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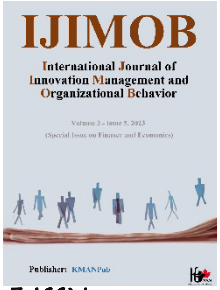

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Examining the Impact of Renewable Energy on the Economy Using the ARDL Method

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A B S T R A C T

Objective: With the continual increase in the global population and the limited availability of energy resources, energy consumption has become a concern for all countries. Today, renewable energies have made it possible to utilize all natural potentials for energy production. However, a comprehensive examination in this field must be conducted to meet the country's energy needs and identify all areas for exploiting renewable energies. Subsequently, the creation of infrastructure and suitable environments for the exploitation, development, and provision of energy becomes significantly important. The results indicate that there is an asymmetric relationship between economic growth, energy consumption, and financial development, such that in the long and short term, a positive shock in energy consumption and financial development has led to a decrease in economic growth. The positive shock in energy consumption shows that producers' efforts to reduce energy consumption cause a reduction in economic growth in the short term.

Methodology: This research investigates the impact of renewable energies on the economy using the ARDL method.

Findings: The first objective of this issue is to minimize the construction costs of regional warehouses in Tehran under various scenarios, and the second objective is to minimize the costs of supply, maintenance of goods in regional warehouses; minimize the costs of sending and maintaining goods in the central warehouse; minimize the costs related to sending goods to demand points, and minimize the costs related to leftover goods in each region at the end of each period.

Conclusion: The results show that the designed model optimizes the logistics costs of relief and rescue.

Keywords: *Economic growth, Renewable energy, ARDL.*

1 Introduction

Today, the importance of exploiting and utilizing these energies is such that it has become one of the competitive fields among numerous countries. As a result, access to the necessary and essential technologies for production and utilization of these energies is considered a significant success for societies. With the depletion of fossil fuels, the importance of these energies has increased, and the ongoing vitality of a country dynamically depends on them. In fact, it can be said that the development of the use of new energies can play a crucial and fundamental role in enhancing the security level of a country's energy system. In Iran, electricity is one of the energy sources in most economic sectors and sub-sectors, with demand increasing alongside population growth, urbanization, and the expansion of economic activities (Alkhateeb & Mahmood, 2019; Karimpour et al., 2021; Shahbaz et al., 2017).

Among the major crises threatening human societies, the limitation of non-renewable energy resources, or fossil energies, and the increase in environmental pollution resulting from excessive use of these fuels can be noted. In light of these problems, not only will Earth's natural resources soon be exhausted, but irreversible damage will also be inflicted on the natural body of the planet. Many researchers and scientists see the use of renewable energy resources as a solution to these crises (Alper & Oguz, 2016; Ghazouani et al., 2020; Shahnazi et al., 2017).

Two major challenges, economic recession and the increasing need for decarbonization, have caused the economies of countries to be affected by these problems. This has led nations worldwide to seek ways to increase economic productivity while reducing greenhouse gas emissions. Therefore, it can be said that renewable energies are the best way to meet the growing energy demand and have a high capacity to improve the energy-related economy. There is a close relationship between the economy and the issue of energy. One of the contemporary discourses in international law is the creation of a green economy (Karimpour et al., 2021; Keshavarzian & Tabatabaiie Nasab, 2021). The main goal of a green economy is to reduce greenhouse gas emissions globally; thus, the use of renewable energies can be seen as a pathway to achieving a green economy. Economic growth is one of the primary objectives of economic policy-making, such that achieving sustainable economic growth, meaning increasing the potential productive capacity, is regarded as one of the main goals of economic policies in most countries around the world. The role of electricity in economic development is such that in addition to increasing the productivity of production factors, it will also improve living standards (Alper & Oguz, 2016; Ghazouani et al., 2020).

Today, sustainable energy supply is considered an indispensable input for economic activities in aiding the process of sustainable development. The limitation of existing fossil energy resources in the world, the absorption and purification of pollutants resulting from the consumption and combustion of fossil fuels, the continuous changes in production technologies, and the existence of national and international requirements related to the consumption of these resources have led the global community to pursue the expansion of renewable and sustainable energies to meet their needs. The expansion of renewable energies in the production sectors and increasing the efficiency of suitable energy supply sources play a significant role in the continuation of the development of economic activities (Aklin et al., 2016; Sepahvand & Mehrabi, 2017).

