Journal of
Renewable Energy Research and Applications (RERA)

Published online

Effect of Renewable Energy Consumption and Commercial Opening on Iran's Economic Growth

A. Fakour[1*], S. Bi Ria[2], A. Rahimifar[1]

1. Department of economy, PhD student in economics, international economics, Isfahan University, Isfahan, Iran.
2.Member of the faculty of the Office of Higher Education Extension, Ministry of Science, Research and Technology, Iran

Received Date 20 August 2022; Revised Date 18 October 2022; Accepted Date 29 October 2022
**Corresponding author: fakourali28@gmail.com (A.Fakour)*

Abstract
Countries need to use energy resources to achieve economic growth but due to the limitation of fossil energy resources such as oil and coal, the increase in the price of these resources in the recent years, as well as the resulting environmental pollution, the country's concern about the use of clean and renewable energy sources has increased. Considering the importance of using renewable energy for the sustainable economic growth of the country in the coming years and the novelty of this topic in domestic studies, therefore, in this research work, the impact of renewable energy consumption on the growth of Iran's GDP is investigated. The innovation of this research work compared to the previous studies is the use of influential variables such as fixed capital formation, employment rate, trade openness, and sanctions in addition to the variable of renewable energy consumption on the country's economic growth. In fact, in this work, the investigated model is expanded with effective variables according to Iran's economy, which has not been addressed in the previous studies. We consider time series for variables including renewable energy consumption, GDP per capita, capital formation, employment rate, trade openness, and sanctions for the time period of 2010–2020. In this research work, the vector auto-regression model with distributed intervals (ARDL) is used to estimate the relationship between the variables. The results show that there is a positive and significant relationship between renewable energy consumption, fixed capital formation, employment rate, trade openness, and GDP growth, and sanctions have had a negative and significant impact on the GDP growth.

Keywords: *Renewable Energy Consumption, Economic Growth, ARDL.*

1. Introduction

With the industrial development of the world, the increasing demand for energy, on the one hand, the limited and necessary preservation of fossil fuel resources for the future generations and the prevention of environmental damage caused by their use and, on the other hand, there is no other way but to use the renewable energy resources [3]. Energy is one of the important factors of production that plays an important role in the economic growth of countries. Most of the energy consumed comes from fossil fuels such as oil, gas, and coal. However, in the not-so-distant future, these resources will end, and there is no substitute for it. For this reason, the increase in energy consumption, along with the decrease in the amount of fossil energy resources and the increase in the price of such resources, as well as the overheating of the earth, have caused the desire to use renewable energy to increase among different countries of the world in the recent years. Among the many advantages of renewable energies, we can mention their higher efficiency, positive environmental effects, and the renewable nature of these resources. The important point in the use of renewable energy is the high cost of building power plants and technical equipment related to the production of renewable energy and the lack of technical knowledge necessary to build such facilities in such a way that most countries must either use private sector financial resources or foreign direct investment to meet its huge costs [4]. However, the benefits of renewable resources justify the costs of creating such facilities. Therefore, despite the fact that the use of renewable energy still has a small share compared to fossil energy, but gradually investment is made in creating the necessary infrastructure for the use of renewable energy such as solar energy, wind, water, and land, and the energy from these sources are increasing [4].

With rich oil and gas resources, Iran is one of the main producers of fossil fuels in the world. This issue has reduced the desire to use renewable energy in Iran. However, the biological and geographical diversity of Iran has provided a suitable platform for the use of renewable energy. However, the share of renewable energies in the country's energy portfolio is very low [30]. However, with the increase in environmental pollutants, the growth of urbanization, the development of various industries, and the lack of ability to exploit Iran's energy resources has renewable energy, it is necessary to adopt policies to reduce the consumption of fossil energy and replace it with renewable energy in order to achieve sustainable economic growth and reduce environmental pollution, so that a combination of different energies is used to be energy production [19]. According to the previous studies, we came to the conclusion that the importance of using renewable energy on the country's economic growth has not been considered as it deserves. In the previous studies, there are significant gaps related to the investigation of the impact of renewable energy consumption on Iran's economic growth, and other effective variables such as the formation of fixed capital, the employment rate, the openness of foreign trade, and especially international sanctions in this model has not been seen comprehensively. The innovation of this research, considering the importance of the subject, is a comprehensive review of all the mentioned variables, which gives a good view of the impact of renewable energy consumption on the country's economic growth.

