Istanbul Gelisim Univ J Soc Sci 2026:13(1);1-11
DOI: 10.17336/igusbd.1604947

ÖZGÜN ARAŞTIRMA / ORIGINAL ARTICLE

Unraveling the Interplay between Trade Openness, Energy Consumption, Government Expenditure and Economic Growth in Iran: A Bootstrap Analysis

İran'da Dışa Açıklık, Enerji Tüketimi, Kamu Harcaması ve Ekonomik Büyüme Arasındaki Etkileşimin Çözümlenmesi: Bootstrap Analizi

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Geliş/Received: 20.12.2024
Kabul/Accepted: 12.11.2025

Abstract

Aim: The impact of trade openness on the economic development of countries is a subject that needs to be investigated. The aim of this study is to investigate the relationship between openness, total energy consumption, renewable energy consumption, government expenditure, and economic growth in Iran between 1980-2023.

Method: In this study, short and long term coefficients were estimated using the ARDL bounds test. Additionally, the cointegration relationship between the variables was analyzed using the Hacker and Hatemi-J (2006) cointegration test.

Findings: Empirical findings show that trade openness has a positive contribution to economic growth in the short and long term. Moreover, total energy consumption increases economic growth. However, the effect of renewable energy on economic growth is statistically insignificant. Additionally, government expenditure positively affects economic growth, which is supported by the Keynesian perspective. According to the bootstrap causality analysis results, there is a two-way causality relationship between trade openness and economic growth. In addition, government expenditure is the causal of economic growth.

Conclusion: As a result of the findings, it is recommended to increase trade openness in Iran and to produce policies that will bring new international agreements and trade associations.

Keywords

Economic Growth, Trade Openness, Renewable Energy Consumption, Government Expenditure, Bootstrap Causality Analysis.

Jel Codes

E20, F10

Tuncer GÖVDELİ, "Unraveling the Interplay between Trade Openness, Energy Consumption, Government Expenditure and Economic Growth in Iran: A Bootstrap Analysis", Istanbul Gelisim University Journal of Social Sciences, 13 (1), 2026, pp. 1-11.

Öz

Amaç: Dışa açıklığın etkisi ülkelerin ekonomik gelişiminde araştırılması gereken bir konudur. Bu çalışmanın amacı İran'da 1980-2023 yılları arasında dışa açıklık, toplam enerji tüketimi, yenilenebilir enerji tüketimi, kamu harcaması ve ekonomik büyüme ilişkisini araştırmaktır.

Yöntem: Çalışmada kısa ve uzun dönem katsayıları ARDL sınır testi yardımıyla tahmin edilmiştir. Ayrıca değişkenler arasındaki eşbütünleşme ilişkisi Hacker and Hatemi-J (2006) eşbütünleşme testi ile analiz edilmiştir.

Bulgular: Ampirik bulgularda, dışa açıklık, kısa ve uzun dönemde ekonomik büyümeye pozitif katkısı vardır. Ayrıca toplam enerji tüketimi ekonomik büyümeyi artırmaktadır. Ancak yenilenebilir enerji ekonomik büyüme üzerindeki etkisi istatistiki olarak anlamsızdır. Ek olarak, Keynesyen bakış açısıyla desteklenen bir şekilde, kamu harcaması ekonomik büyümeyi pozitif etkilemektedir. Bootstrap nedensellik analizi sonuçlarına göre dışa açıklıkla ekonomik büyüme arasında çift-yönlü nedensellik ilişkisi vardır. Ayrıca kamu harcaması ekonomik büyümenin nedenselidir.

Sonuç: Bulgular neticesinde, İran'da ticaret serbestleşmesinin artırılarak, yeni uluslararası anlaşmalar ile ticaret birlikteliklerini getirecek politikaların üretilmesi önerilmektedir.

Anahtar Kelimeler

Yenilenebilir Enerji Tüketimi, Ekonomik Büyüme, Dışa Açıklık, Kamu Harcaması, Bootstrap Nedensellik Analizi.

