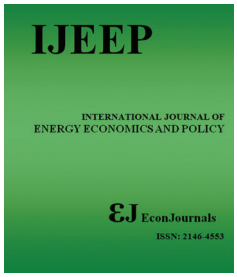

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2022, 12(3), 270-279.

Energy Consumption Impact on Economic Management: Evidence from Indonesian Economy

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Received: 13 February 2022 **Accepted:** 06 May 2022 **DOI:** https://doi.org/10.32479/ijeep.13035

ABSTRACT

Globally, energy consumption has been considered the significant factor that affects economic management and needs the focus of recent studies and regulators. Hence, the present article examines the impact of renewable energy consumption (REC), fossil fuel energy consumption (FFEC), energy use, electric power consumption (EPC) and energy import on the economic management of the Indonesian economy for the period of 1991-2020. The present article used the autoregressive distributed lag model to test the linkage among the variables and executed the Granger causality test to examine the causality association between variables. The results revealed that REC, FFEC, energy use, EPC and energy import have significant and positive linkage with the economic management of the Indonesian economy. The current article has guided the regulators that they should develop the regulators related to the economic management using effective energy consumption.

Keywords: Fossil Fuel Energy Consumption, Energy Use, Electric Power Consumption, Energy Import, Economic Management
JEL Classifications: O13, P28, P48, Q47

1. INTRODUCTION

The world has witnessed notable changes as a result of globalization (Baloch et al., 2021; Hsu et al., 2021; Santiago et al., 2020; Zhao et al., 2021). Globalization has impacted every sector of the economy and also every aspect of life. There is a number of issues merged as a result of globalization. One of the most considerable is the energy issue. Many countries of the world are witnessing a shortage of energy. The shortage is adversely affecting economic growth (EG). In the literature number of researchers proposed a significant as well as positive relationship between energy (renewable form) and economic development (ED) (Gyamfi et al., 2021). Further, energy consumption has a strong influence over any country ED. The EG of any disturbs when it faces issues in managing the economy that is narrated as economic management. Economic management is all about the management of resources, finance, income as well as expenditures of any country or business (Burkaltseva et al., 2018; Chien et al., 2021a; Xueying et al., 2021). Any imbalance in the management of these resources adversely impacts the EG of the country. The increasing energy demand as a result of increasing consumption results in more investment in energy production projects. More and more investment results in an imbalance between income and expenses. Then income of particularly developing countries is not accelerating at a high pace. Thus, the income remains the same but expanses increase which results in difficulties in economics management. Form the present study point of view the energy consumption is impacting the economics management of the country. Indonesia is one of the developing country which is also facing issues in economic management in result of increasing energy consumption (Chien et al., 2021b; Huang et al., 2021c; Li et al., 2021a; Tan et al., 2021).

With more than 17,000 islands, Indonesia is the world's biggest archipelago. This makes it difficult for the country to develop

its infrastructure. Nonetheless, throughout the previous few decades, Indonesia has made great progress in supplying energy throughout the country. Nonetheless, access to power varies widely throughout the many islands. Eastern Indonesian regions such as East Nusa Tenggara and Papua had the lowest electrification rates in the country, with <61% of homes having access to energy. The literature also witnessed that like fossil fuel, i.e. oil, gas as well as carbon along with energy (renewable form) is the major form of energy mix in the country (Mohsin et al., 2021; Sadiq et al., 2021a; Sari and Meidiana, 2019). Indonesia is heavily reliant on fossil fuels for electrical generation, with coal and natural gas providing the bulk of electricity. In the previous 10 years, Indonesia's coal energy supply has increased by a factor of a hundred, much outpacing the country's hydroelectric energy production (Chien et al., 2021c; Huang et al., 2021b; Ordonez et al., 2021; Sadiq et al., 2021b). Despite the fact that important export markets are changing toward alternative energy sources, Indonesia, the world's largest coal exporter, is likely to increase coal energy supplies in the next decades. Recognizing the Indonesian energy i.e. renewable energy resources have yet to be completely exploited, the national electricity company PLN began construction of the Indonesian biggest hydropower plant in the year of 2019, with a goal of generating 1350 megawatts by 2025.

