Renewable Energy Supply and Energy Import in Emerging Market Economies

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Abstract

This study analyzed the effect of the increase in GDP, the energy produced from oil, gas and coal sources, the increase in primary energy supply, the renewable energy supply and the energy density level on energy imports in the emerging market economies by using panel data method. The series are annual and cover the period 1990-2014. According to Driscoll-Kraay Standard Error Test results, the relationship between the energy produced from oil, gas and coal resources, renewable energy supply and energy imports is significant. A 1% increase in the Energy Produced from Oil, Gas and Coal Resources creates a 0.63% increase in Energy Imports. A 1% increase in Renewable Energy Supply leads to a 0.60% decrease in Energy Imports. The variables of GDP, Primary Energy Supply and Energy Intensity Level are not statistically significant in the model.

Keywords: *Renewable Energy Supply, Energy Import, Energy Supply*
Jel: Q21, Q41, Q42, Q43

1. INTRODUCTION

Renewable energy results from natural sources that are constantly replenished is often referred to as eco-friendly energy. Today, energy supply gap and environmental degredation have become an increasingly big concern. Renewable energy supplyofferingtremendous benefits for the needs of environment and economy shows notable progress especially in emerging market economies. One of the dynamics lying behind this trend is the limitations of the fossil fuel stock. Another one is the aim to reduce the damage on air, water and soil caused by toxic gas emissions and solid waste output arising from the use of fossil fuels. This cost created on the environment can be expressed as the decreasing returns of the economic growth carried out under the fossil fuel constraint.

Since the industrial revoluation, the broad trend of energy supply and energy conmsuption is rising throughout the world. Along with the global economic growth, countries have started to use more fossil and renewable resources as input. Countries that do not have sufficient fossil and renewable energy sources have become increasingly dependent on external resources. The monopolistic structure of the energy sector and the firms setting the energy prices with high profit expectations constitute the other determinants of energy imports of the dependent economies. Renewable energy sources are expected to contribute to supply security by reducing energy import dependency to the extent that they substitute the fossil fuels.

Within the scope of this study, the impact of renewable energy supply, primary energy supply GDP increase, energy produced from oil, gas and coal resources and energy intensity on the energy import in the emerging market economies were investigated by using the panel data method.The study consists of six sections. The second section of the study includes the conceptual framework. The third section analyzes the energy indicators in selected emerging market economies. The fourth section conducts a literature review. Thefifth section includes the data and the method. The subdivision of the secitonfiveconsists of the empirical model. The secitonsix shares the results obtained from the model.

2. CONCEPTUAL FRAMEWORK

Limited fossil resources paved the way for the increased interest in energy supply security especially in energy importing countries. IEA (2014),defines the energy supply security as “the uninterrupted availability of energy sources at an affordable price”. Energy supply gap is a concept threatening the energy supply security of the energy dependent countries. It can be expressed as the gap between demand and supply of energy measures. One of the strategy to close the gap between the demand and the supply of energy is to increase the investments in energy sector.

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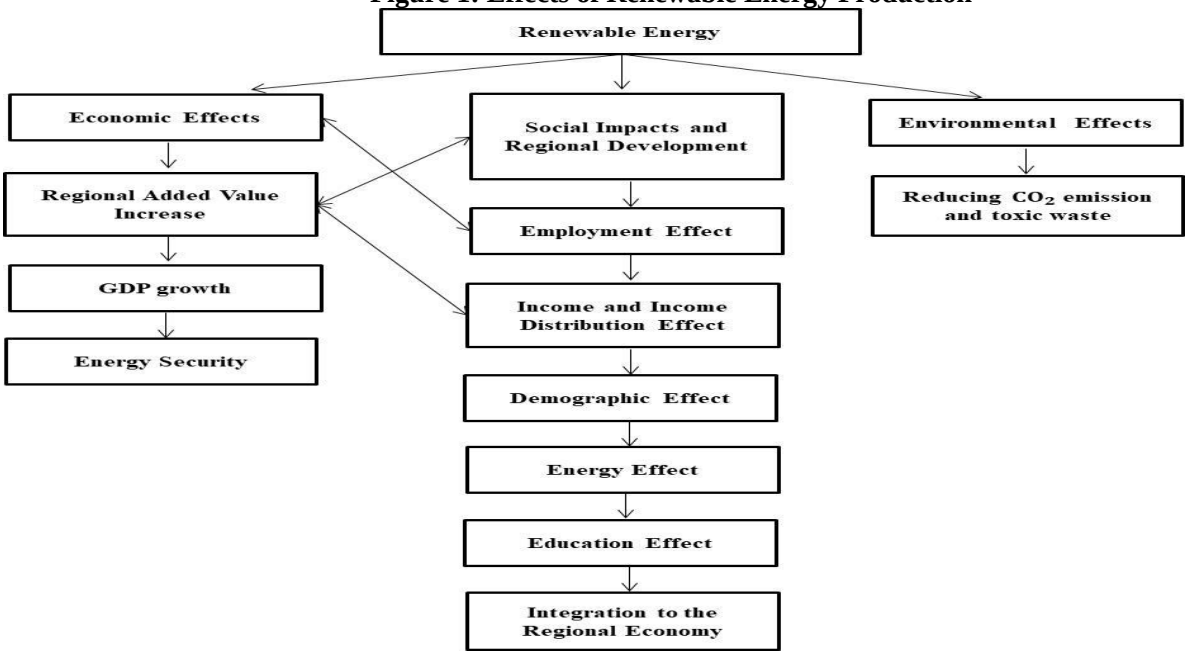
Therefore it isnecessary to initiate electricity sector reforms to enable private investment and promote renewable and environmentfriendly sources of power supply(Krishnaswamy & Stuggins, 2007).Increasing energy demand leads countries to increase the domestic energy investments for renewable energy supply. Renewable energy is a type of energy produced in the form of solid, liquid and pure energy which can be replenished from sources such as wind, solar, geothermal, hydroelectric, biomass, tide, wave and ocean over any reasonable timescale.Renewable energy produced using technologies such as wind turbines, solar panels, hydroelectric power plants can also be defined as environmentally friendly, clean energy.Eurostat Renewable Energy Resources Dictionary defines wind energy as the kinetic energy of the wind, which is converted into electricity in wind turbines.Solar energy is expressed as the method of producing energy by using radiation or solar photovoltaics.Geothermal energy is a type of energy that is present in the earth's crust, usually in the form of hot water or steam.Another renewable energy type is hydroelectric energy produced from the potential and kinetic energy of water in hydroelectric power plants.Tide, wave, ocean energy is a kind of mechanical energy obtained from tidal motion, wave and ocean currents and used to produce electricity. Biomass is a biological material that uses non-fossil organic raw materials such as plants and animal waste for biofuel production.It contains a wide variety of materials such as wood, grass, bamboo, corn, sugarcane, animal waste, sewage sludge harvested from the nature or biological part of the waste.