In fact, in this work, the investigated model has been expanded with effective and real variables according to Iran's economy, which has not been addressed in previous studies, and the innovation of this study is considered compared to the previous studies. In this work, we clearly seek to investigate the relationship between renewable energy consumption, fixed capital formation, employment rate, trade openness, sanctions, and GDP growth in Iran so that we can step in line with the task of policy making and expressing the necessary economic proposals. For this reason, the purpose of this research work is to investigate the relationship between renewable energy consumption and sustainable economic growth in Iran in the period of 2010-2020. ARDL vector auto-regression model has been used for this purpose. In this research work, the background of the research and the theoretical foundations of the topic of expression and the research model and method are introduced. Then the estimation of the model and the presentation of the estimation results and the analysis of the results are done, and in the final part, the summation and conclusion are done.

2. Literature review

In this part, domestic and foreign studies conducted in the field of investigating the relationship between renewable energy consumption and economic growth are reviewed. It should be noted that, unfortunately, few studies have been conducted in Iran in this field, and the most important studies are as what follow.

In a research work, the efficiency and cost of electricity production using solar energy cells in Iran was calculated, and the effect of renewable energy consumption on the economy was investigated [31]. The other research work investigated the relationship between economic well-being and consumption of renewable energy using the auto-regression model with gradual lag (ARDL), and concluded that there was a positive relationship between these two variables [26]. Ansaripour *et al*. (2020) have investigated the demand for renewable energy in different economic sectors of Iran, and estimated the energy demand model for Iran [2].

Karimpour *et al*. (2018) have investigated the impact of renewable energy consumption on the economic growth of selected MENA countries using the panel vector auto-regression model, and concluded that renewable energy consumption had a positive effect on the economic growth of these countries [22].

In the study of renewable and non-renewable energy and its impact on economic growth for the countries of economic cooperation in Asia and the Pacific, using the hamstring test to investigate the long-term equilibrium relationships between variables and to confirm the presence of symbiosis in have examined the long-term for the period of 1990-2015, and have come to the conclusion that the stimulating role of energy in economic growth is positive and meaningful [32].

In an article entitled the impact of renewable energy on the green economy concluded that the consumption of renewable energy had a negative and significant effect on the emission of carbon dioxide gas as an indicator of the green economy in the group of countries selected in the period of 2005-2016. Also the results showed that the impact of renewable energies on the green economy in the group of selected middle-income countries was more than the group of selected high-income countries. Other results showed that economic growth and the degree of openness of

the economy had a positive and significant effect, and human capital, information technology and communication (FAVA) and the rule of law had a negative and significant effect on the emission of carbon dioxide gas as an indicator of the green economy in the group of selected countries [11].

In the study of the impact of renewable, non-renewable energy and the type of regime, on economic growth in 30 countries of Sub-Saharan Africa (SSA)4 using heterogeneous panel coordination tests and error correction tests during The period of 1980-2012 has shown that both renewable and non-renewable energies have had a positive and long-term effect on economic growth. In this way, with an increase of 0.10% in the consumption of renewable and non-renewable energy, the economic growth has increased by 0.27% and 2.11%, respectively [1].

Orihuela (2018) produced the first study on the relationship between energy usage and economic growth. This was inspired by the time's high energy prices. They used data from the United States on gross energy inputs and Gross National Product (GNP). The findings backed up the conservation concept that GNP drives energy usage. This study had a significant impact in that it resulted in the publishing of other papers all over the world. These researches employed various time spans, control variables, econometric methodologies, and so on. The outcomes differed as a result of these changes. Some of these studies proved that the causality went from energy consumption to economic growth but others demonstrated that energy consumption caused economic growth to increase. Yet, other studies showed that there was no causality between these variables, and the last group showed bi-directional causality running in both directions between the two variables [29].

