SDIJournals

Journal of Sustainable Development Issues, 2024, 2(1),

p. 42-50.

Journal homepage: https://journalsdi.com/index.php/jsdi/index

Do Depth, Accessibility, and Efficiency of Financial Institutions Matter for Renewable Energy Development in Azerbaijan?

Ugur Korkut Pata[1], Mustafa Tevfik Kartal[2,*]

[1] Department of Economics, Hatay Mustafa Kemal University, Hatay, Türkiye, ugur.pata@hotmail.com.

[2] Department of Finance and Banking, European University of Lefke, Lefke, Northern Cyprus, TR-10 Mersin, Türkiye, mustafatevfikkartal@gmail.com.

[*] Correspondence: mustafatevfikkartal@gmail.com;

ABSTRACT

The promotion of renewable energies is a decisive factor for the sustainable growth of countries' economies and the development of their environment. The installation and use of renewable energy is costly and therefore financial resources are needed to invest in renewable energy. Accordingly, this study analyzes the impact of depth, accessibility and efficiency of financial institutions (FI) on renewable energy consumption (REC) for Azerbaijan from 1992 through 2021. So, the study uses time series estimators. The results show that the depth and efficiency development of FI increases REC, while financial accessibility is not effective on renewable energy. These findings suggest that Azerbaijani policymakers should deal with to increase the depth and efficiency of FI to promote REC.

Keywords: Renewable Energy; Financial Institutions; Urbanization; Azerbaijan

JEL Classification: C32; G20; Q43

DOI: 10.62433/josdi.v2i1.24

Received: February, 2024 | 1st Revision: April, 2024 | Accepted: June, 2024

1. INTRODUCTION

Azerbaijan is a developing country that makes intensive use of natural gas as an energy source. Azerbaijan needs to diversify its energy resources in order to achieve economic progress in line with the Sustainable Development Goals (SDGs). In this context, the promotion of renewable energies such as wind and solar energy is compatible with the SDGs and Azerbaijan's environmental strategies, as these resources are carbon-free (Pata and Kartal, 2024).

Fig. 1 shows the energy structure of Azerbaijan from 1980 to 2022. Over the years, it has become clear that Azerbaijan's energy structure is based on natural gas and oil. In 2022, 62% of Azerbaijan's energy consumption will come from natural gas and 35% from oil (Our World in Data, 2024a). The share of Azerbaijan's renewable energy consumption (REC) in total energy use is only around 2.5%.

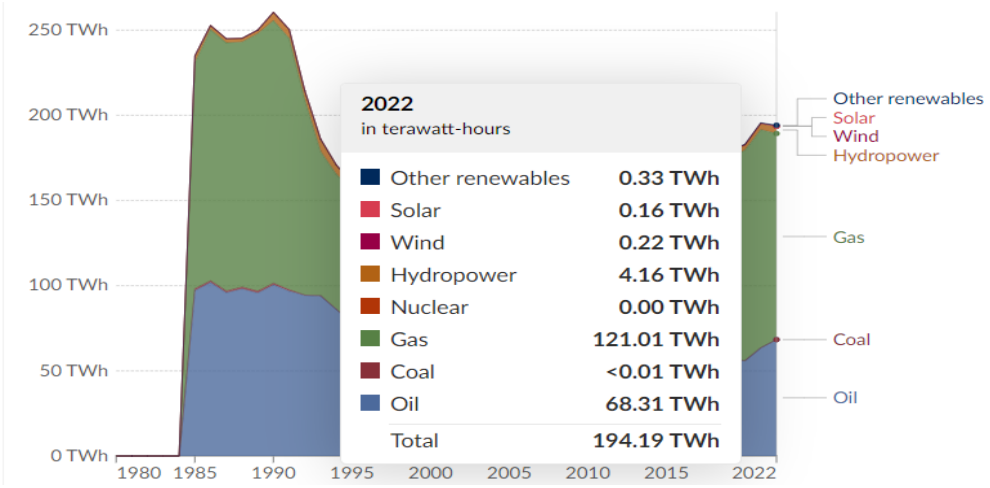

Fig. 1. Energy structre of Azerbaijan from 1980 to 2022

Source: Our World in Data (2024a)

Fig. 2 shows the development of per capita REC in Azerbaijan over time. In Azerbaijan, per capita REC peaked at over 1000 kWh in 2010, but then declined significantly. In 2020 and 2021, Azerbaijan's REC consumption is below 400 kWh. This indicates that the trend towards renewable energy in Azerbaijan has declined by around 60% in the last ten years.