In recent decades, urbanization and the accelerating pace of industrialization have significantly increased the energy consumption trend. Energy consumption forecasts between 2000 and 2030 estimate an increase of two to three times the current situation, and in some alternative and environmentally friendly scenarios, global energy consumption in the next 30 years will exceed 50% of the current situation. If the world's population increases to 9.3 billion people by 2050, the required energy will be six times the energy supplied in 2000. Currently, over 80% of the world's commercial energy consumption is supplied by non-renewable fossil fuels such as oil, natural gas, and coal, which are continuously decreasing (Shahbaz et al., 2017; Shahbaz & Lean, 2012; Shahbaz, Mahalik, et al., 2016; Shahbaz, Mallick, et al., 2016).

One of the energy sources whose global demand is also increasing is electricity. Environmental issues arising from the use of fossil fuels, one of today's global problems, have led to an increased tendency of the global community towards the use of fuels with less pollution and healthier options like electricity. In addition to this, the growing trend of technology, industrial productions, urbanization, and increasing public welfare levels have increased the demand for electricity (Lin & Liu, 2016; Lin & Wang, 2019).

Energy is a common mediator and an accelerating factor in the production process and is considered an indispensable factor in the economy. Brandt and Wood (1975) see the increase in energy consumption as contingent on the

IJIMOB
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economic growth process and view the relationship in reverse (Berndt & Wood, 1975). Energy holds a large share of global trade, and its fluctuations impair the economic growth of countries. Some researchers, such as Sadorsky (2010), introduce financing methods in investing in energy storage technologies as a tool to control fluctuations (Sadorsky, 2010). Energy storage technologies are technological advancements that reduce energy consumption for a specific amount of production, thereby decreasing energy intensity compared to the income effect of energy consumption (Keshavarzian & Tabatabaiie Nasab, 2021; Koščak Kolin et al., 2021).

Renewable energies comprise a variety of different resources. These energies, which originate from accessible natural resources, are always available and are not considered finite like fossil fuels. The use of these energies reduces the consumption of oil products and environmental pollutants and also increases employment and economic revenues. With the continuous increase in the world's population and the limited availability of energy resources, energy consumption has become a concern for all countries. Today, renewable energies have made it possible to utilize all natural potentials for energy production. However, a comprehensive examination in this field must be conducted to meet the country's energy needs and identify all areas for exploiting renewable energies. Subsequently, the creation of infrastructure and suitable environments for the exploitation, development, and provision of energy becomes significantly important. For this purpose, this research investigates the impact of renewable energies on the economy using the ARDL method.

2 Methods and Materials

2.1 Methodology

This study, given its nature and objectives, is applied and in terms of variable control, it is a non-experimental, descriptive-correlational research. The research is conducted in an inductive comparative framework, and the data used are event-based. This study examines the economic data of Iran from 1986 to 2021. The data sources include the Statistical Center of Iran, the Central Bank of the Islamic Republic of Iran, and the Ministry of Energy, with the ARDL method employed for estimating the desired models. It is noteworthy that the Eviews12 software was used for model estimation.

The research model follows studies such as Vilanthenkoodat and Mahalik (2021), Wang et al. (2021), and Qazouni et al. (2020) and is represented as follows:

$$\ln EG_t = \beta_0 + \beta_1 \ln EC_t + \beta_2 \ln FD_t + \beta_3 \ln FDI_t + \beta_4 \ln K_t + \beta_5 \ln L_t + \beta_6 \ln TO_t + \beta_7 \ln PO_t + \beta_8 HDI_t + \beta_9 Dum_t + \mu_{it}$$

Where in the model:

EG = Economic growth (GDP growth rate changes), K = Capital (capital formation), L = Labor (employed workforce), FDI = Foreign direct investment (percentage of GDP), HDI = Human Development Index, PO = Population (total population), FD = Financial development index (ratio of bank facilities granted from GDP), TO = Economic openness (trade to GDP ratio), and Dum = Dummy variable (number 1 for sanction years and 0 otherwise) for economic sanctions. In this study, logarithmic forms of the variables are used.

According to various estimations from the model and studies by Shahbaz (2012), it has been proven that the logarithmic model provides the best results; hence, all variables in the model are taken in their natural logarithmic form. In this review, using the ARDL approach, which statistically is a better and more significant method for determining cointegration relationships in small samples (Shahbaz & Lean, 2012). While the Johansen technique requires large samples to validate its results. Based on the study by Pesaran et al. (2001), using the autoregressive distributed lag method with appropriate lags, long-term consistency coefficients among the desired variables in a model can be obtained. In this method, optimal lags for each variable are selected using criteria such as the Schwarz-Bayesian (SBC), Akaike (AIC), Hannan-Quinn (HQC), or the adjusted R-squared (Sepahvand & Mehrabi, 2017).