Douglas and Walker (2017) provided a date-ordered chronological list of all 59 articles included in our investigation (oldest to newest). The countries that participated in the study are given in the "Countries" column. Sweidan's study, for example, included only one country [13].

Kim and Lin (2017) evaluated the energy–growth relationship for each of the six GCC nations as a group and individually; as a result, 12 observations were recorded. The total number of observations using these criteria was 267. We believe that the number of times research on these nations was conducted was a good indicator of the importance of the issue and scholarly interest in the energy–growth nexus conundrum [24]. Similarly, 267 samples were a sufficient amount to derive some reasonable findings. The time span of the data investigated in the studies is specified in the period column. Irian, for example [27].

Sadeghi *et al*. (2018) have investigated the effect of increasing renewable energy consumption on the gross national product and the environment, and concluded that renewable energy consumption had a positive effect on economic growth and carbon dioxide emissions [30].

A multitude of authors has studied the relationship between GDP and energy consumption by providing a wide range of results in terms of causality, statistically highlighting either a one-way causality, a bidirectional causality, or none. Such analysis was performed in [25] on a panel of 29 OIC countries, data period 1990-2014; in [15], on a panel of 8 east-central European countries, data period 1990-2009; in [16], on a panel of 18 emerging countries, data period 1990-2003; in [17], on a panel of top 38 countries, data period 1990-2003; in [7], on a panel of OEDC countries, data period 1990-2010; in [23], on a panel of OEDC countries, data period 1980-2012; in [21], on a panel G-7 countries, in [13\4], on a panel of developed countries in Europe, data period 1990-2011; in [8], on a panel of 100 countries, data period 1960-2000 or 1971-2000. Similar studies for the case of individual countries and for different time periods can be found for Saudi Arabia [7], for China, Turkey, Brazil, and Lithuania. On the other hand, the European and global energy system perspectives must be assessed in light of present climate change, with a special emphasis on the role of renewable technology [28]. Given these concerns, we believe that it would be useful to examine the impact of renewable energy consumption on GDP as well as the evolution of the share of renewable energy consumption in final energy consumption for EU member nations [11].

Jaradat & al-Tamimi (2022) discussed the economic impact of renewable energy on the economy of the United Arab Emirates, and concluded that there was a significant relationship between the consumption of renewable energy and the economy of the UAE [11].

Zafar and colleagues (2019) investigated the impact of renewable and non-renewable energies on the economic growth of the Asia-Pacific Economic Cooperation countries using the hamstring test for the years 1990-2015, and came to the conclusion that the role of energy in economic growth was positive and significant [32].

Adams and colleagues (2018) investigated the impact of renewable and non-renewable energy on

economic growth in 30 sub-Saharan African countries using heterogeneous panel correlation tests and error correction tests during the period of 2012-2018 [1], and have shown that both renewable and non-renewable energies have a positive and long-term effect on economic growth. In this way, with a 0.10% increase in the consumption of renewable and non-renewable energy, the economic growth has increased by 0.27% and 2.11%, respectively [22].

Inglesi-Lotz investigated the relationship between economic growth and the use of renewable energy in OECD member countries between 1990-2010 using the panel data technique, and concluded the consumption of renewable energy or the increase in their share. In the composition of the country's total energy consumption, it has had a positive and significant effect on the economic growth of the member countries of the aforementioned organization [18]. According to him, the use of renewable energies not only has a positive effect on the preservation of the environment but also has a positive effect on the economic conditions of countries [22].

Apergis and Payne (2010) in their study investigated the relationship between renewable energy consumption and economic growth for 13 European countries during the period of 1992-2007 using multivariate panel data in two panel devices with and without Russia. For both panel devices, the co-aggregation test of the heterogeneous panel indicates the existence of a long-term equilibrium relationship between real GDP and renewable energy consumption, real gross capital accumulation and labor force [4]. The results of the error correction models show a two-way causal relationship between renewable energy consumption and economic growth in both the short-term and long-term conditions [4].

Chuanguo and Xu (2009) using the threshold regression model in panel data (PTR) to investigate the threshold effects of energy prices on the development of renewable energies under systems with different economic growth rates for member countries of the Organization for Cooperation and Development. OECD economists have paid in the period of 1997-2006 [10]. Their results show that countries with high economic growth can react to high energy prices by increasing the use of renewable energy, while countries with low economic growth have less desire to change the level of renewable energy [4].