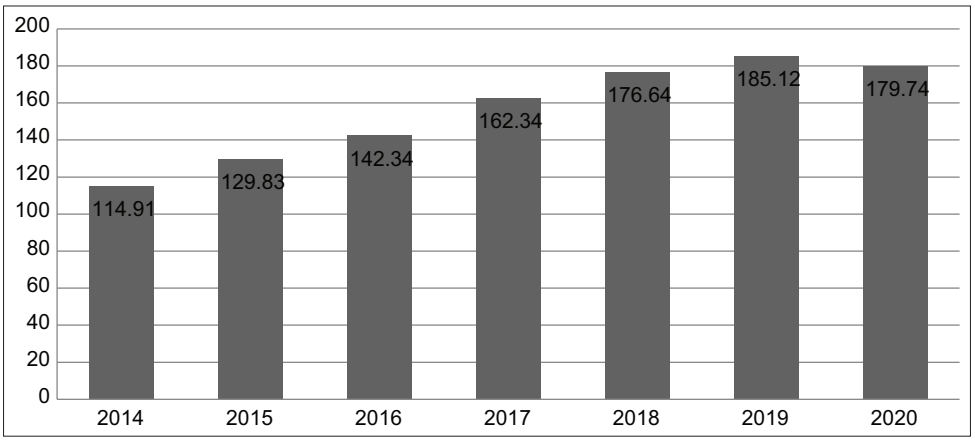
Except that there is a number of challenges that are facing the Indonesian energy sector like Indonesia's primary energy consumption have been growing faster than the country's average yearly rate. Energy usage per capita has gradually increased during the last decade (Chien et al., 2021d; Huang et al., 2021a; Sadiq et al., 2021c; Tambunan et al., 2020). The transportation and industrial sectors, which were still strongly reliant on oil, account for the majority of this expansion. Indonesia's oil output, on the other hand, has been dropping for several years. While the value of investments in Indonesia's oil and gas sector remains high, the sector's contribution to state income has been falling. Indonesia was the world's fifth-largest producer of greenhouse gases, owing primarily to its energy industry. In addition, the energy sector contributes significantly in the GDO of the country in Indonesia. Some statistics related to the GDP from the Indonesian electricity and gas sector are given in Figure 1.

The present study will address some gaps does exist in the literature like (1) being one of the important topics like renewable consumption and economic management although researched although but still not reached its peak, (2) Ehsanullah et al. (2021) and Li et al. (2021), investigated the nexus between renewable energy resources and ED in SAARC whereas the present study will replace the energy resources with energy use and investigate the equation in Indonesian perspective, (3) will test the equation in Indonesia perspective, (4) Liu and Hao (2018), investigated whether renewable energy and ED in EU countries whereas the present study will test the equation in Indonesia with a new data set model, (5) Musibau et al. (2021), investigated the nexus between degradation of the environment, energy usage along with EG in Nigeria whereas the present study will test the equation in Indonesia by removing environment degradation factor. The significance of the study are (1) will highlight the importance of energy consumption for the economy of Indonesia, (2) help the professional to revamp their policies for best utilization of energy for betterment of Indonesia economy, (3) will help the researchers to identify the energy importance for any country economic prosperity.

2. LITERATURE REVIEW

As the world is getting digitalized the demand for energy is accelerating at a rapid pace. This increasing demand for energy is at one side allowing the world to explore more ways to produce the energy as well as to mitigate its impact on the economy (Nawaz et al., 2021; Othman et al., 2020; Shair et al., 2021). The nexus between these factors were reported by a number of scholars in literature (Chien et al., 2022; Danish et al., 2019; Moslehpour et al., 2021; Selvaggi et al., 2018). In this context: Vo et al. (2019) examined the nexus among REC and economic management in the terms of ED. The data set of 43 years from 1971 to 2014 was selected and tested with the help of multiple time-series econometrics approaches. The study concluded that positive nexus between REC and economics management in term of Indonesian, Myanmar as well as Malaysian ED. While, there is no relationship reported between the Philippines and Thailand. Surprisingly, only Myanmar has a unidirectional influence among renewable energy adoption and economic management. Based on the findings of this study, policy implications have developed for each nation in the ASEAN. The economic wellbeing of any country strongly depends upon better economic management. If an economy is progressing