3 Findings and Results

Descriptive results seen in Table 1 show that during the years 1981 to 2020, the average economic growth was 2.776% with a standard deviation of 6.895, indicating that although Iran's economic growth was approximately 3% annually during this period, the high standard deviation suggests high variability. Additionally, the average national electricity consumption was 118,188 million kWh with a standard deviation of 81,682. Other variables' descriptions are visible in the table, with financial development having a positive skewness while the Human Development Index, labor force, and population exhibit negative skewness, and

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other studied variables show better averages and positive skewness in recent decades.

Table 1

Descriptive Indices of Research Variables

Variable	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
Electricity Consumption (million kWh)	18,234	287,379	118,188	81,682	2.047	0.568
Economic Growth (%)	-10.206	27.210	2.776	6.895	5.525	0.899
Financial Development (billion Rials)	41,880	2,357,000	485,096	668,621	3.461	1.367
Foreign Direct Investment (% GDP)	-0.289	2.736	0.437	0.623	6.268	1.697
Human Development Index	0.550	0.798	0.677	0.084	1.534	-0.163
Capital (billion Rials)	3,126,699	8,542,407	5,484,691	1,961,146	1.603	0.450
Labor Force (number)	11,149,000	27,167,000	19,192,000	5,113,000	1.572	-0.056
Population (number)	38,650,246	82,413,771	63,706,899	12,282,018	2.212	0.413
Economic Openness	0.047	0.191	0.108	0.049	1.531	0.324
Dummy Variable	0	1	0.400	0.496	1.166	0.408

The first step in regression estimation is ensuring the stationarity of variables to ensure the validity of ordinary t and F statistics and to prevent spurious regression estimation. Cointegration indicates the existence of a long-term equilibrium relationship that the economic system moves towards over time. In the current study, the stationarity of model variables is tested using common tests such as the Augmented Dickey-Fuller (ADF). Table 2 presents the results of the Augmented Dickey-Fuller unit root test performed using Eviews software.

Table 2

Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	Level	First Difference	Status
Value Statistic	Significance Level	Value Statistic	Significance Level
Electricity Consumption	-4.862	0.000	-
Economic Growth	-6.088	0.000	-
Financial Development	0.810	0.993	-3.407
Foreign Direct Investment	-2.079	0.253	-6.106
Human Development Index	-0.686	0.838	-6.218
Capital	-0.457	0.884	-2.695
Labor Force	-2.369	0.156	-3.358
Population	-3.164	0.030	-
Economic Openness	-1.575	0.485	-5.289

Based on the results of Table 2, the variables of electricity consumption, economic growth, and population are stationary at level, i.e., they are integrated of order zero. On the other hand, variables such as financial development, FDI, Human Development Index, capital, labor force, and economic openness are non-stationary at level but become stationary after first differencing, meaning they are integrated of order one. Therefore, according to the unit root test results, there is no restriction on using the ARDL model since this model does not require variables to be of the same order of integration and allows for the selection of an appropriate model without bias using economic theories.

According to the Schwarz-Bayesian Information Criterion, the maximum optimal lag length for the model under study is selected as 4. This criterion is used because it conserves degrees of freedom, thus being very suitable for small samples. In estimating the model with the ARDL pattern, the long-term model is presented first. Ultimately, the optimal model with ARDL lags (4,0,1,0,1,0,0,0,0,1) has been estimated as the best model.

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Table 3

Estimation Results of the Short-term Linear ARDL Model (4,0,1,0,1,0,0,0,0,1)

Variable	Coefficient	Standard Deviation	t-Statistic	Significance Level
First lag logarithm of economic growth	-0.518	0.156	-3.305	0.003
Second lag logarithm of economic growth	-0.147	0.138	-1.059	0.303
Third lag logarithm of economic growth	-0.301	0.146	-2.058	0.054
Fourth lag logarithm of economic growth	-0.379	0.121	-3.135	0.005
Logarithm of electricity consumption	8.560	3.854	2.221	0.039
Logarithm of financial development	0.194	0.678	0.286	0.777
First lag logarithm of financial development	1.435	0.719	1.995	0.061
Logarithm of foreign direct investment	-0.047	0.280	-0.169	0.867
Logarithm of capital	11.998	8.115	1.478	0.156
First lag logarithm of capital	-22.768	8.283	-2.748	0.013
Logarithm of labor force	-1.247	2.973	-0.419	0.679
Logarithm of economic openness	-0.187	0.575	-0.326	0.748
Logarithm of population	-8.788	6.022	-1.459	0.161
Logarithm of Human Development Index	-0.297	3.411	-0.087	0.931
Dummy variable	-0.076	0.245	-0.313	0.757
First lag dummy variable	-0.763	0.228	-3.333	0.003
Intercept	229.175	124.259	1.844	0.081
Time trend	-0.240	0.195	-1.228	0.234