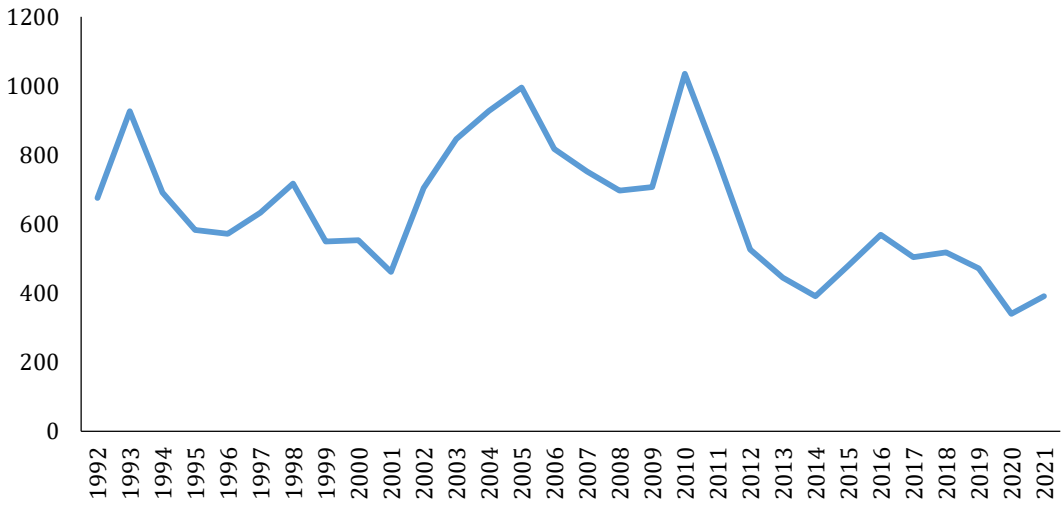

Fig. 2. Per capita REC in Azerbaijan (KwH)
Source: Our World in Data (2024b)

Azerbaijan should develop various strategies to prevent a decrease in REC per capita and promote an increase in REC. This is because increasing the REC is an important policy instrument for achieving the 2030 SDGs. In this context, does the FD promote the REC in Azerbaijan? Does the development of FI have an increasing impact on Azerbaijan's REC? The study searches for the answers to these questions of the research.

As renewable energy investments are related with high infrastructure, start-up and operating costs, a solid financial system and risk management are a necessity (Eren et al., 2019). The financial system can influence the REC in various ways. An advanced financial system can support the business community to invest in a reliable environment and thus utilize renewable energy resources more effectively and efficiently (Shahbaz et al., 2021). A solid financial structure encourages more financing for renewable energy at lower costs, which can increase the REC (Anton and Nucu, 2020). An improved financial system can ensure that funds are found and used efficiently and support the REC (Zhang and Razzaq, 2022). For these reasons, strengthening Azerbaijan's FI can be used as a policy strategy to support the REC. For the policy strategy in REC promotion, it is important which of the elements of depth, accessibility and efficiency are at the forefront and statistically significant.