Figure 1: Indonesian GDP from electricity and Gas (in trillion Indonesia Rupiah)



that means the economic management is in the right direction. In this context: Bilan et al. (2019), examined the nexus of resources of renewable energy with economics management of European Union countries. The data set of 25 years from 1995 to 2015 was tested. The collected data was analyzed by employing FMLOS, DOLS along with VEC model. The study concluded significant nexus between energy (i.e. renewable) and economics management from the perspective of GDP. Furthermore, the data show a retraction of the correction when ED results in energy (i.e. renewable) usage increase. Given the economic, energy-related, and environmental issues that governments, policymakers, and stakeholders confront, associated members of ASEAN have attempted numerous times to establish renewable energy objectives. Thus, Haseeb et al. (2019), examined the nexus between renewable form of energy and economic well-being. The data set of 36 years from 1980 to 2016 was tested by applying the ARDBT approach. The results proposed that the well-being of the Malaysian economy depends upon renewable energy.

As the world is shifting from nonrenewable to renewable energy (1) in order to match the enhancing demand of energy, (2) reduce the energy costs (3) safeguard the global environment. The studies proposed the energy produced from fossil fuels does impact ED (Abokyi et al., 2019; Ali et al., 2021; Chien et al., 2021f). In this context: Li et al. (2021) and Mensah et al. (2019), explored whether fossil fuel based energy consumption does impact economic well-being. The study was conducted in Africa. The data set of 25 years from 1990 to 2015 of 25 African nations were selected for analysis. Heterogeneity and cross-sectional dependency were examined to test the association between selected factors. The findings of the study showed that in both the long as well as short-run, there is a significant relationship does exist between FFEC and ED for all panels. There is a number of factors that impact the economic conditions of a country. One of the major impacting factors is the population density of the country. If a country's economic conditions are good then the country will be able to spend more on their people to enhance their standard of living. On the other hand, providing a healthy living environment to the country's people is also the prime responsibility of the government. Thus, the impact of fossil fuel and EG on population density was explored by Uzair Ali et al. (2022) in India, Bangladesh and Pakistan. The data set of 45 years from 1971 to 2014 was tested by employing the autoregressive distributed lag (ARDL) approach. The results revealed that both fossil fuel and ED does impact the population density. Furthermore, Lin and Benjamin (2018), also explored the nexus between fossil fuel and ED in MINT nations. The data set of 25 years from 1990 to 2014 was tested. The results revealed that there is an association between FFEC and ED. Further, the study recommended that Diversification of the economy is promoted in order to boost worker productivity, and excessive reliance on fossil fuels should be avoided.

The countries are shifting towards energy imports with a view to meet the enhancing demand of the energy within the country. This energy import also has influence over the country's economy in multiple directions. In this context: Üzümcü et al. (2019) tested the association between energy import and EG. This analysis was conducted among importer countries. The data from 1999 to 2004 was collected and tested by employing modern techniques. The findings of the study concluded that there is a significant relationship between energy imports and ED. Similarly, Latief and Lefen (2019) and Liu et al. (2021a), examined the nexus among FDI and EG. The study was being carried out in Pakistan. The data were tested by the employment of Johansen co-integration and Granger to find the causal association between the variables. The results assured a positive conjoint short-run nexus between the consumption of energy and EG. The results also reveal the existence of long-run causality in the equation of consumption of energy. Furthermore, Liu et al. (2021b) and Moreau and Vuille (2018) explored the nexus between energy use and EG. The study was conducted in Switzerland. The results revealed that embodied energy in imports now reaches 81 per cent of total energy consumption in economic activity. Decoupling is more virtual than real, according to a study of energy intensities in trade with and without embodied energy. By relying on increased indirect energy use, shifting energy-demanding activities overseas improves domestic performance but decreases both total energy usage and security.