Jel Sınıflandırması

E20, F10

Introduction

Economic growth (EG) is an important concept in both national and international trade. Linking trade openness and EG has become an important policy. One of the main objectives of all economies is to focus on openness and increase trade. With foreign trade, new jobs may emerge, specialization in the labor force may be achieved, and input costs may decrease. Neoclassical economists have stated that foreign trade is one of the important factors that increase EG. They also stated that trade is an element that cannot be ignored in order to achieve EG (Raghutla, 2020). However, the relationship of trade openness to EG is mixed. There are studies that empirically determine that trade openness has a positive impact on EG (Kong et al., 2021), as well as studies that indicate that it has a negative effect (Yazdi and Khanalizadeh; 2014).

Trade can be the way for developing countries to move from underdevelopment to development (Roquez-Diaz and Escot, 2018). It also governs the stage of development where industrial production overtakes agricultural production. This change can lead to increased energy consumption, but also to technological investments in lower energy consuming technologies (Ohlan, 2018). Iran is a country that provides high subsidies for energy consumption. In Iran, which ranks first in the world in this field, it has become one of the important expense items of the budget. It also has inefficient and outdated transmission-distribution infrastructure (Mukhtarov et al., 2022). Iran is one of the countries with the largest fossil fuel reserves. The country ranks first in the world in terms of oil and natural gas reserves. Therefore, these fuels cover a significant share of energy consumption (Abbaszadeh et al., 2013; Zahedi et al., 2024).

In recent years, climate change is one of the issues that countries have been trying to overcome (Lee et al., 2022; Hassan et al., 2024). Renewable energy consumption is an element that can prevent climate change by reducing air pollution. Iran is a country suffering from air pollution. The health of the people is also negatively affected by air pollution. Increased use of renewable energy will lead to cleaner air and a healthier society. In line with the latest legislation in Iran, the Ministry of Energy, one of the government units, is required to support renewable energy consumption (Razmi et al., 2020).

The share of renewable energy in primary energy resources in Iran was 4.06% in 1980, decreased to 2.69% in 1990, and 0.91% in 2000. It increased to 1.19% in 2010, and 1.82% in 2023. This rate in 2023 is 14.56% on average in the world. In the Middle East, where Iran is located, it is 1.60% (Energy Institute, 2024). Another aim of this study is to draw attention to this issue so that Iran, whose average renewable energy consumption is far behind the world, can play an active role in its growth.

In the Keynesian perspective, government expenditure increases aggregate demand and EG. However, whether increased government expenditure supports EG or not is one of the fundamental problems of economic growth. (Al-Bataineh, 2012; Alshahrani and Alsadiq, 2014; Ahmad and Loganathan, 2015; Dudzevičiūtė et al., 2018). The role of government expenditure on EG is a concern. EG can be negatively affected due to reasons such as corruption (Nguyen and Bui, 2022). Determining the role of government expenditure on EG in Iran is one of the objectives of this study.

Another aim of the study is to analyze annual data on economic growth, trade openness, total energy consumption, renewable energy consumption, and government expenditure in Iran for the period between 1980 and 2023. The reason for choosing Iran in the study is to investigate whether the development of openness policies in this relatively closed country will have positive economic effects. The main motivation for the post-1980 period is to examine the economic repercussions of the Iranian revolution in 1979. This study is guided by three main questions. First, what is the importance of renewable energy in Iran? Second, how important is the impact of trade openness on economic growth in Iran, which is not known to be open enough? Third, how does government expenditure affect economic growth?

The different contributions of this paper to the literature can be listed as follows. First, it is found that renewable energy consumption in Iran does not have a direct impact on EG. Therefore, the necessity of reforming the renewable energy transition in the country is revealed. Second, the contribution of total energy consumption and renewable energy to EG in Iran has been determined using recent data. Based on the results, it is concluded that renewable energy is not sufficiently involved in the country's economy. Third, to the best of our knowledge, this is the first study that uses the bootstrap causality test for the causality relationship between trade openness, total energy consumption, renewable energy consumption, government expenditure, and EG in Iran. Thus, in this study for Iran, causality links are discussed in a different dimension.

In the second part of the study, the current literature review is conducted and summarized. In the third section, the data and the model are defined and the econometric techniques used are explained. The fourth section presents and discusses the empirical results. The last section of the study is the conclusion and policy recommendations are provided.

