southwest Asia. Considering the availability of the required data, 22 countries (Iran, Saudi Arabia, Kazakhstan, Pakistan, Turkey, Afghanistan, Yemen, Turkmenistan, Uzbekistan, Iraq,

Oman, Kyrgyzstan, Syria, Tajikistan, Jordan, Azerbaijan, UAE, Georgia, Armenia, Israel, Kuwait, Qatar, Lebanon, Cyprus, and Bahrain) were selected as the sample size. In collecting data related to testing hypotheses, in order to achieve the goals and ultimately answer the questions raised and the progress of this research, according to the developed model and variables studied from the World Bank Global Development Index and in some cases from Excel and Eviews 10.0 softwares were used.

#### Analytical framework

The Generalized Method of Moments (GMM) or dynamic panel data is known as an efficient econometric method which eliminates the endogeneity between dependent and explanatory variables using instrumental variables. The 2SLS econometric method has been used in many economic studies to resolve the endogeneity problem. However, this method requires finding a proper instrumental variable to solve the endogeneity problem of variables. The advantages of the Dynamic Panel Data (GMM) method are: 1) considering the individual differences and further information, and 2) eliminating the biases in cross-sectional regressions. These advantages lead to more accurate estimates with higher efficiency and less collinearity in the method (Ahmadi et al., 2016). Since in the research model, the dependent variable appears intermittently to the right of the equation, researcher is faced with a dynamic panel data pattern. In this study, Sargan test was used to evaluate the consistency of GMM estimators is. Eviews10.0 software is also used for statistical and econometric analysis. The co-integration method allows regression to be estimated based on time series variables without fear of being false. Numerous tests have been proposed to test co-integration with completely different approaches, including the Pedroni (2004) and Kao (1999) tests. The Cao test is based on the regression residual test and is similar to the parasite-granger co-integration test in time series data (Nourafshan and Jabbari Noghbi, 2012).

## RESULTS AND DISSCUSION

### The model estimation

To examine the durability of the model variables, the unit root test was performed before estimating the model in order to avoid the estimation false regression. Accordingly, the unit root test was embedded for all

the variables included in Eviews 10.0 software and the results were obtained (Table 1).

The Levin-Lin-Chou test (Setayesh, 2015) is used to perform the unit root test. All the studied variables were found to be at a durability level in the Levin-Lin-Chou test, and thus, the probability of false variables seemed to be zero, which is mentioned in the analytical framework section.

*Cointegration tests*

The cointegration test was conducted before estimating the model to avoid false regression (Table 2). Among the two tests (Kao, Pedroni) which have been developed to test the cointegration, the Kao test was selected to be used in this study. This test is mentioned in the Analytical Framework section.

According to the results, the establishment of cointegration in the model was accepted due to the Augmented Dickey-Fuller (ADF) (Paparoditis and Politis, 2018). statistic and its relevant probability. In other words, the null hypothesis of the model (the absence of cointegration) was rejected. Therefore, a long-term relationship could be noticed between the dependent variable and the independent variables. According to Table 3, the models (the first and the second models) were estimated using the Generalized Method of Moments. The technology indices (the

number of internet users and the number of mobile phones subscribers) showed a positive and significant impact on economic growth in these models. In the first model, human capital had a significant effect on the relationship between internet and economic growth. In other words, the internet user coefficient of 0.357 implied that if this coefficient increased by one unit, the rate of economic growth in the studied countries would increase at a rate of 0.0357 unit. In other words, this hypothesis is confirmed that there is a significant relationship between the number of Internet users and economic growth at the level of 5%. in fact, confirmed the hypothesis of the present study. This was also consistent with the findings of Ficawoyi (2018) and Najarzadeh and Rahimzadeh (2012). Moreover, the human capital coefficient is 0.0618 implied that if this coefficient increased by one unit, the economic growth in the studied countries would increase by 0.06 units. In this model, the human capital variable had a positive and statistically significant effect on the relationship between the number of internet users and economic growth. Moreover, the human capital coefficient in both models had a positive and significant effect on economic growth, implying that if the human capital was enhanced by one unit, the economic growth would increase by 0.43. In both models, investment and trade openness had a positive

Table 1: The reliability test

Result	Levin-Lin-Chu test		Variables / Symbols
	Critical value	Test statistics	
At the level, mana	0.0027	-2.277	Human capital
At the level, mana	0.00001	-3.71885	GDP
At the level, mana	0.0013	-3.01243	Government consumption expenditure
At the level, mana	0.0000	-4.41081	Economic growth
At the level, mana	0.0000	-0.4305	The inflation rate
At the level, mana	0.9977	2.83398	Internet users
	0.0006	0.32455	
At the level, mana	0.097	2.33786	Investment
At the level, mana	0.0009	-3.12383	Mobile subscribers
At the level, mana	0.0011	-3.06071	Commercial openness

Table 2: The cointegration test

ADF*	t-tatistic	Prob
	1. 836766	0. 0331
Residual variance		62892.46
HAC**variance		64106.14

\* Augmented Dickey-Fuller

\*\* - Heteroskedasticity- and Autocorrelation-Consistent (HAC)