The energy use has also significantly influences the economic management of the country (Chien et al., 2021e; Moslehpour et al., 2022a; Naseem and Ji, 2021; Usman and Makhdum, 2021; Vo et al., 2019). In this context: Musibau et al. (2021), explored the energy use impact on economic management in terms of ED. The study was conducted in Nigeria. The data of 33 years from 1981 to 2014 was tested by employing the ARDL approach. The results revealed that energy use does impact the EG in Nigeria. Furthermore, Anser et al. (2021), also explored the nexus of energy use and ED. The study was conducted in the South Asian region. The data of 35 years from 1985 to 2019 was tested by employing the FMOLS method. The results exposed that the nexus between energy use and economic management in terms of EG in the South Asian nations. Li et al. (2021), explored the nexus between renewable energy use and economic management in terms of EG. The study was conducted in SAARC nations. The data set of 23 years from 1995 to 2018 was collected and tested. The data was tested by employing PVECM model. The results revealed that energy has an impact over the EG. Further, renewable energy form like hydropower has more impact on the EG in comparison with the forms of renewable energy.

The world is witnessing an energy shortage for the past decade. This is due to the increased demand for and involvement of energy in all aspects of life. The increasing demand for energy has impacted the economic conditions of the world. In this context: Hassan et al. (2022), the relationship between the consumption of electric power and ED. The study was conducted in Portugal, France and Finland. The results revealed that electric power consumption (EPC) has a favorable long-term and short-term influence on EG in Finland and Portugal, as well as a long-term impact in France. The findings also illustrate the labor force's favorable and considerable impact on both long and short-term EG in France and Finland. In the long run, however, it slows EG in Portugal. Further, the study suggested that the focus should be switched away from non-renewable energy sources and toward renewable energy sources in order to ensure that everyone has

access to clean energy by 2030, as part of the UN's Sustainable Development Goals. As a result, the current study helps selected EU member nations achieve long-term EG. Similarly, Liu and Hao (2018), explored the impact of energy usage on ED. The study was conducted on "One Belt One Road" in China. The study used the data set of 43 years from 1970 to 2013. The collected data was tested by employing the VECM, FMOLS and DOLS approach. The results exposed that the usage of energy does impact the ED in the context of "One Belt One Road" project. Similarly, Bekun and Agboola (2019), also explored the association between electricity consumption and ED. The study was conducted in Nigeria. The data from 1971 to 2014 was tested after collection. The results of the study revealed that the use of energy does impact ED in Nigeria.

3. RESEARCH METHODS

The article examines the impact of REC, FFEC, energy use, EPC and energy import on the economic management of the Indonesian economy. The present research has taken the data from WDI from 1991 to 2020. The present article has used the ARDL model to test the linkage among the variables and executed the Granger causality test to examine the causality association between variables. The equation for the study is given below:

$$EM_t = \alpha_0 + \beta_1 REC_t + \beta_2 FFEC_t + \beta_3 EU_t + \beta_4 EPC_t + \beta_5 EI_t + e_t \quad (1)$$

Where;
EM = Economic Management
t = Time Period
REC = Renewable Energy Consumption
FFEC = Fossil Fuel Energy Consumption
EU = Energy Use
EPC = EPC
EI = Energy Import

Economic management has been used as the predictive variable and measured as the CPIA quality of budgetary and financial management rating (1–6). In addition, REC measured as the REC (% of total energy consumption), FFEC measured as the FFEC (% of total energy consumption), energy used measured as the energy use (kg of equivalent per capita), EPC measured as the EPC (kWh per capita) and energy import measured as the energy import (% of energy use) have been taken as the predictors of the study. Table 1 shows the measurement and variables.