Literature Review

This section summarizes the relevant literature. There are two parts to the literature review for this study. Findings linking OP to EG are mixed. While some studies in the literature find that OP has a positive impact on EG, others find negative results. Among the studies that find that trade openness increases EG, Yazdi and Khanalizadeh (2014) used annual data for Iran between 1970-2011. The empirical findings obtained indicate that OP has meaningful and negative results on EG. Similar results were obtained by Yıldız and Eğri (2019) using annual data for Iran between 1964 and 2016. Findings, the elasticity coefficient of trade openness is negative. In another study, Suryandaru (2023) analyzed Indonesia for the period 2010:Q1 to 2019:Q4, but found the elasticity coefficient of trade openness to be statistically insignificant.

There are also studies that find a positive impact of OP on EG. Among these, Hye et al. (2016) studied China for 1975-2009. The findings obtained that OP has a positive effect on EG. Another study by Akhtar et al. (2023) examined Malaysia for 1980-2019. The findings suggest that OP has a positive effect on EG. Similar results are found by Eweade et al. (2024) for Japan for the period between 1980 and 2020 and Nguyen and Nguyen (2021) for Vietnam for the period between 2000 and 2020.

Among the studies examining the causality between OP and EG, Parsa and Sajjadi (2017) investigated the period between 1967 and 2012 in Iran. They concluded that OP is a causal of EG. Ansari et al. (2020) reports similar evidence for the period 1971-2013. There are also studies in which EG is the causal of trade openness. Finding these results, Suhrab et al. (2023) analyzed Pakistan for the period 1985 to 2018, Usman et al. (2023) analyzed Pakistan for the period 1990 to 2017, Ogudu et al. (2023) analyzed Nigeria for the period 1980 to 2017 and determined that EG is the causal of trade openness. Kumari et al. (2023) investigated India for 1985-2018. In the findings, no causality was determined between EG and trade openness. Similar results are found by Goswami et al. (2023) for India for the period between 1980 and 2021 and Eweade et al. (2024) for Japan for the period between 1980 and 2020. . However, Zameer et al. (2020), who investigated India, found that EG is the causal of OP.

Studies that aim to explain the role of (EC) in EG form the second part of the literature review Karimi et al. (2021), who used a model built on the Cobb–Douglas production function (CDPF) among the studies conducted for Iran, investigated the period 1975 to 2017. Findings, the long-term elasticity of renewable EC is positive. Similar findings for Iran were obtained by Oryani et al. (2021) for the period between 1970 and 2017, Aghaei and Lawell (2022) for the period between 1989 and 2018, and Rezagholizadeh et al. (2020) for the period between 1978 and 2016. However, Taghvaee et al. (2017) obtained different results in their study using an econometric model based on the CDPF. In the finding obtained, although the elasticity coefficient of renewable and total EC is positive, the probability value is not statistically significant. Similar results were found by Razmi et al. (2020) for the period 1990 to 2014. It has also been found that renewable energy consumption is not related to EG. Dogan (2016) examined Turkey for the period 1988 to 2012. In the findings obtained, although the elasticity coefficient of renewable energy was negative, it did not achieve statistical significance.

There are also studies examining the causality relationship between EC and EG. Lotfalipour et al. (2010) analyzed the period between 1967 and 2007 in Iran. They found that EG is the causal of energy consumption. Finding similar results for Iran, Solaymani (2021) finds that EG is the causal of nonrenewable EC, while renewable EC is the causal of EG.

Yazdan and Hossein (2012) studied Iran for 1980-2010. They concluded that there is a bidirectional causality between EC and EG in the causality findings. Parsa and Sajjadi (2017), who found similar results, analyzed the causality relationship between variables using econometric methods using the period 1967-2012 in Iran. There are studies that show no causal relationship between EC and EG. Amadeh and Kafi (2015) examined Iran for the period between 1971 and 2009. In the causality analysis, they found no causality between variables.

The third part of the literature includes studies examining the link between government expenditure (G) and EG. Mandala (2020), who argues that G is one of the factors that promote economic growth, analyzed Indonesia for the period 1981-2018. In the long-term results obtained, he estimated that G positively affected EG. The opposite results of these studies are also available in the literature. Uncontrolled government expenditure can also be a factor that weakens economic growth. In a study that contradicts the Keynesian perspective, Buthelezi (2023) investigated South Africa between 1994 and 2021. The findings indicate that G reduces EG. Javed and Husain (2024) investigated Oman between the years 1991-2021. The estimation results obtained show that G negatively affects EG. On the other hand, Mehrara et al. (2013) analyzed Iran between 1970 and 2010. However, they could not find a long-term relationship between G and EG.