A lot of research have empirically analyzed the effects of financial development (FD) on REC. Eren et al. (2019) found that FD contributes to REC in India. Anton et al. (2020) revealed that FD increases REC in 28 EU countries. Mukhtarov et al. (2020) reported that FD increases REC in Azerbaijan. Shahbaz et al. (2021) noted that FD increases REC in 34 developing countries. Wang and Dong (2021) concluded that FD is net effective on REC in the G20 nations. Dimnwobi et al. (2022) showed that FD promotes REC in Nigeria. Mukhtarov et al. (2022) reported that FD increases REC in Turkey. Saadaoui (2022) found that FD has no influence on REC in nine MENA countries. Samour et al. (2022) noted that FD upsurges REC in the United Arab Emirates. Zhang and Razzaq (2022) revealed that FD promotes REC in six developing countries. Wang et al. (2022) reported that FD upsurges REC in next 11 countries. Mukhtarov and Mikayilov (2023) concluded that FD stimulates REC in Poland. Wang et al. (2023) concluded that FD expands REC in 62 countries.

Although studies in the literature generally find that FD promotes REC, some studies have argued that there is no association between FD and REC (see e.g., Wang and Dong, 2021; Saadaoui, 2022). A few studies have analyzed the effects of FD on REC considering financial markets and institutions. Pata et al. (2022) emphasized that improving the depth and access to FI increases REC in the USA. Habiba and Xinbang (2023) emphasized that the development of financial markets and institutions generally has an increasing effect on REC in emerging countries.

Looking at previous studies, the lack of a study examining the effects of depth, accessibility and efficiency of FI on REC for Azerbaijan is a research gap. So far, only Mukhtarov et al. (2020) have analyzed the FD and REC relationship for Azerbaijan, but the researchers did not consider the dimensions of depth, accessibility, and efficiency of FD. Hence, the research contributes to the knowledge by examining the effects of depth, accessibility and efficiency of FI on REC for Azerbaijan.

The study consists of four parts. The second section introduces the data and the method. The third section presents the findings of the study and discusses the incentive strategies for REC in Azerbaijan from a financial perspective. The fourth section concludes the study.

2. METHODS

2.1 Data

The expansion and promotion of REC is one of the most important policy options on the agenda of countries to reduce ecological degradation (Hasanov et al., 2023; Ulussever et al., 2023; Pata et al., 2024). REC requires a large amount of financial resources due to its cost. In this context,

the loans provided by FI to private sector companies and access to these loans as well as the accessibility and efficiency of FI can have an impact on REC. This study examines the effects of the depth, accessibility and efficiency of FI on the REC for Azerbaijan. For this purpose, the study uses annual data for the period 1992-2021. Since three different financial institution data are available until 2021, the study uses a 30-year data set. The variables, units of measurement and sources used in the study are listed in Table 1.

Table 1. Defination of the variables

Type	Symbol	Variable	Measurement	Source
Dependent	REC	Renewable energy consumption	Per capita, kWh	Our World in Data (2024)
Independent	FIE	Efficiency of FI	Index	IMF (2024)
	FID	Depth of FI	Index	IMF (2024)
	FIA	Accessibility of FI	Index	IMF (2024)
	URB	Urban population	% of total population	Our World in Data (2024)

The study analyzes the effects of the development of FI on the REC in logarithmic form as in Eq. (1):

$$\ln REC_t=\delta_0+\delta_1 \ln FIE_t+\delta_2 \ln FID_t+\delta_3 \ln FIA_t+\delta_4 \ln URB_t+u_t \quad (1)$$

where ln shows logarithm, δ_0 denotes intercept, δ_1 to δ_4 illustrate the long term elasticities, and u_t represents error term. Many studies have found that FD plays a role in promoting renewable energy (see e.g., Mukhtarov et al., 2020; Shahbaz et al., 2021). FD can help attract more and easier finance to renewable energy investments by expanding fund flows, lowering financing costs and facilitating access to financial resources. Therefore, δ_1, δ_2 and δ_3 are expected to be positive.

The effects of urbanization on the environment has been examined in many studies, and it has generally been found that urbanization has a negative impact on environmental quality (e.g., Pata et al., 2023a). The effects of urbanization on REC can also be negative. Islam et al. (2022), Dingru et al. (2023), and Pata et al. (2023b) noted that urbanization has a reducing effect on the REC. Urbanization can lead to high consumption of fossil fuels and natural gas. In particular, natural gas is used for heating purposes in cities in many countries such as Azerbaijan, which can have a deterrent effect on the REC. Therefore, δ_4 is expected to be negative.