3. Methodology and data

In the case of Iran, we looked at the connection between renewable energy consumption and economics. Based on the previous research works, this work examined a range of variables including renewable energy consumption, GDP per capita, capital formation, employment, and trade openness (2021). The research work was conducted from 2010 to 2020 using annual data gathered from a variety of sources. Data on renewable energy consumption and economic growth such as GDP per capita (in constant 2010 US dollars), capital formation, and other measures. World Bank Indicators and IRENA were used to compile the data on labor market conditions. As a final step, UNCTAD's data on trade openness was culled. Table 1 breaks down the variables as follows:

Table 1. Details on variables.

Variable	Abbr.	Description
Renewable energy consumption	REC	Renewable energy consumption is accounted for in this metric because it encompasses all types of renewable energy: hydroelectricity; solid biomass; wind; solar; liquid biomass; biogas; and waste
GDP per capita (Constant 2010 US$)	GDP	Gross domestic product (GDP) divided by the midyear population (MYP) equals GDP per capita. It's calculated without taking into account things like fabricated asset depreciation or natural resource depletion and degradation. Data is in 2010 U.S. dollar constants
Capital formation	CF	A company's gross fixed capital formation includes everything from land improvements to equipment purchases to building roads, railways, and other public and private infrastructure. It also includes everything from private residential dwellings to commercial and industrial structures. The figures are in constant 2010 U.S. dollars
Employment	EMP	Employment is the total number of people employed in agriculture, manufacturing, and the service sector
Trade openness	TO	the degree to which a country is willing to engage in international trade
Virtual variable	Dsa	$\mathbf{D_{SA}}$ as a virtual variable of sanctions, which is number one for sanctions years and zero for non-sanctions years.

Source: The definitions for economic indicators are, and renewable energy consumption is based on the world bank indicators and trade openness is based on UNCTAD.

In the present model, which is shown below, the variable effect of renewable energy consumption on gross domestic production during the period of 2010-2020 is investigated. Also by doing the Granger causality test, it was found that renewable energy consumption had an effect on gross domestic production. As a result, the model was written as follows:

$$\mathbf{LGDP = a_0 + a_1LREC + a_2LCF + a_3LEMP + a_4LTO + Dsa + V_0\ [20]} \quad (1)$$

$$\mathbf{LREC = a_0 + a_1\ LGDP + a_2LC + a_3LEMP + a_4LTO + Dsa + V_0\ [20]} \quad (2)$$

By performing the Grangery causality test, it was found that the consumption of renewable energy had an effect on economic growth as a dependent variable, and the direction of the equation was the same as equation (1).

In the current model, GDP is used as a dependent variable and renewable energy consumption variables, fixed capital formation, employment rate, and free trade are used as independent variables that affect the dependent variable [20].

LREC stands for renewable energy consumption, while LGDP is the natural lograture of gross domestic product; LTO is the natural lograture of trade openness; LEMP is the natural lograture of employment; and, finally, LCF represents the natural lograture of capital formation. The residuals are presumed to be white noise with a normal distribution. Determine if the variables have a long-term relationship by performing a regression analysis, the following hypothesis (H0: d 1=d 2=d 3=0) is tested, and the F value (Wald Test) is measured [12]. To use causality analysis, you must first determine the ideal lag length. The number of lags that work best is determined by Akaike Information Criteria (AIC) and Schwatz Information Criteria (SIC) (SIC). Once you've completed the unit root test, you can use these criteria (ADF and PP).

4. Results and discussion

Checking reliability of variables

One of the important requirements in estimating economic equations with time series data and estimating the model by the conventional least squares method is to perform a reliability test. There are several methods for distinguishing stable time series from unreliable, the most important of which is the generalized Dicky-Fuller and Dicky-Fuller unit root test. Therefore, first, the reliability of the proposed model variables based on the generalized Dickey-Fuller (ADF[1]) test is examined to determine whether the regression is false or not. The null hypothesis of this test based on the unit root of time series variables based on McKinnon test statistics is examined in the following tables:

Table 2. Results of reliability.