Renewable energy production underpinsignificant sosyo-economic and environmental benefits. The positive impacts of renewable energyusage become evident when most of the regional added value is concentrated in the agricultural sector.In this case, increasing renewable energy investments contributes to regional development.Renewable energy generation also contributesthe regional employment. Renewable energy projects have an impact on local employment, as long as they contribute to the recruitment of the unemployed. On the other hand, it can enable the diversity of employment by mediating the transfer of workers from agriculture to the renewable energy sector.Another advantage of producing renewable energy is the reducing effect of energy diversity on energy dependence.In this context, it would be appropriate to mention the income effect of renewable energy investments.Payments made to the local farmers and contributions made to the local people in return for the use of the land by the owner of the renewable energy facility can have an income effect. Renewable energy can play an important role in promoting the socio-economic development of the low income groups and contributing to the regional poverty reduction.

Figure 1: Effects of Renewable Energy Production



Source: Prepared by the author.

The demographic effects of renewable energy investments can occur especially when it has the potential to have an impact on preventing immigration of young people from the region. The proportion of renewable energy supply to the regional energy consumption renders a numerical indicator to explain the local energy impact. Carrying out the human resources development activities such as organizing trainings to increase the knowledge and skills of the employees in renewable energy projects and establishing a library stimulates the positive impact of such investments on local

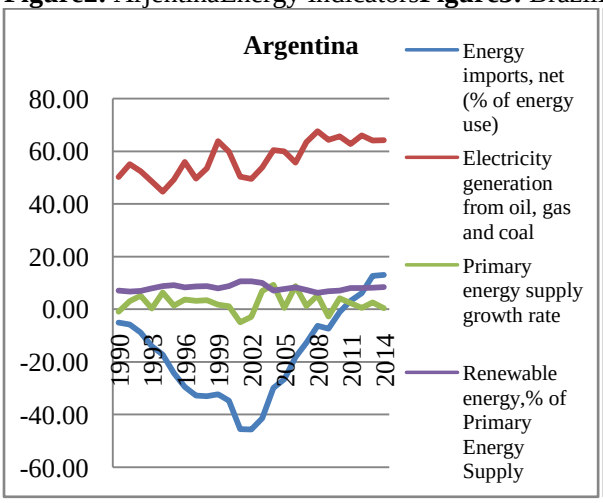
development. The socioeconomic impact increases with the integration of renewable energy investments to the productive structure of the local economy. (Rio & Burguillo, 2009). Renewable energy creates environmentally friendly effects by reducing the emission of harmful gases and toxic substances that contribute to global warming and climate change, such as CO_2.Figure 1 shows the economic, social / regional development and environmental effects of renewable energy production.

The negative environmental effects of renewable energy should not be considered to be zero or insignificant.The type and intensity of environmental impacts vary depending on the technology used, geographical location and many other factors.However, these negative effects are much smaller than the environmental effects of fossil fuels and it seems possible to prevent or minimize these effects by making careful choices.Regarding the wind power generation, there are various environmental impacts that need to be carefully evaluated for land use problems and wildlife areas.Similarly, the environmental effects of solar energy vary greatly depending on the scale of the system, the photovoltaic (PV) solar cells used or concentrated solar thermal power plants.Environmental effects of geothermal power plants also vary depending upon the conversion and cooling technology used.On the other hand, biomass power plants share some similarities with fossil fuel power plants.Both need a raw material to burn to produce electricity.Therefore, biomass plants contain similar problems with fossil fuel plants in terms of gas emission and water use (UCSUSA, 2013).