Fig. 3 shows the course of the analyzed variables over the time period for Azerbaijan.

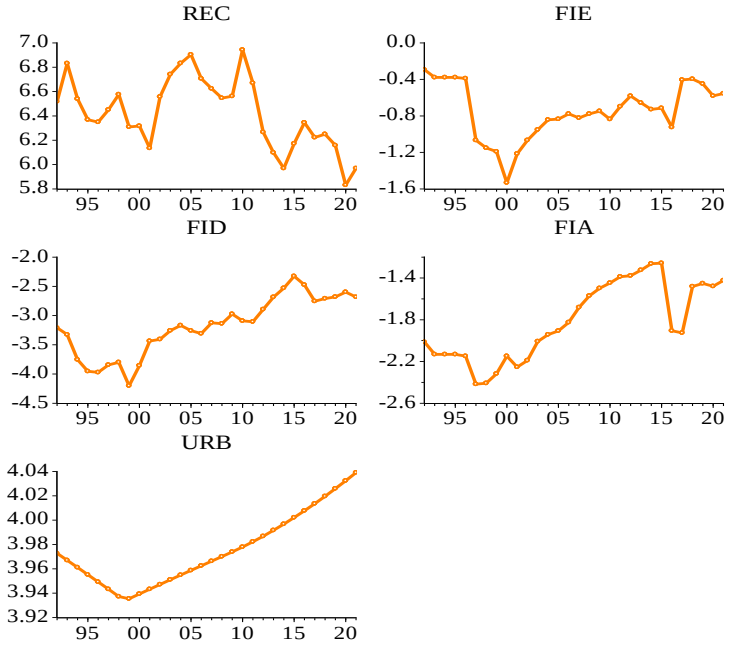

Fig. 3. The course of REC, FI development, and URB over time

As Fig. 3 demonstrates, FI in Azerbaijan became weaker around the year 2000. However, since 2000, the depth, accessibility, and efficiency of FI in Azerbaijan have been developing. Also, urbanization rates in Azerbaijan has been increasing rapidly after 2000. However, the REC has decreased to the lowest levels in the years 2020-2021.

2.2. Empirical Approach

The study analyzes the effects of FI and urbanization on REC promotion in Azerbaijan using various time series approaches. The empirical strategy used in the study is illustrated in Fig. 4.

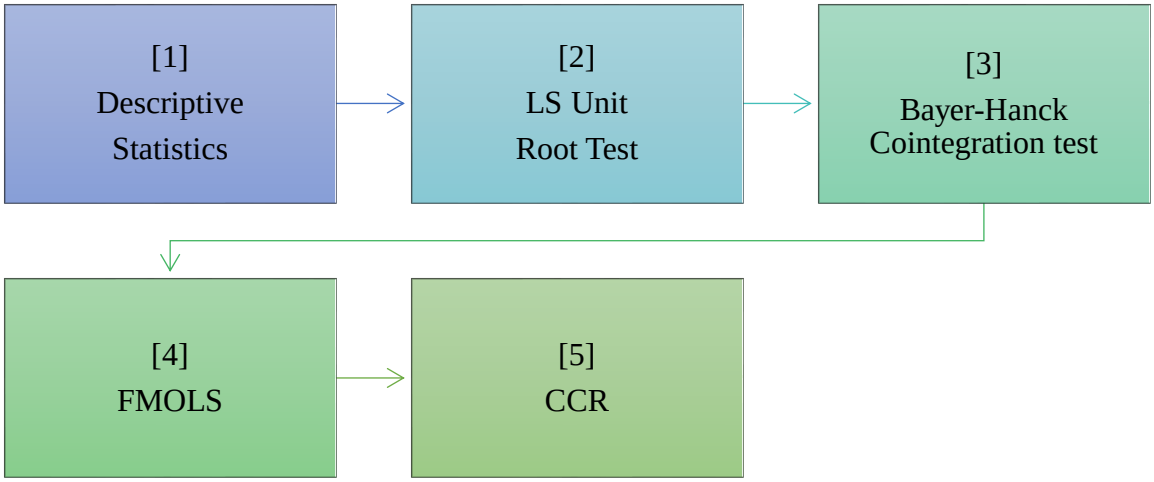

Fig. 4. Emprical flowchart

As represented in Fig. 4, in the first phase, the study examines the descriptive statistics and whether the series are normally distributed using Jarque and Bera's (1980) [JB] test.