LTO	LEMP	LCF	LREC	LGDP	Variable name
I(1)	I(0)	I(1)	I(1)	I(0)	Condition
-2.9755	-3.0855	-3.1935	-3.0165	-2.9452	Statistics
0.0492	0.0421	0.0492	0.0461	0.0421	Prob

Source: Research findings

[1] Augmented Dickey-Fuller

It is estimated using the ARDL method and annual data during 2010-2020. Before estimating the model, the stability test should be performed using the generalized Dickey-Fuller method, which was performed in the previous section to ensure that none of the stable variables are higher than one. In this case, false regression is prevented because when there are stable variables of order higher than one in the model, calculated F is not reliable and meaningful. The F test is based on the assumption that all variables in the model are I (0) or I (1). The results show that the time series are either staggered from zero and at a static level or are static with a one-time differentiation. Therefore, there is no problem in terms of the existence of variables I (2) and more, and the results can be assured. Then using the bond co-integration test, the existence of a long-term relationship in the model is examined, and the classical hypotheses test and the coefficient stability test and the presentation of a long-term relationship are discussed. Finally, the short-term relationship of the model is presented. The results of diagnostic tests and structural stability tests show that the classical assumptions for the desired estimate are established, and the coefficients are stable.

The table below shows the results of the collective test for the model under study as well as the critical values provided by Benerji, Dolado and Master for K = 6. Since the calculated quantity is higher than the critical quantity presented by Benarji, Mr. and Dolado at the 95% confidence level, H0 hypothesis is rejected. Therefore, there is a long-term relationship between dependent and independent variables. Therefore, the obtained results confirm the hypothesis of coexistence between variables in the model.

Table 3. Model convergence test results.

Statistics of maximum eigenvalues		Effect test		Special amount	Null hypothesis
critical value at the 95% level	Statistics of maximum eigenvalues	critical value at the 95% level	Effect statistics		
46.23	116.96	125.61	249.70	0.9989	r=0
40.07	51.78	95.75	132.71	0.9524	r≤1
33.87	37.64	69.81	80.91	0.8908	r≤2
27.58	22.13	47.85	43.32	0.7287	r≤3
21.13	13.27	29.79	21.11	0.5407	r≤4
14.26	7.66	15.49	7.98	0.3663	r≤5
3.84	0.24	3.84	0.25	0.0055	r≤6

Source: Research findings

Table 4. Model convergence test results.

Critical limit values (with intercept and no trend)	
10%	**5%**
3.281	**4.682**
Calculated t-statistic: t=68.99	

Source: Research findings

However, when using the ARDL (e-view) regression technique, the results showed a problem with multi-collinearity. It is necessary to look for another method of testing the relationship if the ARDL regression techniques cause issues with multi-collinearity, and the VECM test yields contradictory results. We used the OLS regression technique to examine the connection between renewable energy consumption and economic growth as an alternative approach based on.

Table 5. OLS results (LGDP – independent variable).

Prob	t statistic	Standard deviation	Coefficient	Variable name
0.0391	-3.2713	67.88396	1.734	LREC
0.0085	-4.3729	16797.32	6.932	LCF
0.0029	-6.3720	12.81698	4.210	LEMP
0.0076	-4.3717	43.46654	2.612	LTO
0.0019	-6.2719	14.75320	-27.201	Dsa

Source: Research findings

As it is clear from the table above, there is a significant and positive relationship between renewable energy consumption and gross domestic production so that with a 1% increase in the amount of renewable energy consumption, the amount of gross domestic production has increased by 1.734%. Also there is a significant and positive relationship between gross domestic product and variables of capital formation, employment rate, and trade openness. However, there is a negative and significant relationship between sanctions and GDP.