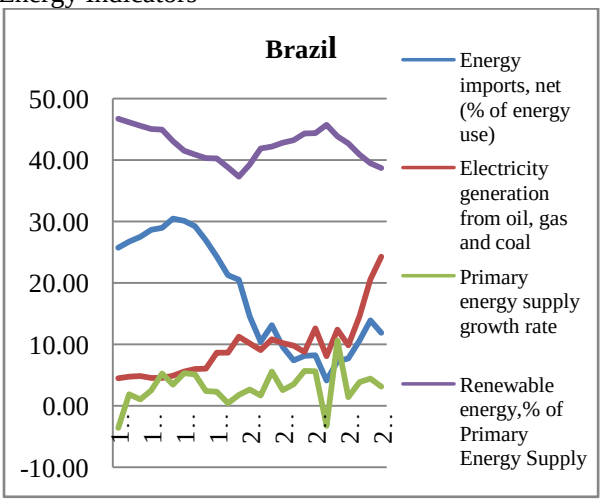
3. ENERGY INDICATORS IN EMERGING MARKET ECONOMIES

Electricity generation on a global scale increased by an average of %3.0 between 1985 and 2017.As of 2017, the largest share in energy production belongs to coal with %38.1.While the share of natural gas in electricity production is %23.2, the share of hydroelectricity is %15.9.The increase in electricity production in emerging markets follows a trend parallel to the increase in world economic growth rate (TSKB, 2018). In 2018, the global economy achieved a growth rate of 3.7%.The largest part of the renewable energy supply was met by renewable thermal energy (estimated 4.2% of net energy consumption), hydroelectric energy (3.6%), wind energy and solar PV (2%), transport biofuels (about 1%).More than half of the global investment in renewable energies in 2018 has been driven by emerging market economies (REN21, 2019). The graphs below show the energy indicators of the selected emerging market economies.