In the second phase, the study analyzes the stochastic properties of the series using the unit root test of Lee and Strazicich (2013) [LS]. The LS unit root test considers one structural break. Since the study works with limited observations of 30 years, it is sufficient to consider only one structural break. Unlike previous unit root tests with one break (i.e., Zivot & Andrews, 1992; Lumsdaine & Papell, 1997), the null hypothesis of the LS unit root test states that the series contains a unit root with a structural break. In this respect, the LS unit root test provides more robust estimates than previous one-break unit root tests.

In the third stage, the research performs the cointegration test by Bayer and Hanck (2013) [BH]. The BH test provides an effective approach by combining the test statistics of four different cointegration tests. The cointegration test by Engle and Granger (1987) [EG] is suitable for bivariate modeling and is based on error terms. Johansen (1991) [J] considers the modeling of vector autoregression. Due to the different characteristics of EG, J, and other cointegration tests, the findings on the long-term relationships between the series may differ. The BH cointegration test minimizes the discrepancies in the results by combining EG, J and other various cointegration tests with Fisher statistic based modeling to provide effective cointegration estimates.

In the fourth stage, the study analyzes the long-term effects of FI and urbanization on REC by estimating elasticities using the FMOLS approach of Phillips and Hansen (1990).

The fifth stage includes the robustness check of the findings using the CCR approach of Park (1992). Both FMOLS and CCR models are the models, which make estimation based on mean-values.

By following the above-explained empirical flow, the study compares the results of FMOLS and CCR and analyzes the robustness of the findings.

3. RESULTS

Table 2 contains some descriptive statistics on the variables.

Table 2. Descriptive Statistics

	lnREC	lnFIE	lnFID	lnFIA	lnURB
Mean	6.425	-0.744	-3.184	-1.815	3.975
Median	6.409	-0.739	-3.153	-1.907	3.969
Maximum	6.943	-0.294	-2.326	-1.257	4.039
Minimum	5.831	-1.533	-4.202	-2.417	3.935
Standard Deviation	0.290	0.304	0.502	0.371	0.030
Skewness	-0.064	-0.539	-0.269	0.015	0.600
Kurtosis	2.247	2.829	2.148	1.596	2.277
Jarque-Bera	0.729	1.489	1.270	2.464	2.455
Probability	0.694	0.475	0.530	0.292	0.293

REC is the variable with the highest mean. The variable with the highest standard deviation is FID. In other words, the depth of FI is more volatile than accessibility and efficiency. Applying nonlinear approaches for series that are not normally distributed can provide more effective findings (Pata & Yilanci, 2021). Therefore, the study first tests the normality of the series to determine whether it is appropriate to apply linear approaches. The JB statistics and probability values show that all series are normally distributed. This result shows that the use of linear time series methods such as BH is appropriate.

In the second stage, the study applies the LS unit root test and presents the results in Table 3.

Table 3. LS unit root results

Variables	I(0)	I(1)
REC	-2.560 [1999]	-5.133 [2012]*
FIE	-2.592 [2010]	-5.951 [2010]*
FID	-2.275 [2005]	-5.462 [2015]*
FIA	-2.048 [2017]	-5.527 [2010]*
URB	-2.093 [2002]	-4.328 [2004]*

** denotes 1% significance level.*

The LS test shows that all series are I(1), which menas that the series are stationary at first difference and in this case BH cointegration analysis can be applied.

Table 4 reports the findings of the GH test.