5. Conclusion

This research work aimed to investigate the causal relationship between renewable energy consumption, fixed capital formation, employment rate, trade openness, sanctions, and GDP growth in Iran for the period of 2010-2020. The ARDL program (e-views) was used to perform a standard analysis to verify this relationship and determine its dimensions and the country's dependence on renewable energy and its impact. The results showed that there was a statistically significant relationship between renewable energy consumption and economic growth in Iran. This does not mean that Iran has been affected by the consumption of renewable energy for the growth of its economy. Considering the increasing use of greenhouse gases and the resulting environmental problems, it is thought that renewable energies will replace fossil energies in a 50-year period, so attention to this sector should be more on the agenda. According to the results of the model and the positive effect of renewable energy consumption, fixed capital formation, trade openness, and employment rate on Iran's economic growth, it is suggested that:

- The development of the use of new energies should be considered as a basic principle, and proper investment should be made in this field in the country.
- Identify and evaluate the suitable geography in the country for investment and exploitation of new energies such as solar energy, and wind energy, and clarify the economic justification of these areas for investors.
- The fields of foreign investment and formation of fixed capital should be facilitated, and additional administrative bureaucracies should be avoided.
- In order to invest more in renewable energy, incentives such as subsidies and tax exemptions should be applied to companies active in this field.
- By using active economic diplomacy, the areas of increasing foreign trade and trade liberalization should be put on the agenda.
- The roadmap for the development and application of renewable energies for a long-term time horizon can be seen in the country's supreme documents.
- The knowledge-based companies active in the field of renewable energy should be facilitated, and the necessary financing should be considered for these companies, especially for the growth of their research and development sector.

Also for future studies, it is suggested to analyze the economic and financial evaluation of power plants and renewable projects for susceptible geographical areas.

6. References

[1] Adams, S., Klobodu, E. K. M., and Apio, A. (2018), "Renewable and non-renewable energy, regime type and economic growth", Renewable Energy, No. 125, pp. 755-767.

[2] Ansaripour. S., Noorollahi. Y., Yousefi. Y., and Golshanfard. A. (2020). An investigation on effective factors of energy demand utilized in sustainable development planning, Scientific Quarterly Journal of Renewable and New Energies, 8(1), pp. 63-69 (in Persian).

[3] Alayi, R. and Jahanbin, F. (2020). Generation management analysis of a stand-alone photovoltaic system with battery. Renewable Energy Research and Application, 1(2), 205-209.

[4] Apergis, N. and Payne, J. E. (2011), "Renewable and Non-Renewable Energy Consumption-Growth Nexus: Evidence from a Panel Error Correction Model", Energy Economics, Vol. 88, pp. 5226-5230.

[5] Arbab, H. R., Emami-Meibodi. A., and Rajabi-Ghaderi. S. (2015). The relationship between renewable energy consumption and economic growth in selected OPEC countries, Iranian energy economy research journal, 6(23), pp. 29-56 (In Persian).

[6] Barro, R.J. and Lee, J.W. (2013), A new dataset of educational attainment in the world, 1950-2010. Journal of Development Economics, 104, 184-198.

[7] Becker, S., Boeckh, K., Hainz, C., and Woessmann, L. (2016), The empire is dead, long live the empire! long-run persistence of trust and corruption in the bureaucracy. The Economic Journal, 126(590), 40-74.

[8] Cabrales, A. and Hauk, E. (2011), The quality of political institutions and the curse of natural resources. The Economic Journal, 121(551), 58-88.

[9] Cavalcanti, T., Mohaddes, K., and Raissi, M. (2011), Growth, development and natural resources: New evidence using a heterogeneous panel analysis. The Quarterly Review of Economics and Finance, 51(4), 305-318.

[10] Chuanguo Zhang, C. and J. Xu (2012), "Retesting the Causality Between Energy Consumption and GDP in China: Evidence from Sectorial and Regional Analyses Using Dynamic Panel Data", Energy Economics, No. 34, pp. 1782-1789.

[11] Daneshvari, Samia; Salatin, Parvaneh and Mohammad Khalilzadeh (2018), "Effect of renewable energies on green economy", Environmental Science and Technology, Volume 21, Number 12, March 2018.

[12] Dogan, E., Altinoz, B., Madaleno, M., Taskin, D. (2020), The impact of renewable energy consumption to economic growth: A replication and extension of. Energy Economics, 90, 104866.

[13] Douglas, S., Walker, A. (2017), Coal mining and the resource curse in the eastern United States. Journal of Regional Science, 57(4), 568-590.