According to the results in Table 3, in the short term, the first, third, and fourth lags of economic growth have a significant negative effect on economic growth. Electricity consumption shows a significant positive effect on economic growth, with the estimated coefficient of 8.560, significant at the 95% level. It can be said that in the short term, with an increase in electricity consumption, economic growth increases by 8.560%. The major consumption of electricity in the country is in the industrial and agricultural sectors, which play an important role in the country's production. Thus, an increase in electricity consumption can be considered an increase in production level and consequently, economic growth. Financial development with one time lag affects economic growth significantly, with an estimated coefficient of 1.435, significant at the 90% level. Liquidity injection into the country's production sector can be equated with financial development. With liquidity entering the production sector and strengthening this sector, it is not far-fetched that this liquidity injection in the form of facilities will lead to more production, albeit with a time lag. Economic sanctions also show a negative effect with a time lag on economic growth, with the estimated coefficient of -0.763, significant at the 99% level, and the R-squared of 0.847, indicating that the explanatory variables have been able to explain 84.7% of the variations in economic growth.

After estimating the short-term relationship and before estimating the long-term relationship, it is necessary to estimate the error correction model (ECM). These models establish a connection between short-term fluctuations of variables and their long-term equilibrium values. Using these models, the forces effective in the short term and the speed of approaching the long term are measured.

Table 4

Estimation Results of the Short-term Linear ARDL Model (1,1,0,0,0,0,0,0,0)

Variable	Coefficient	Standard Deviation	t-Statistic	Significance Level
Intercept	229.175	17.724	12.928	0.000
Time trend	-0.240	0.018	-13.065	0.000
First difference logarithm of economic growth	0.828	0.129	6.395	0.000
Second difference logarithm of economic growth	0.681	0.102	6.620	0.000
Third difference logarithm of economic growth	0.379	0.067	5.662	0.000
Difference in logarithm of financial development	0.194	0.411	0.472	0.642
Difference in logarithm of capital	11.998	2.902	4.134	0.000
Difference in dummy variable	-0.076	0.131	-0.584	0.565
Error correction term	-2.346	0.181	-12.916	0.000
R-squared	0.922	Adjusted R-squared	0.900	F-statistic

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According to Table 4, it is observed that financial development also has a short-term effect on economic growth, but its coefficient is positive. Furthermore, the error correction coefficient (ECM) is statistically significant and negative, indicating that each period corrects a percentage of the short-term disequilibrium of economic growth to achieve long-term equilibrium; in other words, this coefficient shows how many periods it takes for economic growth to return to its long-term trend. The estimated coefficient is -2.346. Given this estimated coefficient, it can be said that economic growth is diverging from the short-term relationship towards long-term equilibrium.

Before estimating the long-term relationship, it is necessary to test the possibility of a long-term relationship. For this purpose, the Bounds test is used.

Table 5

Bounds Test for Linear Model

Test Statistic	Value	Significance Level	I(0)	I(1)
t-test	-7.704	10%	-3.13	-4.82
		5%	-3.41	-5.15
		1%	-3.96	-5.79

According to the results of Table 5, the test statistic value of -7.704 is greater than all listed thresholds at the 1%, 5%, and 10% levels. Therefore, the null hypothesis is rejected, suggesting the existence of a long-term relationship.

Table 6

Estimation Results of the Long-term Linear ARDL Model

Variable	Coefficient	Standard Deviation	t-Statistic	Significance Level
Logarithm of electricity consumption	3.647	1.593	2.289	0.034
Logarithm of financial development	0.694	0.358	1.935	0.068
Logarithm of foreign direct investment	-0.020	0.119	-0.169	0.867
Logarithm of capital	-4.589	1.453	-3.157	0.005
Logarithm of labor force	-0.531	1.249	-0.425	0.675
Economic openness	-0.080	0.250	-0.319	0.753
Population	-3.745	2.433	-1.539	0.141
Logarithm of Human Development Index	-0.126	1.458	-0.086	0.937
Dummy variable	-0.358	0.141	-2.537	0.020

Table 6 shows the long-term effects of various economic and demographic variables on economic growth. The results indicate significant negative impacts of capital and a dummy variable, whereas electricity consumption shows a positive and significant effect. The coefficients for other variables like financial development and foreign direct investment are not significant, highlighting their limited long-term impact on economic growth according to this model.