Table 1: Measurements of variables

S#	Variables	Measurement	Sources
01	Economic Management	CPIA quality of budgetary and financial management rating (1–6)	WDI
02	REC	REC (% of total energy consumption)	WDI
03	FFEC	FFEC (% of total energy consumption)	WDI
04	Energy Use	Energy use (kg of equivalent per capita)	WDI
05	EPC	EPC (kwh per capita)	WDI
06	Energy Import	Energy import (% of energy use)	WDI

Firstly, the current article checks the descriptive statistics to examine the variables' characteristics such as mean, observations used, maximum values, standard deviation and minimum values. Secondly, a correlation matrix has also been run to test the directional linkage among variables. Thirdly, variance inflation factor (VIF) has also been applied to investigate the multicollinearity among predictors. The equations for VIF are mentioned as under:

$$R^2_{Y}\ Y_{it} = \alpha_0 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + e_{it} \quad (2)$$

$$j = R^2_Y, R^2_{X1}, R^2_{X2,} R^2_{X3,} R^2_{X4,} R^2_{X5} \quad (3)$$

$$Tolrance = 1 - R^2_j VIF = \frac{1}{Tolerance} \quad (4)$$

Fourthly, Augmented Dickey-Fuller Test (ADF) test has also been applied by this article to check the unit root among the constructs. The equation is given as under:

$$d(Y_t) = \alpha_0 + \beta t + \mathrm{Y} Y_{t-1} + d(Y_t(-1)) + \varepsilon_t \quad (5)$$

The unit root has been examined individually, and the equations for the individual construct are given below:

Economic Management

$$d(EM_t) = \alpha_0 + \beta t + \mathrm{Y} EM_{t-1} + d(EM_t(-1)) + \varepsilon_t \quad (6)$$

REC

$$d(REC_t) = \alpha_0 + \beta t + \mathrm{Y} REC_{t-1} + d(REC_t(-1)) + \varepsilon_t \quad (7)$$

FFEC

$$d(FFEC_t) = \alpha_0 + \beta t + \mathrm{Y} FFEC_{t-1} + d(FFEC_t(-1)) + \varepsilon_t \quad (8)$$

Energy use

$$d(EU_t) = \alpha_0 + \beta t + \mathrm{Y} EU_{t-1} + d(EU_t(-1)) + \varepsilon_t \quad (9)$$

EPC

$$d(EPC_t) = \alpha_0 + \beta t + \mathrm{Y} EPC_{t-1} + d(EPC_t(-1)) + \varepsilon_t \quad (10)$$

Energy import

$$d(EI_t) = \alpha_0 + \beta t + \mathrm{Y} EI_{t-1} + d(EI_t(-1)) + \varepsilon_t \quad (11)$$

The present article has used the ARDL model for testing the linkage among the variables because the ADF test indicated that some constructs have unit root at level, but some constructs have not unit root at the level. In addition, one of the characteristics of ARDL is that it provides the best estimation even in the case of small sample size (Ahmed et al., 2021) as the current research has used only 30 observations. Moreover, the ARDL model provides

the short and long-run results altogether. The ARDL model equation with understudy construct is given as under:

$$\Delta EM_t = \alpha_0 + \sum \delta_1 \Delta EM_{t-1} + \sum \delta_2 \Delta REC_{t-1} + \sum \delta_3 \Delta FFEC_{t-1} + \sum \delta_4 \Delta EU_{t-1} + \sum \delta_5 \Delta EPC_{t-1} + \sum \delta_6 \Delta EI_{t-1} + \varphi_1 EM_{t-1} + \varphi_2 REC_{t-1} + \varphi_3 FFEC_{t-1} + \varphi_4 EU_{t-1} + \varphi_5 EPC_{t-1} + \varphi_6 EI_{t-1} + \varepsilon_1 \quad (12)$$

In addition, the Granger Causality test has also been applied by the current research to examine the bidirectional, unidirectional and no association between the variables. The equations for the Granger Causality test are given as under:

$$Y_t = \beta_0 + \sum_{j=1} \beta_{1j} Y_{t-1} + \sum_{h=1} \beta_{2h} Y_{t-p} + \varepsilon_t \quad (13)$$

$$X_t = \acute{\alpha}_0 + \sum_{s=1} \acute{\alpha}_{1s} Y_{t-s} + \sum_{t=1} \acute{\alpha}_{2t} X_{t-m} + \varepsilon_t \quad (14)$$

4. RESEARCH FINDINGS

Firstly, the current article checks the descriptive statistics to examine the variables' characteristics such as mean, observations used, maximum values, standard deviation and minimum values. The findings revealed that the mean value of EM is 3.585 while the average value of REC was 39.234%. In addition, the results also exposed that the mean value of FFEC is 63.311% and the average value of EU is 779.018%. Finally, the mean value of EPC was 567.648%, and the average value of EI is −85.415%. Table 2 shows these findings.