Table 4. BH cointegration results

			Critical values	
Tests	Test stat.	p-value	1%	5%
EG-J	57.780*	0.000	15.845	10.576
EG-J-BA-BO	82.832*	0.000	30.774	20.143

Notes: EG, J, BA, and BO denotes Engle-Granger, Johansen, Banerji, and Boswick, in order.
** denotes 1% significance level.*

The results of FMOLS are shown in Table 5. The results show that URB has a reducing effect on REC. A 1% increase in FIE and FID increases REC by 0.36% and 0.32%, respectively. FIA has no statistically significant effect on REC.

Table 5. FMOLS Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FIE	0.361**	0.171	2.110	0.045
FID	0.325***	0.185	1.758	0.091
FIA	0.152	0.187	0.814	0.423
URB	-14.147*	2.946	-4.800	0.000
C	64.239*	12.206	5.262	0.000

*Notes: *, **, and *** denote 1%, 5%, and 10% significance levels, in order.*

The BH results show that there is a long-term relationship between REC, FIE, FID, FIA and URB. This is because the EG-J and EG-J-BA-BO test statistics are greater in absolute value than the critical values. In this case, the study performs estimation of the long-run coefficients by applying FMOLS and CCR, respectively.

Table 6 presents the CCR findings.

Table 6. CCR Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FIE	0.334**	0.162	2.064	0.050
FID	0.457*	0.130	3.519	0.001
FIA	0.043	0.132	0.325	0.747
URB	-13.276*	0.854	-15.536	0.000
Constant	60.979*	3.509	17.376	0.000

*Notes: *, **, and *** denote 1%, 5%, and 10% significance levels, in order.*

The CCR results indicate that FIE and FID increase the REC, while URB has a decreasing effect. FIA has no influence on the REC. These findings confirm the FMOLS results.

The results of the study should show that Azerbaijan needs to improve the depth and efficiency of FI in order to promote REC. In addition, the Azerbaijani government should minimize the negative impact of URB on REC with environmentally friendly urban plans.

4. CONCLUSION

Turning to renewable energy is an important option for countries to achieve the SDGs and decouple environmental pollution and economic growth. However, the installation, processing and implementation of renewable energy is costly and requires large sums of financing. To increase renewable energy use, it is therefore important that FI and markets have a strong structure and support investments. The effects of depth, accessibility and efficiency of FI on the REC can vary. However, for Azerbaijan, no study analyzing the effects of the three different aspects of FI on the REC has been conducted so far. This study fills in the corresponding research gap by analyzing the effects of depth, accessibility and efficiency of FI on REC. To this end, the study uses the BH cointegration test as well as FMOLS and CCR estimators. The results of the study show that the accessibility of FI has no impact on the REC. The depth and efficiency of FI have an increasing effect on the REC. In contrast, urbanization hinders the expansion of the REC. Several recommendations for REC policies and energy financing in Azerbaijan emerge from these results.

The fact that the FIA has no influence on the REC shows that there is no interaction in terms of accessibility to financial resources for investments in renewable energy in Azerbaijan. The Azerbaijani government should focus on increasing the depth and efficiency of FI. To this end, Azerbaijan can grant tax exemptions to encourage FI to invest more funds in green projects. In addition, the Azerbaijani government can provide incentives and subsidies to FI for clean energy technologies to increase their effectiveness in carbon-free projects. In this way, the development of FID and FIE can contribute to increasing RECs and improving the ecological quality of Azerbaijan. In addition, the Azerbaijani government should not neglect the negative, oppressive role of urbanization on REC. Urbanization brings higher energy demand and consumption. Developing cities cause an increase in the consumption of fossil fuels and natural gas. In Azerbaijan, the use of fossil fuels by the urban population is displacing the REC. To prevent this, the Azerbaijani government should encourage the growth of REC in cities through education programs and energy efficiency measures. The restrictive role of urbanization for REC can be minimized, for example, through monetary subsidies and a reward system for the use of solar energy by households. As another policy strategy, Azerbaijani policy makers can expand electricity production through electricity and wind energy. In this way, the spread of REC can also be achieved in urban areas.

