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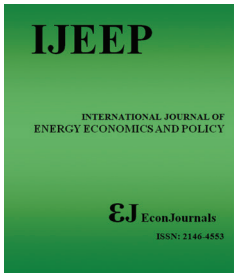

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The Impact of Energy Subsidy Reform on Economic Growth in Egypt Over the Period from 2013 to 2020

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ABSTRACT

In most developing countries, and the Middle East region in particular, "Energy Subsidy" is an issue of special importance for policymakers. To this day, there are no conclusive results concerning the possible impacts of the energy subsidies reform on economic growth. On this basis, this current study aims to examine the impacts of the energy subsidies reform on the economic growth in Egypt. To achieve the study's objective, the impacts of the energy subsidies reform have been divided into the following: (a) indirect impacts: estimated through the use of AMOS OR WARP PLS program, and (b) direct impacts: determined on basis of the Autoregressive Distributed Lag Model. So, this study evaluates the indirect effects of energy subsidy reform on economic growth. So, this current study has concluded that the energy subsidies reform in Egypt has significant negative effects on economic growth in both the short and long terms, whether they are direct or indirect impacts. Therefore, this research recommends that when it comes to reducing the energy subsidies, the Egyptian government shall adopt a lenient approach, to avoid the relevant negative impacts; thus, such measures shall be executed over many stages that extend for a longer period of time, with the provision of a social fund that supports the low-income people more comprehensively.

Keywords: Energy Subsidy Reform, Economic Growth, Egypt
JEL Classifications: O4, C5, Q4

1. INTRODUCTION

Energy Subsidy is an issue of particular importance for policymakers, as well as all researchers of both economics and politics (Al-Saidi, 2020). So, the different types of fuel and electricity play a major role in the social and economic development; and based on this basic role, the governments of developing countries, in particular, have several justifications to keep on providing energy price subsidies; thus, the low prices of energy - especially the prices of electricity and other types of fuel that are not harmful to the environment such as natural gas - shall provide the low-income groups with more access to the modern forms of energy. Also, these low prices enable the governments to protect their low-income groups, hence contributing to alleviating poverty on one hand, as well as balancing the fluctuations in the prices of basic commodities and avoiding the negative impacts of inflation on the other hand (IMF, 2017). Moreover, the governments of rich countries - such as the Gulf States - may also use energy low prices as a tool to diversify their economic structures (Al-Saidi, 2020).

In general, the previous studies addressing the nature of the relation between energy subsidy and economic growth have been split into two views. The first opinion believes that the energy subsidies reform has positive effects on the economic growth; and that is due to its role in redistributing the income in favor of the poor groups, in addition to the following benefits: eliminating the price distortions; achieving efficiency in distributing the resources; increasing the investments allocated for the provision of alternative energy sources; and directing more investment towards labor-intensive production activities, hence providing more job opportunities which is an issue of great importance to the developing countries in particular.

Furthermore, the increasing cost of energy subsidy programs - whether it was due to the constant increases in the energy consumption levels or due to the recorded rises in global oil prices - may result in several interiors and exterior economic imbalances that affect the economies of several countries, especially the net importers of energy resources. In this sense, the general budgets of these countries are burdened by more financial obligations due to the costs of these inefficient programs, hence exposing these countries to continuous fluctuations due to the changes in global oil prices; which in turn threatens their levels of fiscal discipline and financial sustainability (Gelb, 1988; Clancy, 2008; Clements et al., 2013; Coady et al., 2015; IMF, 2015; Kumar and Woo, 2010; Timilsina and Pargal, 2020).

As for the second point of view, it believes that the energy subsidies reform has negative impacts on the economic growth due to the accompanying inflationary pressures, in addition to the political considerations which might damage the economy, not to mention that such reform could hinder the investment because of the high costs of production (Fattouh and El-Katiri, 2015; Verme, 2016; Sarrakh et al., 2020; Aghaei and Lawell, 2020).

Anyway, after the global financial crisis in 2008, the world witnessed a severe rise in the international prices of energy. That is to say, during the period from 2009 to 2013, these prices were nearly doubled (IMF, 2013). This spike is attributed to several factors, including the global economy itself. The global economy in this period witnessed a fluctuation in the economic growth rates as well, which was reflected in the demand for energy by a rise; not to mention the state of unrest and conflicts witnessed by the oil-producing countries such as the Arab Spring countries and Iran.

Despite the high energy prices and their fluctuation at high levels during the past decade, many low and middle-income countries (including Egypt) did not just stop at adjusting the domestic energy prices as a result of this rise, but they also sought to finance the price difference by providing a subsidy which was incurred by the State's general budget, hence increasing the budget deficit (IEA, 2011a; 2011b). Therefore, during the fiscal year 2012/2013, the ratio of the Egyptian general budget deficit to the Gross National Product (GNP) has reached (12.9%), after it was just (10%) during the fiscal year 2011/2012 (MOF, various reports).