Secondly, a correlation matrix has also been run to test the directional linkage among variables. The results investigated that REC, FFEC, EU, EPC and EI have positive linkage with economic management. Table 3 shows these results.

Thirdly, VIF has also been applied to investigate the multicollinearity among predictors. The results mentioned in Table 4 indicated that the values are <5, which means no multicollinearity issue in the model.

Fourthly, the ADF test has also been applied by this article to check the unit root among the constructs. The results given in Table 5 indicated that EM and EPC are stationary at the level. In contrast, REC, FFEC, EU and EI are stationary at the first difference, and the exposed ARDL model could be used.

The co-integration among the constructs has been checked by applying ARDL bound test. The results indicated that the 6.52 calculated f-statistics is larger than the critical value at 10 and 5% level of significance. These results exposed that the co-integration exist and the ARDL model could be used. Table 6 shows these results.

The results of the ARDL model revealed that REC, FFEC, energy use, EPC and energy import have significant and positive linkage with the economic management of the Indonesian economy in the short run. In addition, the results also exposed that 55.4028% of the changes in economic management are due to the predictor used in the article. Table 7 shows the short-run results of the ARDL model.

In addition, the results of the ARDL model also revealed that REC, FFEC, energy use, EPC and energy import have significant and positive linkage with the economic management of the Indonesian economy in the long run. Table 8 shows the long run results of the ARDL model.

Finally, the current research applied the Granger Causality test to examine the bidirectional, unidirectional and no association

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
EM	30	3.585	0.242	3	4
REC	30	39.234	11.031	19.836	57.829
FFEC	30	63.311	3.328	54.811	67.155
EU	30	779.018	110.669	560.588	941.464
EPC	30	567.648	286.601	177.955	1104
EI	30	−85.415	32.214	−156.301	−50.174

Table 3: Matrix of correlations

Variables	EM	REC	FFEC	EU	EPC	EI
EM	1.000					
REC	0.120	1.000				
FFEC	0.170	−0.897	1.000			
EU	0.143	−0.967	0.960	1.000		
EPC	0.113	−0.983	0.846	0.945	1.000	
EI	0.034	0.838	−0.558	−0.709	−0.889	1.000

Table 4: Variance inflation factor

	VIF	1/VIF
REC	2.092	0.478
FFEC	2.991	0.334
EU	1.982	0.505
EPC	1.882	0.531
EI	2.944	0.340
Mean VIF	2.378	

Table 5: Unit root test

Augmented Dickey-Fuller Test (ADF)	Level	t-statistics	P-values
EM	I (0)	−2.190	0.042
REC	I (1)	−5.883	0.000
FFEC	I (1)	−5.926	0.000
EU	I (1)	−5.822	0.000
EPC	I (0)	−2.218	0.034
EI	I (1)	−5.637	0.000

Table 6: ARDL bound test

Model	F-statistics	Lag	Level of Significance	Bound test critical values	
				I (0)	I (1)
EM/(REC, FFEC, EU, EPC, EI)	6.52	4	1%	6.63	6.99
			5%	5.13	5.87
			10%	4.52	4.92

between the variables. The results revealed that bidirectional linkage exists among REC and EM and EPC and EM. In addition, the results also exposed that unidirectional linage exists among FFEC and EM and EU and EM. Finally, the results also revealed no causality linkage among EI and EM. Table 9 shows the Granger causality test results.