Figure2: ArjentinaEnergy Indicators**Figure3:** BrazilEnergy Indicators



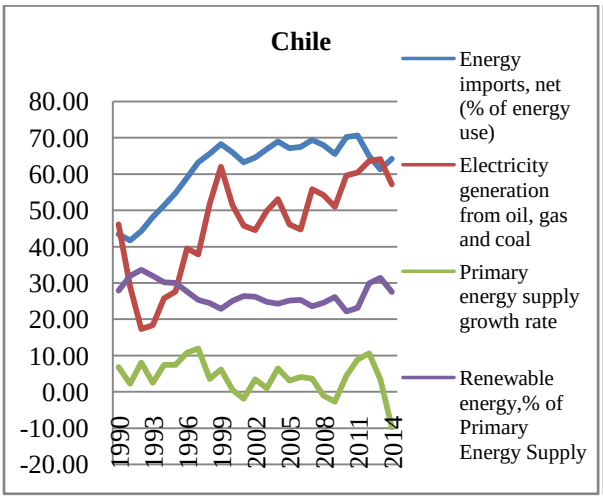
Source: World Development Indicators



Source: World Development Indicators

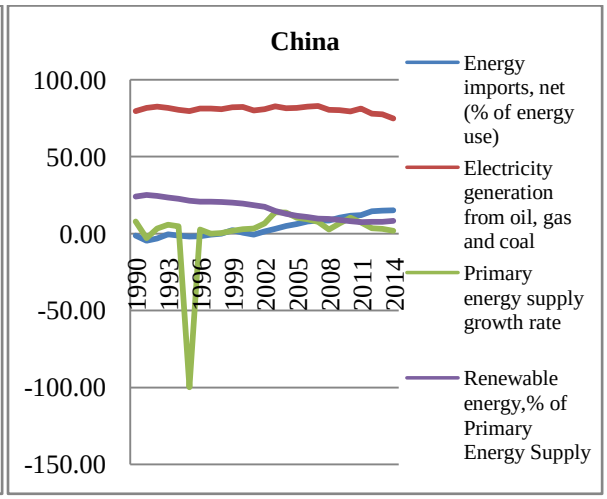
Figure 4: Chile Energy Indicators

Figure5: China Energy Indicators



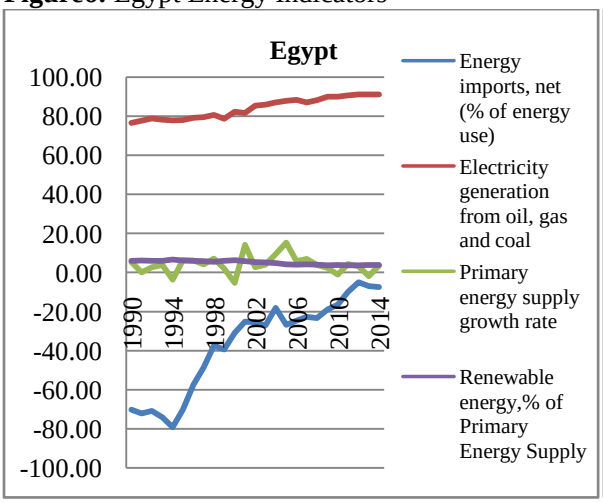
Source: World Development Indicators

Figure6: Egypt Energy Indicators



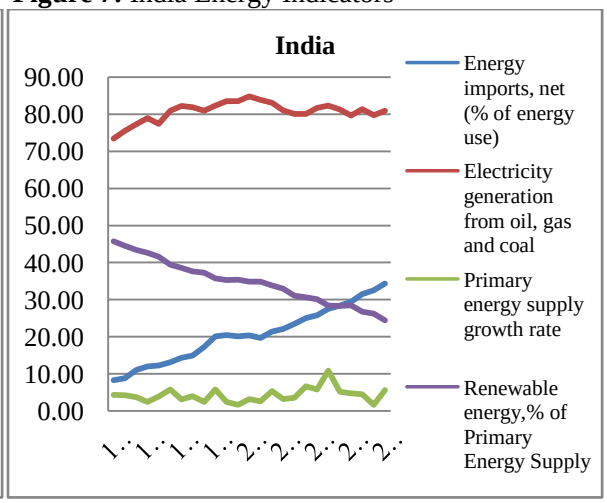
Source: World Development Indicators

Figure 7: India Energy Indicators



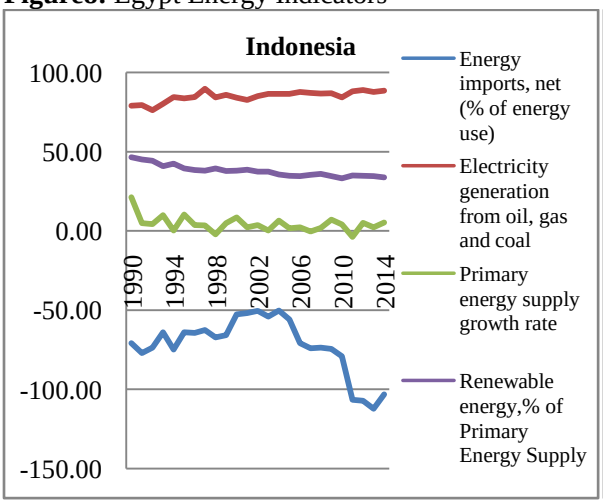
Source: World Development Indicators

Figure8: Egypt Energy Indicators

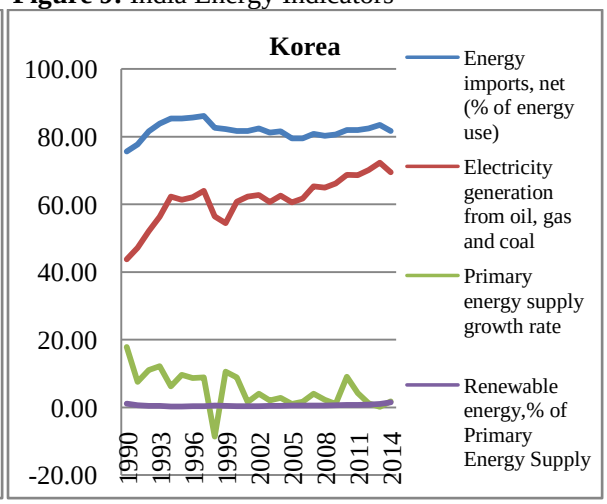


Source: World Development Indicators

Figure 9: India Energy Indicators

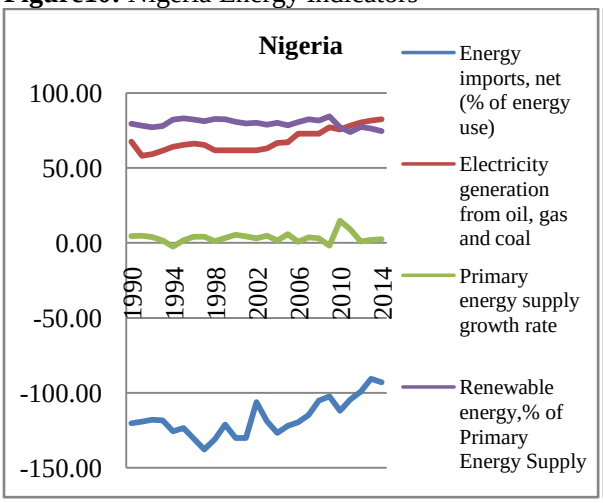


Source: World Development Indicators



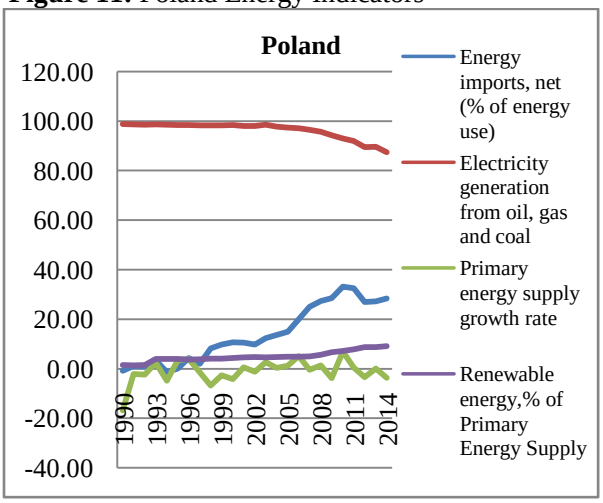
Source: World Development Indicators

Figure10: Nigeria Energy Indicators



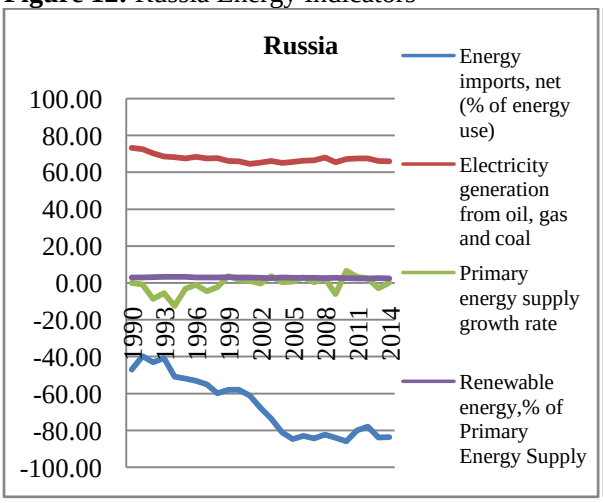
Source: World Development Indicators

Figure 11: Poland Energy Indicators



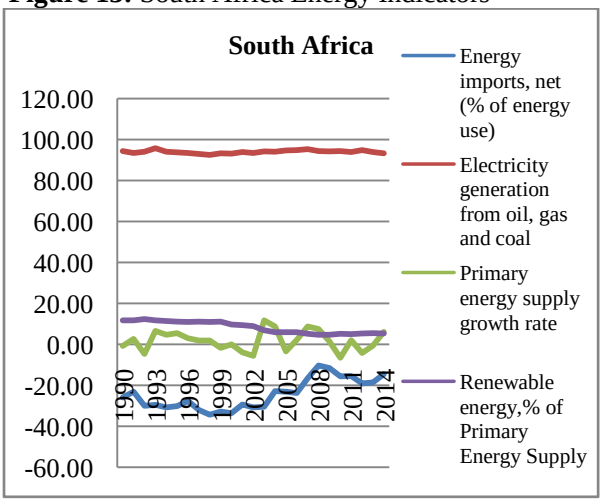
Source: World Development Indicators

Figure 12: Russia Energy Indicators



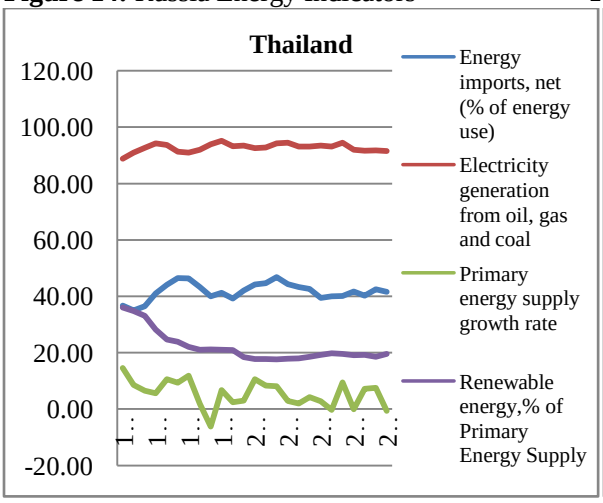
Source: World Development Indicators

Figure 13: South Africa Energy Indicators



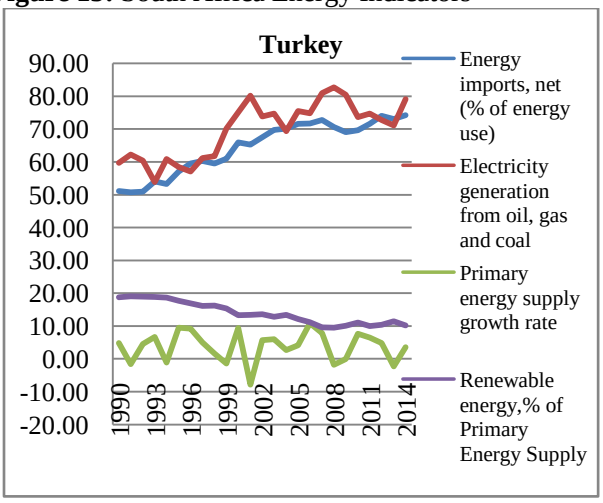
Source: World Development Indicators

Figure 14: Russia Energy Indicators



Source: World Development Indicators

Figure 15: South Africa Energy Indicators



Source: World Development Indicators

In Argentina, net energy imports as a percentage of energy consumption were - %5.1 in 1990. The negative value indicates that the country is a net energy exporter. The relevant value was %13.03 in 2014. During this time, Argentina recorded an average growth of %3.22. In 2014, %64.26 of electricity production is obtained from