Under these circumstances, as well as the other economic conditions, the Egyptian government had to resort to loans to finance their imports of commodities in general, and of the energy goods in particular; thus, the Egyptian government resorted to the International Monetary Fund as one of the best available options. To get the approval of the International Monetary Fund, the Egyptian government had to adopt an economic reform program that involves the energy subsidies reform. On this basis, since the fiscal year 2013/2014, the Egyptian government has adopted a 5-year plan concerning liberating the energy prices in Egypt.

The plan execution started on July 1st, 2014 by raising the prices of natural gas by about (111%), as well as the prices of gasoline (types 95, 92, and 80) by about (6.8%, 40.5%, and 77.8%) respectively. Also, the prices of electricity were raised by (26%), as well as the prices of both diesel and kerosene by (63.6%) and mazout by (26.3%).

Moreover, over the following years of 2015, 2016, 2017, and 2018, the different energy goods have witnessed another rise. The latest of these increases was in 2019, as the prices of gasoline (types 80, 92, and 95) were raised by about (22.7%, 18.5%, and 16.5%) respectively. Also, the prices of diesel and kerosene were raised by (22.7%); and the prices of natural gas were raised by a rate ranging from (20%) to (34%) (MOF, various reports; Egypt oil and Gas Newspaper, Various issues, MOP, 2014, MoEE, 2015; 2016; IMF, 2017). Since then, the government formed a committee affiliated with the Ministers Council, to follow up the global energy prices and to develop a mechanism for changing the prices of energy materials in Egypt periodically every 3 months.

On the foregoing, this current study aims to examine the possible effects of the energy subsidies reform on the economic growth in Egypt. For this purpose, this study has been divided into four sections as follows: Section (1): Literature Review and Introduction. Section (2): Review of Energy Subsidy in Egypt. Section (3): Data and Methodology. Section (4): Results and Conclusion.

2. LITERATURE REVIEW

Several previous studies have examined the impact of energy subsidy on economic growth (Kpodar, 2006; Foster and Steinbucks, 2009; IMF, 2013; Solaymani and Kari, 2014; Mundaca, 2014, Valadkhani et al., 2014; Olufemi, 2015; Dennis, 2016; Kimura, 2016; Mlachila et al., 2016; El Hamidi, 2016; Pershin et al., 2016; Li et al., 2017; Hussein, 2018; Rademaekers et al., 2018; Sarrakh et al., 2020; Solarin, 2020). These studies have demonstrated that economic growth is significantly affected by the energy subsidies reform through many channels as shown in Figure 1.

The figure focuses on three routes where the economy will be impacted after the subsidies are removed: the consumer effect, the energy-saving effect, and the budget effect. Their findings differ concerning GDP. Although the price impact will negatively affect GDP, the effect of energy-saving will be positive. The budget effect depends on which way the budget will be used. The overall effect on GDP depends on whether it is.

In general, we may say that there are two points of view regarding the nature of the relation between energy subsidy and economic growth as follows:

2.1. First Opinion

Negative relationship between energy subsidy and economic growth[1] According to the supporters of this opinion, whenever the subsidy of energy goods is decreased, this shall lead to increasing the per capita growth rate from the Gross National Product (GNP) (Clements et al., 2007; Subsidies, 2008; Burniaux et al., 2009; Ellis, 2010; Holton, 2012; Ebeke et al., 2015; Mundaca, 2017; Sarrakh

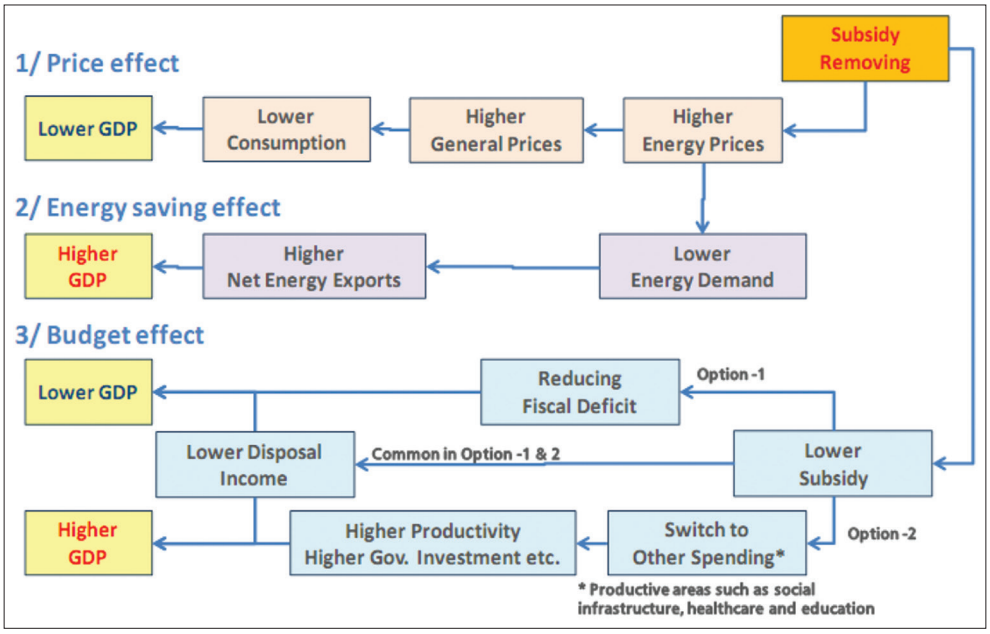
1 This means that there is a positive relationship between energy subsidy reform and economic growth