The study has some research limitations in relation to finance and energy. First, the study considers total REC. The effects of FD on REC can be analyzed separately for wind and solar. The second limitation is that the study does not consider financial markets. This study can also be analyzed in the context of the effects of Azerbaijan's financial market development on the REC. Another limitation is to directly focus on the REC. Future research can directly analyze the effects of financial depth, accessibility and efficiency on the ecological quality of Azerbaijan. Finally, technological advancement is an important element for the REC and is not considered in this study. Researchers can discuss the effects of technological advancement on REC in future studies from different perspectives for Azerbaijan.

Author Contributions: "Conceptualization, U.K.P. and M.T.K.; methodology, U.K.P.; software, U.K.P.; validation, U.K.P.; formal analysis, U.K.P.; investigation, U.K.P.; resources, U.K.P.; data curation, U.K.P. and M.T.K.; writing - original draft preparation, U.K.P. and M.T.K.; writing—review and editing, U.K.P. and M.T.K.; visualization, U.K.P.; supervision, U.K.P. and M.T.K.;; project administration, U.K.P. and M.T.K. All authors have read and agreed to the published version of the manuscript."

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

Anton, S. G., & Nucu, A. E. A. (2020). The effect of financial development on renewable energy consumption. A panel data approach. Renewable Energy, 147, 330-338.

Bayer, C., & Hanck, C. (2013). Combining non-cointegration tests. Journal of Time series analysis, 34(1), 83-95.

Dimnwobi, S. K., Madichie, C. V., Ekesiobi, C., & Asongu, S. A. (2022). Financial development and renewable energy consumption in Nigeria. Renewable Energy, 192, 668-677.

Dingru, L., Onifade, S. T., Ramzan, M., & AL-Faryan, M. A. S. (2023). Environmental perspectives on the impacts of trade and natural resources on renewable energy utilization in Sub-Sahara Africa: Accounting for FDI, income, and urbanization trends. Resources Policy, 80, 103204.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: journal of the Econometric Society, 55(2), 251-276.

Eren, B. M., Taspinar, N., & Gokmenoglu, K. K. (2019). The impact of financial development and economic growth on renewable energy consumption: Empirical analysis of India. Science of the Total Environment, 663, 189-197.

Habiba, U., & Xinbang, C. (2023). The contribution of different aspects of financial development to renewable energy consumption in E7 countries: The transition to a sustainable future. Renewable Energy, 203, 703-714.

IMF (2024). Financial development index database. https://data.imf.org/?sk=388dfa60-1d26-4ade-b505-a05a558d9a42. (Accessed 15 April 2024).

Islam, M. M., Irfan, M., Shahbaz, M., & Vo, X. V. (2022). Renewable and non-renewable energy consumption in Bangladesh: The relative influencing profiles of economic factors, urbanization, physical infrastructure and institutional quality. Renewable Energy, 184, 1130-1149.

Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. Economics Letters, 6(3), 255-259.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. Econometrica: Journal of the Econometric Society, 1551-1580.

Lee, J., & Strazicich, M. C. (2013). Minimum LM unit root test with one structural break. Economics Bulletin, 33(4), 2483-2492.

Lumsdaine, R. L., & Papell, D. H. (1997). Multiple trend breaks and the unit-root hypothesis. Review of Economics and Statistics, 79(2), 212-218.

Hasanov, F. J., Mukhtarov, S., & Suleymanov, E. (2023). The role of renewable energy and total factor productivity in reducing CO2 emissions in Azerbaijan. Fresh insights from a new theoretical framework coupled with Autometrics. Energy Strategy Reviews, 47, 101079.

Mukhtarov, S., & Mikayilov, J. I. (2023). Could financial development eliminate energy poverty through renewable energy in Poland?. Energy Policy, 182, 113747.

Mukhtarov, S., Humbatova, S., Hajiyev, N. G. O., & Aliyev, S. (2020). The financial development-renewable energy consumption nexus in the case of Azerbaijan. Energies, 13(23), 6265.

Mukhtarov, S., Yüksel, S., & Dinçer, H. (2022). The impact of financial development on renewable energy consumption: Evidence from Turkey. Renewable Energy, 187, 169-176.