5. DISCUSSION

The findings revealed that REC has a positive impact on economic management. These results are supported by Danish et al. (2019), which states that the renewable energy is suitable for effective economic management practices. These sources of energy are cheaper than the traditional energy source or high voltage power. So, when many electrical appliances or technologies are used for the building infrastructure and performing goods or services production-related activities, renewable or clean energy is used, the financial resources can be saved and allocated on some other more productive processes. These resources are also in line with Ridzuan et al. (2017), which shows that through encouraging REC within the economy, the economists can better manage the economic practices and their effectiveness. The use of renewable energy like solar power, wind power, or biomass reduces environmental pollution and help economists in natural resource management and human resource management, whose effectiveness is essential for sustainable EG. These results agree with Kutan et al. (2018), which analyzes the REC role in financial-economic management. The REC instead of non-renewable energy within a region for economic purposes helps reduce the medical expenditures or environmental protection expenditures, as it assists in minimizing the natural resources quality and health-damaging effects of economic activities.

Table 7: Short run coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (REC)	2.872914	1.172793	2.449634	0.0342
DFFEC)	0.892622	0.398822	2.238146	0.0423
D (EU)	3.772620	1.342525	2.810093	0.0273
D (EPC)	4.756145	1.726241	2.755203	0.0290
D (EI)	3.928726	1.092833	3.594992	0.0192
CointEq(-1)*	−1.727998	0.298810	−5.782932	0.0000
R-squared	0.554028	Mean dependent var		−0.065653
Adjusted R-squared	0.530928	S.D. dependent var		2.109291

Table 8: Long term coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REC	3.982023	1.299920	3.063283	0.0212
FFEC	5.993009	2.726251	2.198260	0.0349
EU	1.882734	0.453621	4.150456	0.0000
EPC	3.987837	1.142427	3.490671	0.0105
EI	2.653827	0.992635	2.673517	0.0305
C	1.872639	0.465292	4.024653	0.0113

Table 9: Granger causality test

Null Hypothesis	F-Statistic	Prob.	Decision
REC does not Granger Cause EM	5.87282	0.0000	Bidirectional
EM does not Granger Cause REC	4.28271	0.0023	
FFEC does not Granger Cause EM	5.87297	0.0000	Unidirectional
EM does not Granger Cause FFEC	0.09827	0.4352	
EU does not Granger Cause EM	5.90298	0.0000	
EM does not Granger Cause EU	1.42328	0.2324	Unidirectional
EPC does not Granger Cause EM	6.76362	0.0000	
EM does not Granger Cause EPC	5.98272	0.0000	Bidirectional
EI does not Granger Cause EM	0.76259	0.2726	
EM does not Granger Cause EI	1.32425	0.0877	No

The findings indicate that FFEC has a positive impact on economic management. These results agree with Uzair Ali et al. (2022), which examines the FFEC role in the effectiveness of economic management. The study posits that fossil fuel energy works as an operator and accelerator in the performance of economic practices as the use of fossil fuels directly provide energy or help in energy generation in the form of electricity or nuclear power. So, the fossil fuels energy consumption within the country enhances the effectiveness of economic management. These results also match with Li et al. (2019), which implies that the consumption of energy from fossil fuels assists in the utilization of larger amount of energy than any other source of energy as fossil fuels store significant source of solar energy. The use of solar energy stimulates the business practices in all economic sectors like industrial, service, transportation, and agriculture, so, in case the use of fossil fuels energy effective business strategies can be formed and executed. Hence, fossil fuel energy plays a crucial role in economic management.

The findings highlight that energy use has a positive impact on economic management. These results match with Moreau and Vuille (2018) and Moslehpour et al. (2022b), which highlights that the use of different forms of energy is an essential factor of the economy. The use of different business technologies like computers, software, networking, telephone communications, inventory system, inventory control system, production technology, construction machinery and depends on the energy consumption which could run these technologies. It is the use of energy on the part of businesses that allow them to adopt any technology which could assist their business performance. So, energy use assists in economic management. These results are supported by Kouton (2019), which reveals that the usage of energy assists in the transportation firms, assists all the businesses in carrying out their activities like the acquisition of raw material or other resources, transportation of human resources from one place to another, and marketing of services and products in time in order to respond to the customers' requirements. When a large amount of energy is available for utilization in the economy, it becomes easy for them to do economic management effectively. These results also match with Alam and Murad (2020), which shows that the economies where energy is used in large amounts are easier to be managed financially.