fossil energy sources, while %8.46 of the total energy supply is from renewable energy sources. Targets were set for electricity supply from renewable energy in December 2015 in Argentina. These targets are %8, %12, %16, %18 and %20 for 2017, 2019, 2021, 2023 and 2025 respectively(IAEA, 2018).

In Brazil, net energy imports as a percentage of energy consumption was %25.72 in 1990. The relevant value was %11.87 in 2014. There is a significant decline in the net energy imports of the country between 1997-2009. Energy imports started to increase again after 2009. In the period of 1990-2014, Brazil grew by %2.78 on average. In Brazil, %4.50 of energy supply was obtained from fossil energy sources in 1990, while %46.71 was obtained from renewable energy sources. By 2014, these rates were %24.25 and %38.70 respectively. Nowadays, Brazil, which has %100 energy efficiency, is the leader in biofuels, ethanol and biodiesel production and use in industry (Uludüz, 2007). In this context, renewable energy use in final energy consumption in Brazil is expected to increase from its current value of % 39to %45 in 2040 (IEA, World Energy Outlook 2017, 2017).

Net energy imports as a percentage of energy consumption in Chile was %43.41 in 1990. The related value increased to %64.20 in 2014. In other words, Chile's external energy dependency has increased. In the period of 1990-2014, Chile recorded an average of %5.04 growth. In Chile, %46.16 of energy supply was obtained from fossil energy sources in 1990, while %27.85 was obtained from renewable energy sources. By 2014, these rates were %57.19 and %27.50 respectively. As of 2014, renewable energy sources have come to the fore in Chile's energy policy. The share of the use of renewable energy sources in Chile in total energy consumption is projected to increase from %10 to % 20in 2025, %60 in 2035 and %70 in 2050(DEİK, 2017).