4 Discussion and Conclusion

Due to the scarcity and limitation of resources, particularly energy, and its extensive role and importance in the supply chain both as a final product for consumers and as a production factor in manufacturing products, the factors influencing energy demand have become a focus for policymakers and economists. In this article, electricity consumption and financial development's impact on economic growth are examined using the ARDL technique and Granger causality. The time series results from the study period confirm cointegration among these series, with financial development and economic growth having a significant and positive impact on electricity consumption both in the short and long term. There is unidirectional causality: from financial development to electricity consumption, from electricity consumption to economic growth, and bidirectional causality: from financial development to economic growth. Thus, economic growth and electricity consumption in the Iranian economy are bolstered by financial development. Therefore, based on the results obtained, special attention should be paid to electricity consumption, which is a significant factor in economic growth. Additionally, financial development could provide a suitable context for the optimal allocation of resources and increase capital efficiency. In other words, the

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main channel of positive impact and transmission from financial development to economic growth, comparatively, is through increasing capital efficiency rather than increasing investment. In this case, it can be expected that even in a society where financial development reduces the volume of savings, but leads to increased capital efficiency, it can enhance economic growth; conversely, if in a country financial development leads to an increase in the volume of savings and investment but cannot enhance capital efficiency, it will not affect economic growth, and this is important for the formulation of macroeconomic policies aimed at financial development to be considered by policymakers in these countries. Studies also demonstrated such a result in relation to the consumption of petroleum products and economic growth in Iran (Keshavarzian & Tabatabaiie Nasab, 2021; Savari et al., 2020; Shahnazi et al., 2017). With the growth of financial development in Iran, energy consumption increases; therefore, it is recommended that investment to increase financial development in Iran should be directed towards employing new technology for the use of clean energies to both meet the increasing energy needs and control environmental pollution further. Thus, the impact of increasing financial development and economic growth on energy consumption causes increased use of energy, and policymakers should seek a mechanism to address the rising demand for energy following the increase in the variables studied in the research, noting that without a coherent plan, achieving this goal by the Sixth Development Plan and the 2025 horizon becomes impossible. Moreover, the results obtained are similar to those obtained for Tunisia and Lebanon (Jalil & Feridun, 2011; Shahbaz et al., 2017; Shahbaz & Lean, 2012; Shahbaz, Mahalik, et al., 2016; Shahbaz, Mallick, et al., 2016).

If the policymakers' long-term goal is to improve economic growth, it is suggested to avoid any contractionary policies in the realm of electricity consumption that would lead to a reduction in demand and subsequently a decrease in production, so as not to prevent achieving planned and desired economic growth due to the shortage of this significant and influential factor. It is recommended that a policy for managing electricity demand and adjusting its price be employed to increase easy and inexpensive access for productive sectors like industry, and it is necessary to focus on achieving sustainable development goals by providing electricity through nuclear technologies and renewable resources. In this way, by saving on the consumption of fossil fuels in power plants, the necessary conditions for the production and export of high-value-added petroleum derivatives and raw energy exports for earning foreign currency revenues are provided, and in line with the results of the article, it is suggested that planning to increase the country's electricity production capacity pay more attention to alternative programs such as focusing more on financial development along with increasing the power industry's production capacity. Additionally, leveraging financing of economic growth towards activities with higher added value that have lower electricity consumption relative to similar industrial activities can also be a significant factor in controlling electricity consumption.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

References

Aklin, M., Cheng, C.-y., Urpelainen, J., Ganesan, K., & Jain, A. (2016). Factors affecting household satisfaction with electricity supply in rural India. *Nature Energy*, *1*(11), 16170. https://doi.org/10.1038/nenergy.2016.170

IJIMOB
E-ISSN: 3041-8992

Alkhateeb, T. T., & Mahmood, H. (2019). Energy Consumption and Trade Openness Nexus in Egypt: Asymmetry Analysis. *Energies*, *12*(10).