[14] Eregha, P.B. and Mesagan, E. (2016), Oil resource abundance, institutions, and growth: Evidence from oil producing African countries. Journal of Policy Modelling, 38(3), 603-619.

[15] Faria, H., Montesinos-Yufa, H.M., Morales, D.R., and Navarro, C.E. (2016), Unbundling the roles of human capital and institutions in economic development. European Journal of Political Economy, 45, 108-128.

[16] Haapanen, L. and Tapio, P. (2016), Economic growth as phenomenon, institution and ideology: A qualitative content analysis of the 21st century growth critique. Journal of Cleaner Production, 112, 3492-3503.

[17] Inglesi-Lotz, R. (2016), "The Impact of Renewable Energy Consumption to Economic Growth: A Panel Data Application", Energy Economics, Vol. 53, pp. 58–63.

[18] International Country Risk Guide (2019). International country risk guide. Available at: https://epub.prsgroup.com/products/icrg

[19] Ismail Nia, A. and Hamza Khani. A. (2010), Economic Review of the Use of Coal for Power Generation in Iran, Scientific Extension Journal of Development Strategy, 24: pp. 200-168 (in Persian).

[20] Jaradat, M.S. and AL-Tamimi, K.A.M. (2022). Economic Impacts of Renewable Energy on the Economy of UAE, International Journal of Energy Economics and Policy,12(1), pp.156-162.

[21] Ji, K., Magnus, J., and Wang, W. (2014), Natural resources, institutional quality, and economic growth in China. Environmental and Resource Economics, 57(3), 323-343.

[22] Kakanov, E., Blöchliger, H., and Demmou, L. (2018), Resource Curse in Oil Exporting Countries, OECD Working Paper No. 1511.

[23] Karimpour, S., Shakeri Bostanabad. R., and Ghasemi, A. (2020). The Effect of Renewable Energy Consumption on the Economic Growth of Selected Countries in the MENA Region: Application of the Panel Vector Autoregressive Model (Panel VAR), Iranian energy economy research journal, 8(32), pp.105-136 (in Persian).

[24] Kim, D. and Lin, S.C. (2017), Human capital and natural resource dependence. Structural Change and Economic Dynamics, 40, 92-102.

[25] Moradbeigi, M. and Law, S.H. (2017), The role of financial development in the oil-growth nexus. Resources Policy, 53, 164-172.

[26] Noorani, A., Rahimi, M., and Mirbagherijam, M. (2021). Survey the Effect of Types of Renewable and Non-renewable Energies Consumption on Economic Welfare in Iran, Scientific Quarterly Journal of Renewable and New Energies, Scientific Quarterly Journal of Renewable and New Energies, 9(1), pp.61-68 (in Persian).

[27] Okada, K. and Samreth, S. (2017), Corruption and natural resource rents: Evidence from quantile regression. Applied Economics Letters, 24(20), 1490-1493.

[28] Organization of Petroleum Exporting Countries (OPEC). (2019), Kuwait. Available from: https://www.opec.org/opec_web/en/about_us/165. httm. [Last accessed on 2019 Jun 14].

[29] Orihuela, J.C. (2018), Institutions and place: Bringing context back into the study of the resource

curse. Journal of Institutional Economics, 14(1), 157-180.

[30] Sadeghi, K., Sojoodi, S., and Ahmadzadeh-Deljavan, F. (2015). The impact of renewable energy on Iran's economic growth and environmental quality, Quarterly Journal of Energy Planning and Policy Studies, 3(6), pp.171-202 (in Persian).

[31] Shateri Aliabad, Y. Ebazadeh, R., Iswanto Suwarno, A. Najafi, and S.Ollah M. (2022). Economic analysis and energy utilization of renewable energy to supply electric charge with approach of storage resources, Renewable Energy Research and Applications, 3(2), pp.183-190 (in Persian).

[32] Zafar, M. W., Shahbaz, M., Hou, F., and Sinha, A. (2019), "From nonrenewable to renewable energy and its impact on economic growth: the role of research & development expenditures in Asia-Pacific Economic Cooperation countries", Journal of cleaner production, No. 212, pp. 1166-1178.