When the literature of the study is summarized, the relationship between OP and EG is complicated. One of the main reasons for this is the econometric method and period used. The second is that it is due to other variables used in the study. Although this result was negative in the studies conducted for Iran, it was positive in other countries. It can also be said that EC positively affects economic growth in Iran. There is no consensus in the literature on the effect of government expenditure on economic growth. It has been observed that the studies conducted for Iran on this subject are limited. This study aims to contribute to the literature by conducting it for Iran.

Data, Model, and Econometric Techniques

Data and Model

In this research, using the latest available data, annual data on economic growth (EG), trade openness (OP), total energy consumption (TE) and renewable energy consumption (RE) are used for the period between 1980 and 2023. Gross Domestic Product (EG) per capita in constant 2015 USD is used as the economic growth variable. OP includes exports+imports as a percentage of EG. RE and TE are chosen as energy consumption per capita (kWh/person). The variable government expenditure (G) represents government expenditure per capita in constant 2015 US dollars. EG, OP, and G data are from the World Bank database, RE and TE are from Our World in Data database. In order to reach accurate estimates and normalize the data, natural logarithms of the variables must be used (Nathaniel et al., 2020). All variables used are logarithmic. While developing the econometric model, it was inspired by the model in the study of Lee and Sarkodie (2020).

$$EG_t = \beta_0 + \beta_1 OP_t + \beta_2 RE_t + \beta_3 TE_t + \beta_4 G_t + \varepsilon_t \quad (1)$$

Where, β 1, β 2, β 3, and β 4 represent the parameters to be estimated, t = 1980, 1981, … 2023 and $\varepsilon\ t$ stands for the error term. In the above function, EG represents economic growth; OP represents trade openness; RE represents renewable energy consumption; TE represents total energy consumption; G represents government expenditure.

There are studies that conclude that the impact of OP on EG is positive (Hye et al., 2016; Akhtar et al., 2023; Eweade et al., 2024) as well as negative (Yazdi and Khanalizadeh, 2014; Yıldız and Eğri, 2019). The main motivation for using trade openness in this study is to bring a different perspective to this issue, the results of which are mixed in the literature.

The contribution of RE to EG in Iran needs to be investigated more carefully. The share of RE in primary energy consumption in Iran in 2023 is quite low. While this rate is 1.82% in Iran in 2023, the world average is 14.56% (Energy Institute, 2024). The main motivation for including renewable energy in Equation 1 is to discuss whether it has an impact on economic growth.

Econometric Techniques

Initially, in order to conduct cointegration and causality analyses, the stationarity of the variables should be determined. Spurious results may occur due to the unit root problem in many of the variables. Therefore, the stationarity analysis of time series variables is tested with the help of Augmented Dickey and Fuller (1978) (ADF) and Phillips and Perron (1988) methods. The stationarity level of the variables should be carefully analyzed before moving on to the next stage of empirical analysis.

The empirical analysis continues with the estimation of short and long term coefficients of the variables. The Autoregressive Distributed Lag (ARDL) bounds test is used because the variables are stationary in level or first difference. In this test introduced by Pesaran et al. (2001), variables should be stationary at level or first difference. This test is used more because it gives more rational results compared to Johansen and Juselius (1990) (Gövdeli, 2019). The advantage of this test is that independent variables can be used at level or first difference. ARDL bounds test adapted in Equation 1:

$$\Delta EG_t = \phi_0 + \phi_1 EG_{t-1} + \phi_2 OP_{t-1} + \phi_3 RE_{t-1} + \phi_4 TE_{t-1} + \phi_5 G_{t-1} + \sum_{i=1}^{P-1}\lambda_i \Delta EG_{t-i} + \sum_{j=0}^{q_1-1}\delta_{1j} \Delta OP_{t-j} + \sum_{j=0}^{q_2-1}\delta_{2j} \Delta RE_{t-j} + \sum_{j=0}^{q_3-1}\delta_{3j} \Delta TE_{t-j} + \sum_{j=0}^{q_4-1}\delta_{4j} \Delta G_{t-j} + \varepsilon_t \quad (2)$$

Above, Δ is the 1st difference; α is the coefficients expected to be predicted; *p*, q_1, q_2, q_3, and q_4 signify lag length; ε is the error term. $H_0: \phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = 0$; $H_1: \phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq \phi_5 \neq 0$. Case II (restricted intercepts; no trends) was used in the ARDL bounds test. Critical values are taken from Table CI(ii) in Pesaran et al. (2001).