Net energy imports as a percentage of energy consumption in China was -%17 in 1990. In other words, China was a net energy exporter in 1990. In 2014, China's net energy imports rose to %15.02. This rate reveals that there has been a serious increase in China's external energy dependency in the said period. In the period of 1990-2014, China recorded an average of %9.86 growth. In China, %79.59 of the energy supply was obtained from fossil energy sources, while %24.19 was obtained from renewable energy sources. In 2014, these rates were %74.82 and %8.19, respectively. Coal, which is a local resource in China, has a %60 share in electricity production. China has been importing oil since 1995. %9.4 of world nuclear energy consumption belongs to China. The country's hydroelectric consumption corresponds to %28.5 of global consumption. Today, China has a % 21.9share in renewable energy production worldwide. The country's biofuel consumption corresponds to %2.6 of world consumption. China realizes %25.4 of the world's electricity production (İstikbal, 2019).

Net energy imports as a percentage of energy consumption in Egypt was -%70.13 in 1990. In 1990, Egypt is a net energy exporter. In 2014, Egypt's net energy imports fell to-%7.39. This rate reveals that Egypt's power to become an energy exporter has declined in the 25-year period. In the period of 1990-2014, Egypt grew %4.35 on average. In Egypt, %76.50 of the energy supply was obtained from fossil energy sources, while %5.93 of it was obtained from renewable energy sources. As of 2014, the said ratios were 91.13% and %3.83, respectively.
The share of net energy imports in energy consumption in India was %8.26 in 1990. In 2014, India's net energy imports rose to %34.31. In the 1990-2014 period, the Indian economy grew at a high rate of %6.14 on average. In 1990, %73.41 of energy supply from India was obtained from fossil energy sources, while %45.68 was obtained from renewable energy sources. As of 2014, the said ratios were %80.90 and %24.36 respectively.

The share of net energy imports in energy consumption in Indonesia was - %70.86 in 1990. In 2014, Indonesia's share of net energy imports rose to %103.09. These rates show that Indonesia strengthens its position as a net energy exporter. In the period of 1990-2014, Indonesia achieved an average growth of %4.92. In Indonesia, 79.08% of the energy supply was obtained from fossil energy sources, while %46.57 was obtained from renewable energy sources. As of 2014, the said ratios were %88.52 and %33.78 respectively.

The share of net energy imports in energy consumption in Korea was %75.65 in 1990. In 2014, Korea's net energy import share increased to %81.70. These rates show that Korea is dependent on imports in the field of energy. In the period of 1990-2014, Korea grew by %5.47 on average. In Korea, %43.77 of the energy supply was obtained from fossil energy sources, while %1.08 of it was obtained from renewable energy sources. As of 2014, the said ratios were %69.50 and %1.47 respectively. The share of net energy imports in energy consumption in Mexico was - %58.10 in 1990. In 2014, Mexico's share of net energy imports fell to -%12.73. The decrease in this ratio means that Mexico's power to become a net energy exporter has weakened during the analysis period. The average growth rate of Mexico in

the period 1990-2014 is %2.65. In Mexico, %72.77 of the energy supply was obtained from fossil energy sources, while %12.12 was supplied from renewable energy sources. As of 2014, the said ratios were %79.22 and %8.47, respectively.

Nigeria's share of net energy imports in energy consumption was - %120.25 in 1990. In 2014, Nigeria's net energy import share decreased to -%93.03. This rate being negative indicates that Nigeria is a net energy exporter. However, the decrease in this rate in the 25 years period means that Nigeria's view as a net energy exporter shows a downward trend. The average growth rate of Nigeria in the period of 1990-2014 is %5.21. In Nigeria, %67.41 of the energy supply was obtained from fossil energy sources in 1990, while %79.48 was obtained from renewable energy sources. This ratio shows that the weight of renewable energy sources in Nigeria's energy production is higher than fossil sources. As of 2014, the said ratios were %82.41 and %74.43 respectively.

In Poland, the share of net energy imports in energy consumption was-%0.74 in 1990. In 2014, Poland's net energy import share increased to 28.39%. The conversion of this ratio from negative to positive shows that Poland has changed from net energy exporter to energy importer. The average growth rate of Poland in the period of 1990-2014 is %3.38. In Poland, %98.75 of energy supply was obtained from fossil energy sources in 1990, while only %1.53 of it was obtained from renewable energy sources. This ratio shows that almost all of Poland's energy production is obtained from fossil sources. As of 2014, the said ratios were %87.36 and %9.15 respectively. This development shows that some of the proportion of fossil resources in Poland's total energy supply is replaced by an increase in renewable energy sources. The share of energy obtained from renewable sources in total primary energy production in Poland increased from %12.12 to %14.46 in 2014-2018. Energy derived from renewable sources in Poland in 2018 comes mainly from solid biofuels (%69.26), wind energy (%12.40) and liquid biofuels (%10.20). Considering the structure of energy consumption from renewable sources, it is seen that a large share of %58 belongs to the use of end consumers, and a smaller ratio of %42 is used for energy conversion(GUS, 2018).