Table 3: The research findings

Variables	The first model: internet users			The second model: the number of mobile phones subscribers		
	Coefficient	Statistics t	Probability level	Coefficient	Statistics t	Probability level
Growth (-1)	0.264	0.019	0.000	0.36	12.95	0.000
Internet users	0.357	0.094	0.6404	---	---	---
Human Capital	0.0618	0.069	0.5469	-0.115	5.4	0.000
Internet users Human Capital* Number of mobile subscribers	0.044	0.0009	0.7257	---	---	---
Human. Capital * Number of mobile subscribers	---	---	---	3.64e-10	1.57	11.94
Investment	0.004	0.025	0.02995	0.09	0.015	0.000
Trade	0.044	0.149	0.000	0.075	11.7	0.000
GC	-0.08	0.048	0.000	-0.15	-3.45	0.0007
Inflation	0.000	0.023	114.0	-----	-----	-----
Population growth rate	----	--	---	-0.34	-5.2	0.0000
J-statistic	108	---	---	123.11		----
Prob (J-statistic)	0.675	---	---	0.307		----

and significant effect on economic growth. However, inflation rate and GC expenditure had a negative and significant impact on economic growth. The interrupted economic growth also had a positive effect on economic growth of the current period. These findings were consistent with the results reported by Afzal *et al.* (2018) and Katircioglu, (2009). In the second model, there was a significant relationship between the number of mobile phones subscribers and economic growth. This was consistent with the results reported by Ficawoyi (2018). Moreover, a significant relationship was found between mobile phones and economic growth in the countries having more efficient human capital for the employed people with academic education. This seemed to be consistent with the results of self-correlation of fixed effects. More importantly, the interaction between mobile phones and human capital had a positive effect on economic growth. This was consistent with the results obtained by Ficawoyi (2018) and Chachar and Hassan (2013).

*Sargan test*

Sargan test is a method to detect the non-correlation of regression model error sentences and instrumental variables in econometric studies. This test was introduced by Sargan (1958). The Sargan test was utilized to confirm the validity of instrumental variables. The J-statistic and its probability level have been presented at the ending part of Table 3. If the probability level of the J-statistic was greater than 5%, the instrumental variables would have the necessary validity. However, the pvalue method was applied to ensure the validity of the instrumental variables. When the test was done, if the p value of the variable was above 5%, the instrumental variable would have the necessary validity. The extracted p value (s) of the studied variables for both models are presented in Table 4. The results of the Sargan test indicated the validity of the instrumental variables.

The result of the above table, considering the amount of statistics and the calculated probability

Table 4: The instrumental variables' p value

Model	P value
The first model	0.5173
The second model	0.6937

levels, does not reject the null hypothesis that the residual component are not correlated with the instrumental variables; Therefore, the results of the estimated coefficients are statistically confirmed. According to the findings of the Table 4, it can be said that the results obtained from model estimation showed the positive and significant effect of internet on economic growth of the studied countries. Therefore, hypothesis is confirmed, which is consistent with the findings of Ficawoyi (2018). This finding indicates that the Internet, in addition to playing a key role in promoting knowledge and awareness of the countries studied, has reduced consumerism in these countries.

### CONCLUSION

Given the growth of the Internet economy in the world today and the competition of less developed countries to gain a significant share of various commercial, industrial and agricultural markets and services and its impact on global economic growth and the role of education on it, the purpose of this study evaluate the impact of human capital on the relationship between technological advances and economic growth in Southwest Asia within 2000 and 2018. To test the hypothesis, the generalized torque method and Ives 10.0 software were used. The results showed that the Internet affects economic growth, this finding indicates that all communication tools without the Internet cannot be effective even with better training Have a significant impact on economic growth. It was also found that the transfer of the trade openness facilitates technology across borders could lead to more efficient economy, allocate resources to produce better goods in production, and increase the revenue. The relationship between the rate of population growth and economic growth was found to be negative since a low population rate could lead to an increased higher per capita income. The "GC" variable, as the government's annual consumption expenditure on goods and services, or a share of GDP, could affect the economic growth. Given the prominent role of

technology indicators in influencing the economic growth of communities, the role of human capital in enhancing the level of technology and, consequently, economic growth could not be ignored. Thus, it seemed necessary to recommend these countries to: 1) improve the economic growth by strengthening education, technology, and productivity human capital; 2) encourage the manufacturers to produce the goods and software related to information and communication technology by providing specific foreign exchange resources, including low-interest and long-term loans, and granting tax exemptions and facilities such as paying a subsidy to attend foreign exhibitions and offering appropriate discounts on transit of the exported goods; 3) help the producers and consumers in providing the required inputs and variety of goods by developing the foreign relations, increasing the import of goods and services, and reducing the tariff and non-tariff barriers to facilitate the development of the technology sector; and 4) take into account the positive and significant effect of human capital on GDP (economic growth), increase investment in this sector, and improve the quality of workforce.

### Research Limitations

In research work, like any other work, there is a possibility of disturbing factors that hinder the normal flow of affairs and affect the research results. It is obvious that the effect of these factors in some cases reduces the results of research and in some cases causes them to be more intense. The main limitations of the present study that could possibly affect the generalizability of the research results are:

- Given that the present study was conducted in some countries of Southwest Asia, so the results cannot be generalized to other developed countries;
- The existence of some conditions such as unexpected events and political conditions that affect companies (in the micro state) and the country (in the macro state), have not been considered in the present study. Therefore, caution should be exercised in generalizing the research results.



### AUTHOR CONTRIBUTIONS

M. Poorahsham, performed the literature review, questionnaire design and analyzed and interpreted the data, prepared the manuscript text, and manuscript edition.

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### CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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### ABBREVIATIONS

ARDL Autoregressive Distributed Lag

ADF	Augmented Dickey-Fuller
GC	Government consumption
GDP	Gross Domestic Product GDP
GMM	Generalized Method of Moments
ICT	Information and Communications Technology
OPEC	Organization of the Petroleum Exporting Countries
WDI	World Development Indicators
2SLS	the Two-Stage Least Squares method

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