The next stage of the empirical analysis is causality analysis. In this study, bootstrap causality analysis was used. The Hacker and Hatemi-J (2006) test is an adaptation of Toda and Yamamoto (1995). The application of Var(p+d) in the variables is as follows:

$$yt = v + A_1 y_{t-1} + \dots + A_p y_{t-p} + \dots A_{p+d} y_{t-p-t} + \varepsilon_t \quad (3)$$

Above, p, VAR lag length; A, parameter matrix; d, max. stationarity order. In this test, the variables do not have to be stationary. The Var(p+d) model:

$$Y=DZ+\delta \quad (4)$$

This method is tested by Wald Test:

$$Wald = (C\beta)' \left[C\left((Z'Z)' \otimes S_U\right)C'\right]^{-1}\left(C\beta\right) \sim X_P^2 \quad (5)$$

Above, β=vec(d); vec, column delimiter; ⊗, Kronecker factor; C, pxn(1+n(p+d)) matrix. The main difference from the Toda and Yamamoto (1995) is that it uses bootstrap distribution. This test used in the study was applied with 10000 bootstrap simulations.

Empirical Applications and Discussions

In the first part of the empirical analysis, the unit root degrees of the variables were determined. The findings obtained are given below.

Table 1. ADF and PP Test Results

Variables	ADF		PP	
	t-stats	**p-value**	**t-stats**	**p-value**
EG	-1.554	0.496	-1.103	0.706
ΔEG	-4.599*	0.000	-4.538*	0.000
OP	-2.291	0.179	-1.846	0.353
ΔOP	-4.933*	0.000	-4.962*	0.000
RE	-3.399	0.016	-3.441	0.014
ΔRE	-6.594*	0.000	-9.781*	0.000
TE	-0.461	0.889	-0.424	0.895
ΔTE	-6.768*	0.000	-6.805*	0.000
G	-4.040*	0.002	-3.868*	0.004
ΔG	-	-	-	-

Note: Critical values are denoted by 1%, *.

The G variable is stationary at level. Since the H0 hypothesis couldn't be rejected at the test statistics level for EG, OP, TE and RE, the variables have unit roots. By taking the difference of the variables, the null hypothesis of the test statistics of the variables are rejected. Since the alternative hypotheses of the variables are accepted (Table 1).

Table 2. Bound Test Results

Optimum Lag Length	**(2, 3, 4, 2, 4)**	
k	4	
F statistics	6.48	
Critical Values	I(0)	I(1)
1%	3.29	4.37
5%	2.56	3.49
10%	2.20	3.09

At this stage, the boundary test results are analyzed. The F statistic statistics is found to be 6.48 (Table 2). Since this value was greater than 4.37, it was decided that the model was cointegrated.

Table 3. Diagnostic Test Results

R2	0.975
Adjusted R2	0.955
F Statistic	49.426
LM Test	0.945
ARCH Test	0.469
RESET Test	0.586
Normality Test	0.853

In this section of the empirical analysis, diagnostic test results are presented. The LM test examines the autocorrelation problem. According to the findings, there is no autocorrelation. The ARCH test analyzes the heteroscedasticity problem. There is no heteroscedasticity problem. Ramsey RESET tests that the model is established with the correct specifications. Test results show that the model is established with correct specifications. In the normality test, it shows the normal distribution of the error term. Since no problems were found in the diagnostic test results, short term elasticity coefficient estimation was performed.

Table 4. Short Term Elasticity Coefficients

	Coeff.	**p-values**
OP	0.176*	0.001
RE	-0.031	0.438
TE	0.345*	0.000
G	0.2999	0.031
C	-1.142	0.240
ECT(-1)	-0.605*	0.000

Note: Critical values are denoted by 1%, *.