Alper, A., & Oguz, O. (2016). The role of renewable energy consumption in economic growth: Evidence from asymmetric causality. *Renewable and Sustainable Energy Reviews*, *60*, 953-959. https://doi.org/10.1016/j.rser.2016.01.123

Berndt, E. R., & Wood, D. O. (1975). Technology, prices, and the derived demand for energy. *The Review of Economics and Statistics*, 259-268. https://www.jstor.org/stable/1923910

Ghazouani, T., Boukhatem, J., & Yan Sam, C. (2020). Causal interactions between trade openness, renewable electricity consumption, and economic growth in Asia-Pacific countries: Fresh evidence from a bootstrap ARDL approach. *Renewable and Sustainable Energy Reviews*, *133*, 110094. https://doi.org/10.1016/j.rser.2020.110094

Jalil, A., & Feridun, M. (2011). The impact of growth, energy and financial development on the environment in China: A cointegration analysis. *Energy Economics*, *33*(2), 284-291. https://doi.org/10.1016/j.eneco.2010.10.003

Karimpour, S., Shakeri Bostanabad, R., & Ghasemi, A. (2021). 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). *Journal of Iranian Energy Economics*, *8*(32), 99-129. https://www.magiran.com/paper/2313040

Keshavarzian, M., & Tabatabaiie Nasab, Z. (2021). Analysis of the Relationship between Electricity Consumption and Economic Growth in OPEC Member Countries: Bootstrap Panel Causality Test Approach. *Quarterly Energy Economics Review*, *17*(69), 1-21. https://www.magiran.com/paper/2325460

Koščak Kolin, S., Karasalihović Sedlar, D., & Kurevija, T. (2021). Relationship between electricity and economic growth for long-term periods: New possibilities for energy prediction. *Energy*, *228*, 120539. https://doi.org/10.1016/j.energy.2021.120539

Lin, B., & Liu, C. (2016). Why is electricity consumption inconsistent with economic growth in China? *Energy Policy*, *88*, 310-316. https://doi.org/10.1016/j.enpol.2015.10.031

Lin, B., & Wang, Y. (2019). Inconsistency of economic growth and electricity consumption in China: A panel VAR approach. *Journal of Cleaner Production*, *229*, 144-156. https://doi.org/10.1016/j.jclepro.2019.04.396

Sadorsky, P. (2010). The impact of financial development on energy consumption in emerging economies. *Energy Policy*, *38*(5), 2528-2535. https://doi.org/10.1016/j.enpol.2009.12.048

Savari, A., Fatrus, M. H., Haji, G., & Najafizadeh, A. (2020). Asymmetric analysis of the effect of energy consumption and financial development on economic growth in Iran: Application of nonlinear ARDL method. *Quarterly Journal of Quantitative Economics*, *17*(3), 69-90. https://www.magiran.com/paper/2188833

Sepahvand, E., & Mehrabi, H. (2017). Investigating the Impact of Agricultural Mechanization on the Food Security of Rural Families In Iran. *Iranian Journal of Agricultural Economics and Development*, *47*(3), 609-618. https://www.magiran.com/paper/1646762

Shahbaz, M., Hoang, T. H. V., Mahalik, M. K., & Roubaud, D. (2017). Energy consumption, financial development and economic growth in India: New evidence from a nonlinear and asymmetric analysis. *Energy Economics*, *63*, 199-212. https://doi.org/10.1016/j.eneco.2017.01.023

Shahbaz, M., & Lean, H. H. (2012). Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. *Energy Policy*, *40*, 473-479. https://doi.org/10.1016/j.enpol.2011.10.050

Shahbaz, M., Mahalik, M. K., Shah, S. H., & Sato, J. R. (2016). Time-varying analysis of CO2 emissions, energy consumption, and economic growth nexus: Statistical experience in next 11 countries. *Energy Policy*, *98*, 33-48. https://doi.org/10.1016/j.enpol.2016.08.011

Shahbaz, M., Mallick, H., Mahalik, M. K., & Sadorsky, P. (2016). The role of globalization on the recent evolution of energy demand in India: Implications for sustainable development. *Energy Economics*, *55*, 52-68. https://doi.org/10.1016/j.eneco.2016.01.013

Shahnazi, R., Hadiyan, E., & Jorgani, L. (2017). An Investigation of Energy Consumption, Economic Growth and Co2 Emission in the Iranian Economic Sectors. *Journal of Economic Growth and Development Research*, *7*(28), 70-51. https://www.magiran.com/paper/1735385

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