The findings showed that EPC has a positive impact on economic management. These results agree with Rahman (2020), which posits that electric power is a form of energy that is effective for infrastructures like lightning, heating, and cooling the organizational building and communication networking. The infrastructure builds a context where the business functions can be performed in a smooth and effective manner, and the business objectives are easy to be achieved; thus, the energy usage facilitates the economic management of a country. These findings are also supported by Salahuddin et al. (2018), which highlights that in electricity form, the power through grids can be transferred to far off areas. Thus, the firms can expand their businesses to remote areas as well and establish business units that could provide more productivity and job opportunities to many individuals. Hence, business managers can function effectively when the facility of EPC is available.

The findings revealed that energy import has a positive impact on economic management. These findings agree with Akadiri and Adebayo (2021), which states that when in a country, the individuals and firms are allowed to take energy resources from foreign countries, there are minimum chances of monopoly in the energy sector. So, there would not be any break in the economic practices and policies or strategies formulated for the economic management can be implemented efficiently. Thus, energy import encourages economic management effectiveness. These results are also supported by Balsalobre-Lorente and Leitão (2020), who argue that the import of cheaper and affordable energy reduces the worries of the business firms to rely only on the energy sources available in the country at higher prices. By saving the money from the expenditures side, the firms can adopt innovative technologies and other better-quality resources. The positive contribution of energy import into the economy enhances the significance of energy import in economic management.

6. CONCLUSION, POLICY RECOMMENDATIONS AND LIMITATIONS

The aim of the study was to analyze the influences of REC, FFEC, energy use, EPC, and energy import on economic management. For this purpose, the authors selected the Indonesian economy and, through a survey to Indonesia, collected data about REC, FFEC, energy use, EPC, energy import, and economic management and the relationship among them. As per these findings, the relationship of REC, FFEC, energy use, EPC, and energy import with economic management is positive. The results revealed that the increased use of renewable energy not only help carry on the economic practices but also reduces environment-related costs and develops EG. So, REC helps in economic management. The results also stated that in all the economic sectors, for the business operations, energy has become essential as now mostly the economy is based on the technologies used, and fossil fuels are the fast source of energy. The findings showed that electric power, instead of the combustion of fossil fuel to gain energy, is more suitable concerning environmental & health influences and coverage of the large area. Likewise, the results revealed that the facility to import energy from foreign countries enables the firms within the country to maintain the business processes meeting the energy needs.

The present study has a great theoretical significance for having made a lot of contributions to economic literature. The present article examines the influences of REC, FFEC, energy use, EPC, and energy import on economic management. In prior literature, the relationship of REC, FFEC, energy use, EPC, and energy import with economic management has been the subject. But the relation of these factors with economic management has been discussed with reference to renewable and non-renewable energy. So, the present study has done something new. The selection of the Indonesian economy for the analysis of the role of REC, FFEC, energy use, EPC, and energy import in economic management extends the economic literature. The study also has many empirical implications. It is a guideline for the government that there must be work for electric power production, renewable energy must be encouraged, and energy import should be allowed through suitable policies so that the economic management may be effective. The economists must be responsible for the EG and must make policies for encouraging REC, increasing FFEC, energy use, EPC, and energy import for better economic management.

The current study is limited from some perspectives. However, the authors are recommended to present an improved study. The study examines the energy consumption through different like REC, FFEC, energy use, EPC, and energy import for analyzing the economic management effectiveness. Consequently, the study scope is limited. It is recommended to the future authors to pay attention to many other factors like government policies, political matters, human capital, financial development etc., which have an influence on economic management. Moreover, the duration of the research determines the essence of the study to be implemented in practice. The analysis of REC, FFEC, energy use, EPC, and energy import impacts on economic management for the limited time period raises a question to the study implication. The scholars must analyze the relation among the aforementioned factors for the extended period so that better results can be presented.

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