The estimated short term elasticity coefficients are tabulated. According to the findings, the elasticity coefficient of OP, TE and G are positive and statistically significant. However, the elasticity coefficient of RE is negative, it is statistically insignificant. Moreover, the coefficient of ECT(-1) is between (-1,0) and the p-value is statistically significant. 60.5% of the short term deviation will have a correction in the next period (Table 4).

Table 5. Long Term Elasticity Coefficients

	Coeff.	**p-values**
OP	0.292*	0.000
RE	-0.052	0.430
TE	0.570*	0.000
G	0.600*	0.002
C	-1.886	0.232

Note: Critical values are denoted by 1%, *.

The long term elasticity coefficients obtained as a result of the ARDL bounds test are given. According to Table 5, the OP elasticity coefficient was found to be positive and significant. In Iran, a 1% increase in OP will increase EG by 0.292%. The ability of developing countries to increase their EG depends on balanced trade. In particular, importing to increase their exports can be one of the characteristics of such countries. In addition, with trade, an opportunity can be seized to develop high value-added products. This result in Iran, one of the partially closed countries, can indicate that opening up to the outside in trade can bring EG. These results are similar to those of Hye et al. (2016), Akhtar et al. (2023) and Eweade et al. (2024). However, Yazdi and Khanalizadeh (2014) found the long term elasticity coefficient of trade openness to be negative in their findings.

The elasticity coefficient of TE is positive. Increasing energy used by 1% will increase economic growth by 0.570%. However, Taghvaee et al. (2017) found the flexibility coefficient of total energy consumption to be positive in their study, but the probability value is not statistically significant. The elasticity coefficient of RE is not statistically significant. According to these results, it can be concluded that RE is not sufficiently emphasized in Iran. One of the main reasons for this is that renewable energy has a very low share in primary energy resources. These results are in line with Taghvaee et al. (2017) and Razmi et al. (2020).

Government expenditure positively and significantly affects EG. A 1% increase in EG increases G by 0.6%. One of the factors that increases economic growth is government expenditure. These findings are consistent with Le and Sarkodie (2020). However, contrary to these results, there are studies that contradict the Keynesian perspective. Among these studies, Buthelezi (2023) and Javed and Husain (2024) estimated that G negatively affects EG.

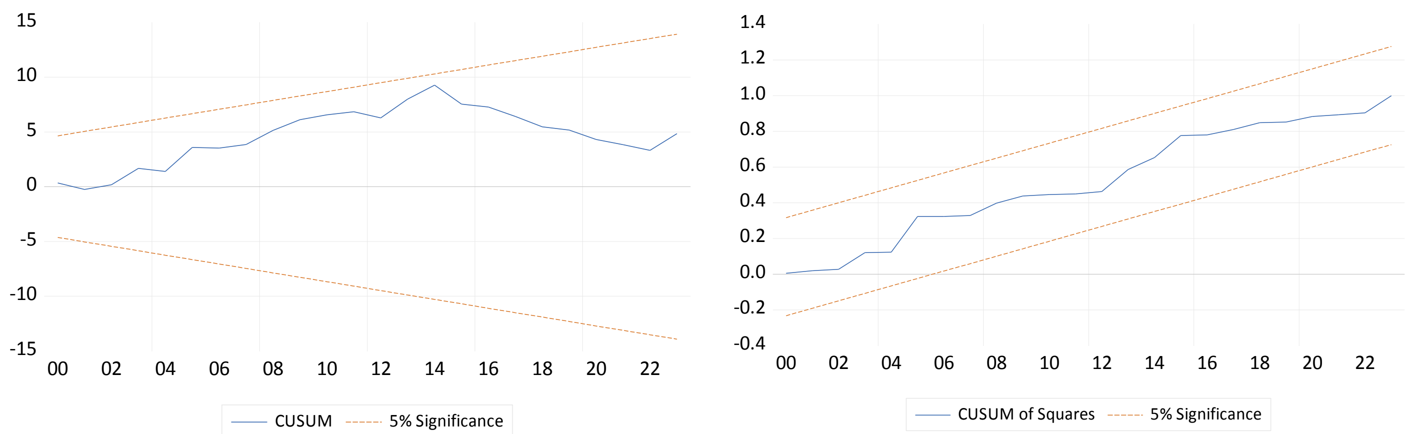

Figure 1: CUSUM-Q Graphic

The cumulative sum (CUSUM) and cumulative sum of squares (CUSUM-Q) graph are shown determines the stability of the parameters with the help of the CUSUM-Q. The CUSUM-Q graph falls within the line boundaries at the 5% level. So, the estimated parameters are found to be stable (Figure 1).