Our World in Data (2024a). https://ourworldindata.org/energy/country/azerbaijan. Energy consumption by source, Azerbaijan (Accessed 15 April 2024).

Our World in Data (2024b). Per capita CO_2 emissions. https://ourworldindata.org/grapher/co-emissions-per-capita (Accessed 15 April 2024).

Park, J. Y. (1992). Canonical cointegrating regressions. Econometrica: Journal of the Econometric Society, 60(1), 119-143.

Pata, U. K., & Kartal, M. T. (2024). Investigating the impacts of trade openness and energy consumption on environmental quality in Azerbaijan: An analysis under the Load Capacity Curve Hypothesis. Opportunities and Challenges in Sustainability, 3(2), 72-78.

Pata, U. K., & Yilanci, V. (2021). Investigating the persistence of shocks on the ecological balance: evidence from G10 and N11 countries. Sustainable Production and Consumption, 28, 624-636.

Pata, U. K., Yilanci, V., Zhang, Q., & Shah, S. A. R. (2022). Does financial development promote renewable energy consumption in the USA? Evidence from the Fourier-wavelet quantile causality test. Renewable Energy, 196, 432-443.

Pata, U. K., Caglar, A. E., Kartal, M. T., & Kılıç Depren, S. (2023a). Evaluation of the role of clean energy technologies, human capital, urbanization, and income on the environmental quality in the United States. Journal of Cleaner Production, 402, 136802.

Pata, U. K., Alola, A. A., Erdogan, S., & Kartal, M. T. (2023b). The influence of income, economic policy uncertainty, geopolitical risk, and urbanization on renewable energy investments in G7 countries. Energy Economics, 128, 107172.

Pata, U. K., Wang, Q., Kartal, M. T., & Sharif, A. (2024). The role of disaggregated renewable energy consumption on income and load capacity factor: a novel inclusive sustainable growth approach. Geoscience Frontiers, 15(1), 101693.

Phillips, P. C., & Hansen, B. E. (1990). Statistical inference in instrumental variables regression with I (1) processes. The review of economic studies, 57(1), 99-125.

Saadaoui, H. (2022). The impact of financial development on renewable energy development in the MENA region: the role of institutional and political factors. Environmental Science and Pollution Research, 29(26), 39461-39472.

Samour, A., Baskaya, M. M., & Tursoy, T. (2022). The impact of financial development and FDI on renewable energy in the UAE: a path towards sustainable development. Sustainability, 14(3), 1208.

Shahbaz, M., Topcu, B. A., Sarıgül, S. S., & Vo, X. V. (2021). The effect of financial development on renewable energy demand: The case of developing countries. Renewable Energy, 178, 1370-1380.

Ulussever, T., Kartal, M. T., & Kılıç Depren, S. (2023). Effect of income, energy consumption, energy prices, political stability, and geopolitical risk on the environment: evidence from GCC countries by novel quantile-based methods. Energy & Environment, https://doi.org/10.1177/0958305X231190351.

Wang, Q., & Dong, Z. (2021). Does financial development promote renewable energy? Evidence of G20 economies. Environmental Science and Pollution Research, 28, 64461-64474.

Wang, X., Xu, Z., Qin, Y., & Skare, M. (2023). The global impact of financial development on renewable energy in a panel structural vector autoregression analysis. Sustainable Development, 31(3), 1364-1383.

Wang, Z., Le Hoa Pham, T., Wang, B., Hashemizadeh, A., Bui, Q., & Nawarathna, C. L. K. (2022). The simultaneous impact of education and financial development on renewable energy consumption: an investigation of Next-11 countries. Environmental Science and Pollution Research, 29(56), 85492-85509.

World Bank (2024). Urban population (% of total population).

https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS (Accessed 15 April 2024).

Zhang, R. J., & Razzaq, A. (2022). Influence of economic policy uncertainty and financial development on renewable energy consumption in the BRICST region. Renewable Energy, 201, 526-533.

Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. Journal of Business & Economic Statistics, 10, 251-270