et al., 2020). This view was confirmed by the applied results on the European States and the Developed countries (Mundaca, 2014).

In this regard, these studies have attributed the positive impacts for the elimination or reduction of energy subsidies on the economic growth to several reasons as follows:

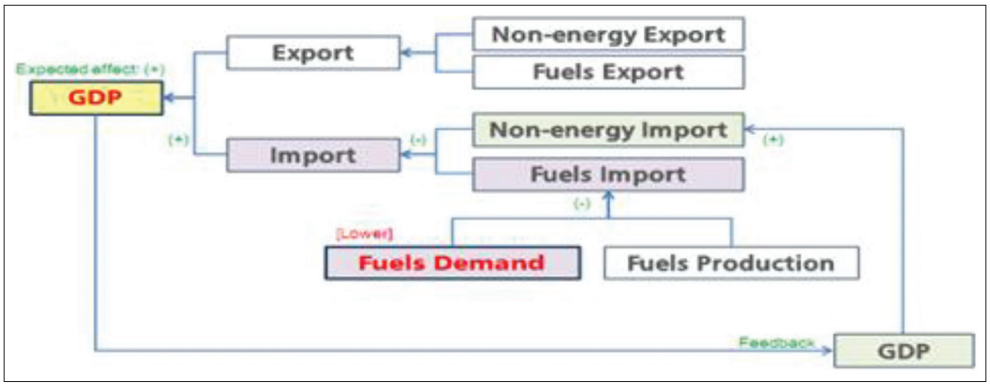
1. The reformative effects of reducing the energy subsidies; as it is expected that raising the energy prices and rationalizing its consumption will result in a rise in its efficient use, which shall in turn contribute to enhancing the economic growth in both the short and long terms (Al-Tal and Al-Tarawneh, 2021). This is mainly attributed to saving a significant part of the resources which were allocated to the energy subsidy, and directing this part towards other productive fields such as investment, which shall in turn support the economic growth. Furthermore, the reduction of subsidy and the consequent low demand on energy materials shall also contribute to decreasing their imports; and when the exports are stable or even lower than the imports due to the high prices, this shall undoubtedly have a positive effect on the economic growth as shown in Figure 2.
2. The increased interest in development research concerning the provision of energy-saving alternatives; which could be a promising field for investment on one hand, not to mention attracting more private investments directed to the energy sector as a whole on the other hand; which shall in turn enhance the economic growth in the long term. Hence, some applied studies have shown that increasing the investment in more efficient and energy-saving technologies shall result in raising the growth rate up to (1%) in the long term (Mundaca, 2014).
3. The subsidies reform will indeed result in increasing the energy prices and the production cost in the short term; however, in the long term, this shall lead to redistributing the resources on less intense activities regarding the use of energy and capital, hence leading to more demand on labor which shall result in increased incomes as well as the positive effects on growth. Furthermore, this might also lead to reducing the negative foreign impacts; hence saving large funds that could be directed to the treatment of diseases caused by the pollution resulting from the excessive use of polluting energy, and could be directed to other fields supporting growth

Figure 1: Channels that energy subsidies effect on economic growth



Source: (Kimura, 2016)

Figure 2: Energy subsidies, energy sector and economic growth



Source: (Kimura, 2016)

in general such as education and health. In this context, Figure 3 shows that there is a positive relationship between increasing the energy subsidy and the environmental damages[2] (Parajuli et al., 2015).

4. The positive impacts resulting from decreasing the general budget deficit as a result of reducing the energy subsidy, as shown in Figure 4.