In Russia, the share of net energy imports in energy consumption was - %47.08 in 1990. In 2014, Russia's net energy import share increased to -%83.67. The fact that this rate is negative and increasing over the years shows that Russia continues to strengthen its increasing energy exporter position.
The average growth rate of Russia in the period of 1990-2014 is %3.38. In Russia, %73.16 of the energy supply was obtained from fossil energy sources, while %3.01 was obtained from renewable energy sources. This ratio shows that most of Russia's energy production is obtained from fossil sources. As of 2014, the said ratios were %66.01 and %2.54 respectively. Russia is dependent on the oil and gas sector. However, the Russian government is increasingly attaching importance to the renewable energy sector. One of the steps taken in this direction is the Paris Climate Agreement signed in September 2019. In 2018, %0.1 of the total energy matrix in Russia (excluding wind and solar, hydro) generated renewable energy (0.98 TW). A detailed projection of energy use was prepared in Russia's Energy Strategy draft by 2035. Accordingly, it is planned to increase the share of renewable energy in Russia's TFEC to %4.9 by 2030(IRENA, 2017).

In South Africa, the share of net energy imports in energy consumption was -%25.92 in 1990. Although the share of South Africa's net energy imports decreased to -%14.48 in 2014, the country still maintains its position as an energy exporter. The average growth rate of South Africa in the period 1990-2014 is %2.50. In South Africa, %94.28 of electricity production was obtained from fossil energy sources in 1990. This ratio shows that most of South Africa's electricity production is obtained from fossil sources. The share of renewable energy supply in total energy supply was %11.70 in 1990. As of 2014, the share of fossil energy resources in total electricity generation is %93.18. The share of renewable energy supply in total energy supply was %5.31 in 2014.

In Thailand, the share of net energy imports in energy consumption was %36.64 in 1990. In 2014, Thailand's net energy import rate increased to %41.57. The average growth rate of Thailand in the period of 1990-2014 is %4.57. %88.74 of electricity production in Thailand is obtained from fossil energy sources in 1990. In 2014, this ratio increased to %91.44. The share of renewable energy supply in total energy supply decreased from %36.04 in 1990 to %19.57 in 2014. In Turkey, the share of net energy imports in energy consumption was %51.03in 1990. The ratio of net energy imports in 2014 rised to 74.21%. 1990-2014 period, the average growth rate in Turkey is %4.69. Of electricity production in Turkey in 1990, of %59.63 is obtained from fossil energy sources. In 2014, this ratio increased to %78.97. The share of renewable energy supply in total energy supply decreased from %18.78 in 1990 to %10.13 in 2014. These results increase the share of fossil resources in Turkey's total electricity supply, while the total energy supply of the energy supply is obtained from renewable sources wherein suggest that decreased the share. The rate of increase in primary energy supply in Turkey %4.77 in 1990 and %3.53 in 2014. In the analysis period, energy supply followed an average level of %3.70.

4. Literature review

Zhao analyzed the determinants of China's energy import demand by using cointegration and VECM techniques. According to the findings obtained from the study, it has been determined that the international oil price is not an important determinant of China's oil imports. The study also showed that the increase in industrial production contributed significantly to China's oil imports. It is concluded that domestic energy production such as oil and coal substitutes import oil imports and urbanization and the resulting energy demand increase oil imports.

In his study, Bayramoğlu (2015) has investigated whether a renewable resource such as bioenergy can be an alternative to the use of fossil energy to warm up in the TRA1 Region. Findings revealed that investments in biomass energy in TRA1 Region will contribute more to local economic growth than fossil energy sources. Kaygusuz (2001), put forth that bioenergy is an important source in meeting energy demand and reducing fossil energy imports in Turkey. In his analysis he suggested that %10 of the energy need can be met with bioenergy.

Erdal (2015), estimated the determinants of energy supply security by using the Granger Causality Test and Johansen Cointegration Test for the years of 1970-2009 in Turkey. The results show that renewable energy positively affects supply security in all models.Increasing per capita energy consumption is a risk factor that threatens energy supply security in the future. The amount of fossil fuel emissions was found to be negative in all models. Total Primary Energy Supply is an important factor for energy supply security. A significant increase in energy supply brings with it an increase in energy supply security. Frondel & Schmidh (2008), determined that the risk of Germany's power shortage is higher than the USA due to the intensity of imported energy sources by using Energy Supply Risk Index for the years of 1980-2004.

Gupta (2008), analyzed the oil import dependency in 26 net oil importing countries for the years of 2004 within the scope of market risk indicators; local oil reserves, net oil import dependency, diversification of supply sources, political risk and market liquidity in oil supplying countries. The most important determinants in the Oil Supply Security index are oil import / GNP ratio, national income, market liquidity, energy concentration and oil ratio.
According to the interpretation of the results obtained by Gupta (2008), the factors affecting oil import are also determinant on energy supply security. At this point, diversifying the energy mix to include renewable energy sources is also important for supply security.

Gökgöz & Güvercin (2018), empirically confirmed the substitute effect of renewable energy for energy imports initially. The study also analyzed the performance of renewable energy efficiency from the energy security perspective of EU countries between 2004-2014. The results of the data envelopment analysis (DEA) revealed that the average renewable energy efficiency of the selected EU countries have increased during the analysis period.