Table 6. Bootstrap Causality Test Results

	MWALD Stats.	Bootstrap Critical Values		
		1%	5%	10%
OP $\nrightarrow$ EG	13.809**	16.715	10.925	8.584
EG $\nrightarrow$ OP	11.646**	16.684	11.018	8.744
RE $\nrightarrow$ EG	0.138	7.854	4.190	2.873
EG $\nrightarrow$ RE	0.271	7.535	4.134	2.864
TE $\nrightarrow$ EG	3.159	13.612	8.756	6.774
EG $\nrightarrow$ TE	1.498	14.006	9.001	6.998
G $\nrightarrow$ EG	16.655*	14.196	8.996	7.000
EG $\nrightarrow$ G	5.410	12.858	8.528	6.742
OP $\nrightarrow$ RE	0.810	7.151	4.087	2.897
RE $\nrightarrow$ OP	0.535	7.612	4.028	2.837
OP $\nrightarrow$ TE	7.321***	14.072	8.859	6.890
TE $\nrightarrow$ OP	1.526	13.434	8.529	6.728
RE $\nrightarrow$ TE	1.448	7.957	4.199	2.903

Table 6. Continue				
	MWALD Stats.	**Bootstrap Critical Values**		
		1%	**5%**	**10%**
TE ↛ RE	0.390	7.265	4.044	2.840
OP ↛ G	7.158***	13.367	8.634	6.684
G ↛ OP	15.074*	13.393	9.024	7.164
TE ↛ G	3.855	10.374	6.434	4.793
G ↛ TE	9.507**	11.097	6.678	5.011
RE ↛ G	0.053	7.208	4.021	2.825
G ↛ RE	0.002	7.931	4.387	2.911

Not: Critical values are denoted by 1%, 5% and 10%, *, ** and ***.

Bootstrap causality test results indicate that there is bidirectional causality between OP and EG. The change in EG will change the foreign trade volume. This may also cause a change in OP. Another reason is the dispersion that will occur in OP may cause EG. Moreover, OP is the causal of TE. Among the underlying reasons, total productivity may increase with OP, which may cause TE. These results are similar to Zameer et al. (2020), Voumik et al. (2023). In addition, G is the causal of EG. This result is also supported by the Keynesian perspective. However, in another study conducted for Iran, Mehrara et al (2013) estimated that EG is the causal of G (Table 6)

Conclusion

In study, trade openness, total energy consumption, renewable energy consumption were analyzed in the context of economic growth using econometric techniques. For this purpose, the last data set was used and the period between 1980 and 2023 was selected. Empirical estimates suggest that trade openness and total energy consumption are the driving forces of economic growth. The error correction model predicts a convergence to equilibrium of 60.5% per year.

The long term results show that trade openness boosts economic growth, which indicates that a 1% increase in trade openness significantly increases economic growth by 0.292%. These results are very important for Iran, which lacks trade openness due to some embargoes or other reasons. In recent periods, it has been observed that openness has played a very important role in economic growth. Iran adopting more flexible policies that will increase its trade openness and especially establishing its relations with the west will increase its economic growth. The policies that will form the basis of this depend on rational decisions. While making these decisions, decisions that are suitable for the socio-economic structure of the society should also be taken.

One result of the empirical research is that total energy consumption accelerates economic growth. Increasing total energy consumed by 1% will increase economic growth by 0.570. The positive long term coefficient of total energy consumption indicates that it is one of the driving forces of economic growth. The long term coefficient of renewable energy consumption is positive but insignificant. This can be interpreted as a lack of emphasis on renewable energy consumption by policymakers in Iran. In particular, the very low share of renewable energy in primary energy sources confirms this. It is proposed to overcome this problem by developing incentives to encourage renewable energy consumption. In the Middle East, where oil resources are dwindling day by day, there is a need for international agreements that can establish this awareness.

In line with these findings, some policy suggestions can be presented to increase economic growth in Iran. First, the country should develop and implement policies that will increase its trade openness. An increase in the terms of trade will ensure that its domestic potential is used. This will lead to a decrease in domestic input costs. Second, since trade openness is one of the driving forces of economic growth, it needs to implement controlled trade openness policies. It should focus on policies that protect companies that produce high value-added products in the country. At the same time, it should provide incentives that will allow these companies to trade openness. Third, since total energy consumption increases economic growth, economic policies should encourage the use of renewable energy resources. In this way, energy crises that may arise in the future due to the rapid depletion of resources such as oil can be prevented. Fourth, the use of energy resources should be directed more effectively. For this, it should be ensured that energy policies can be shaped together with economic growth. As a result, it is recommended to encourage trade openness practices. For this, it should make agreements with international trade organizations and develop economic infrastructures that will fulfill these agreements. In order to achieve this goal, politicians should work in harmony with economists. In addition, the Iranian government should identify the factors that increase total energy consumption and ensure a gradual transition to renewable energy consumption. In order to achieve this goal, national and international companies can be given incentives for renewable energy investments, and tax exemptions or discounts can be provided. It is also recommended that the government take initiatives to raise people's awareness in order to achieve this transition.

The findings of this study show that Iran, which stands out with its non-renewable energy sources, has not yet had a significant level of renewable energy in its economic development. Therefore, Iran's policy makers should do what is necessary to transition to renewable energy before it is too late. In order to do this, technological advances in renewable energy should be followed and brought into the country, and these should be evaluated effectively. Although non-renewable energy is seen as a substitute for these energy sources, the use of renewable energy should be expanded because it is both a cleaner energy source and the energy source of the future.

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Özet

Hem ulusal hem de uluslararası ticarette ekonomik büyüme (EG) önemli bir kavramdır. Dışa açıklık ile ekonomik büyüme bağlantıları ülkelerin önemli politikaları haline gelmiştir. Tüm ekonomilerin temel amaçlarından birisi dışa açıklık üzerine yoğunlaşıp, ticareti artırma gayretidir. Dış ticaretle birlikte yeni istihdamlar ortaya çıkabilir, iş gücünde uzmanlaşma sağlanabilir, girdi maliyetleri azalabilir.

Gelişmekte olan ülkelerin gelişiminde dışa açıklığın etkisi araştırılması gereken bir konudur. Bu amaçla çalışmada İran'da dışa açıklık, toplam enerji tüketimi, yenilenebilir enerji tüketimi, kamu harcaması ve ekonomik büyüme yıllık verileri 1980 ile 2023 dönemi için analiz edilmiştir. Değişkenlerin çoğunda birim kök sorunu olmasından kaynaklı sahte sonuçlar ortaya çıkabilmektedir. Bu nedenle, zaman serisi değişkenlerin durağanlık analizleri yapılmıştır. Bununun için Dickey ve Fuller (1978) (ADF) ve Phillips ve Perron (1988) testleri kullanılmıştır. Ampirik analiz değişkenlerin kısa ve uzun dönem katsayıları tahmini ile devam etmektedir. ARDL sınır testi nin kullanıldığı bu çalışmanın ampirik bulgularında kısa ve uzun dönemde dışa açıklık ve toplam enerji tüketiminin esneklik katsayısı pozitif ve anlamlıdır. Ancak yenilenebilir enerji tüketiminin esneklik katsayısı pozitif olmasına karşılık istatistiki olarak anlamsızdır. Ayrıca Kısa dönemdeki sapmanın %60.5'i sonraki dönemde düzeltilecektir.

Çalışmada, bootsrap nedensellik analizi ile değişkenler arasındaki nedensellik ilişkisi araştırılmıştır. Elde edilen bulgularda, dışa açıklık ile ekonomik büyüklük arasında çift yönlü nedensellik vardır. Ayrıca dışa açıklık toplam enerji tüketiminin nedenselidir. Bunlara ek olarak kamu harcaması ekonomik büyümenin nedenselidir. Ampirik bulgulara göre, İran'da ticaret serbestleşmesinin artırılarak, yeni uluslararası anlaşmalar ile ticaret birlikteliklerini getirecek politikaların üretilmesi önerilmektedir.