Jansen (2004), He stated that the increase in the reserve and production rate of the domestic energy source increased the energy supply security within the scope of the domestic production index, and that the countries' high import dependency against a single energy source had negative effects on the energy supply security within the scope of the energy security index. This approach of Jansen (2004) supports the approach that increasing the renewable energy production and import dependence on fossil energy resources will have positive effects on energy supply security through increasing domestic renewable energy production.

5. Data Set and Method

The study examined selected emerging market economies, respectively, Argentina, Brazil, Chile, China, Egypt, India, Indonesia, Korea, Mexico, Nigeria, Poland, Russia, South Africa, Thailand and Turkey. In the analysis, the effect of GDP growth, energy production from oil, gas and coal sources, primary energy supply increase, renewable energy supply and energy intensity level on energy imports were investigated. The data were obtained from OECD and World Development Indicators databases. The series are annual and cover the period from 1990 to 2014. Stata 14.0 was used for the computer application of the model. For the study, panel data analysis, which will cover the whole country group and can be included in the analysis at the same time, was preferred. Thus, it is aimed to examine both time and unit effects in the model.

5.1. Empirical Findings

When examining a model created with panel time series, it is first necessary to suspect the existence of unit effect. Because, if the necessary importance is not given to the unit effect process, the pooled least squares (PLS) method is used. The PLS estimator, which is done by ignoring the existence of the unit effect in the model, gives a really distant

result. For this reason, firstly, the classical model is tested and the unit effect in the model is tested with certain tests. As mentioned, first of all, tests to examine the existence of unit effect in the model are examined against fixed effects or random effects examining the classical model. The tests and their results are shown in the tables below.

Table 1: F,LM, LR, Score Test Results

Statistics Value	**Probability Value**
F (14, 355): 369.69	0.0000 ∗
Chi(1) X^2 : 3278.94	0.0000 ∗
Chi(1) X^2 : 946.68	0.0000 ∗
Chi(1) X^2 : 2.006	0.0000 ∗

* %5 denotes that the main hypothesis is rejected at 5% significance level.

According to the results of F, LM, LR and Score tests, it is seen that the model subject to the analysis is not a classic model and the presence of unit effect in the model is determined. In this model, in which the classical model was rejected, Hausman (1978) test was initiated in order to determine the direction of the unit effect (fixed or random effect). In panel data models, it is preferred to choose between estimators (fixed or random effect)(Tatoğlu, 2012). In Table 2 below, Hausman Test results are shown as follows;

Table2: Hausman Test Results

Statistics Value	**Probability Value**
Chi(5) X^2 : 13.86	0.0165 ∗

* %5 denotes that the main hypothesis is rejected at 5% significance level.

According to the results of Table 2, the H_0hypothesis is rejected for the model and it is seen that the fixed effects estimator is valid. Accordingly, the analysis is continued with the fixed effects estimator. While making regression analysis in econometric models, basic assumptions should be tested. The same is true in panel data econometrics. Therefore, in the model where the fixed effects estimator is valid as a result of Hausman identification test, it is tested whether the effectiveness is valid by looking at heteroscedasticty, autocorrelation and correlation between units. The results are shown in Table 3.

Table3: Wald, DW – LBI, Friedman Test Results

Statistics Value	**Probability Value**
Chi(15) X^2 : 9467.85	0.0000 ∗
Durbin-Watson (DW):0.17	0.0000 ∗
Baltagi-Wu (LBI): 0.31	0.0000 ∗
Friedman:22.434	0.0701 ∗∗

* %5 denotes that the main hypothesis is rejected at 5% significance level.
** %5 denotes that the main hypothesis cannot be rejected at 5% significance level.

According to the above results, while fixed variance, autocorrelation, which is among the basic assumptions, was rejected, the non-correlation between units could not be rejected. Only autocorrelation (since DW and LBI values are less than 2) and heteroscedasticity were found in the fixed effects estimator. Therefore, in order to fulfill basic assumptions, resistant standard errors are obtained in the fixed effects model and a consistent estimation is made on the regression model.

Tablo 4: Driscoll-Kraay StandardErrors Test Results

Değişkenler	**Coefficient**	**Statistics Value**	**Probability Value**
GDP-.218515	-0.95	0.361	
Electricity Production 6303329	10.94	0.000 ∗	
EnergySupply 0774523	1.26	0.228	
RenewableEnergy -.6015032	-3.50	0.004 ∗	

EnergyDensity-.5713109	-1.27	0.224	

* %5 denotes that the main hypothesis is rejected at 5% significance level.

6. Results

According to the findings obtained from the analysis, Electricity Productionand Renewable Energy variables have a significant impact on Energy Imports. A 1% increase in Electricity Production creates a 0.63% increase on Energy Imports. In the emerging market economies, most of the Electricity Production comes from fossil fuels. As Electricity Production for industry and usage increases, fossil fuel imports increase. According to another finding obtained from the research, a 1% increase in Renewable Energy creates a 0.60% decrease on Energy Imports. As emerging market economies diversify their energy supplies and generate energy from local sources, imported energy dependencies decrease. Although the relationship is negative and meaningful, the amount of renewable energy production and investments are not at a level to replace the energy obtained from fossil sources. However, even in emerging market economies with large amounts of fossil resources, it seems that energy ministries have been established, energy markets have been regulated, and they have ratified international agreements aimed at reducing harmful gas and waste emissions. It is anticipated that renewable energy supply will increase significantly by 2030. According to other findings of the study, GDP increase, Energy Supply increase and Energy Intensity variables do not show statistical significance within the model.

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