2.2. Second Opinion

Positive relationship between energy subsidy and economic growth[3]

Contrary to the previous view, the supporters of this opinion believe that whenever the subsidy directed to the energy goods is reduced, the per capita growth rate from the Gross National Product (GNP) shall decrease as well. In this regard, some applied studies have assured that this opinion applies to Developing countries such as the Middle East and North Africa region (Dartanto, 2013; Coady et al., 2015; Verme, 2016; Gelan, 2018). In other words, whenever the fuel prices are raised (i.e. reducing its subsidy), the economic growth rate shall rise more quickly. On the average, increasing the prices of diesel and gasoline by (20 cents) for each subsided liter shall be accompanied by an increase in the per capita growth rate from the Gross National Product (GNP) by (0.55%).

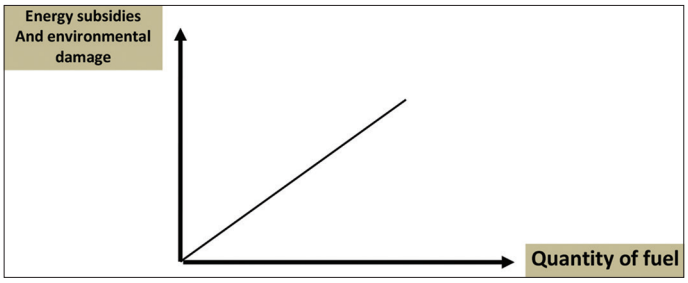
In this context, the negative impacts of reducing the subsidy allocated to the energy goods on the economic growth could be illustrated as follows:

1. The negative impact of the energy subsidies reduction on the energy sector as a whole; thus, reducing the subsidy directed to the energy goods may lead to a lower demand (hence causing a decline in the realized profits), or it may lead to a stable demand at least, with the energy producers incurring the costs of subsidy and low profits as well. Moreover, there is no doubt that the low profits will weaken the capacity of the State-owned companies to expand their energy production; in addition, this will discourage the private sector from increasing or directing new investments towards the energy sector in both the short and long terms, which might result in a severe deficit in energy leading to hindering the economic activity, hence negatively affecting the economic growth. These impacts are supported by the findings of a previous study which showed that the losses incurred by the investors in the field of electricity due to reducing the subsidy directed to this field have significantly limited their capacity to invest in the field of electricity generation as well as improving the services quality (Kumar and Woo, 2010; Reinhart and Rogoff, 2010)
2. It is well-known that the rise in energy prices will affect the economic growth negatively due to one of the following: a) the increase in the production costs, leading to a rise in the prices of local products (including energy) - assuming the stability of the exchange rate and the elasticity value - hence negatively affecting the competitive ability of exports in the international markets as shown in Figure 5; or b) the high prices will eventually lead to demands for increasing the wages of employees, hence raising the costs, reducing the production as well as the low profits(Fofana et al., 2009; Clements et al., 2007; Clements et al., 2014). Furthermore, the shortcomings of infrastructure in the energy sector (especially in the electricity field) will lead to undermining the competitive abilities of the local producers due to their inability to increase the production or to the breakdown of production lines, hence negatively affecting the volume of GNP and the economic growth in turn. Therefore, a previous study showed that the per capita growth rate from the Gross National Product (GNP) might increase by (2%), in case of improving the level of the electricity infrastructure in Sub-Saharan countries in Africa(Escribano et al., 2008; Calderón, 2008)
3. The high expenses directed to energy subsidy might lead to increasing the general budget deficit, hence forcing the State to resort to loans for the required financing in this regard. This will undoubtedly lead to raising the interest rate, hence negatively affecting the economic growth and investment, as a result crowding out effect that happen because of the competition that might occur between the public and private sectors with regard to getting the loans

2 This is called externalities

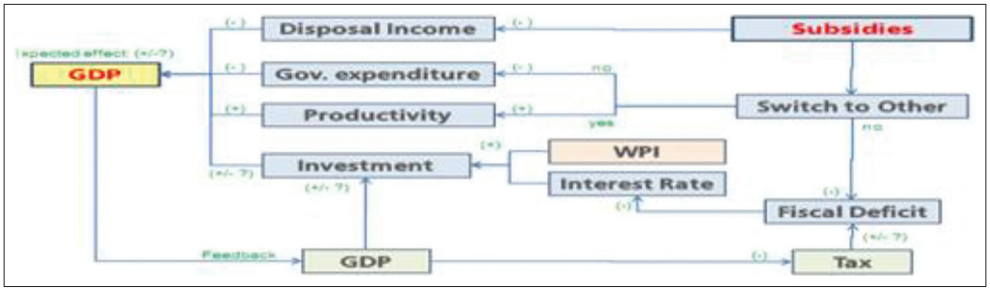
3 This means that there is a negative relationship between energy subsidy reform and economic growth

Figure 3: Impact of energy subsidies on environment



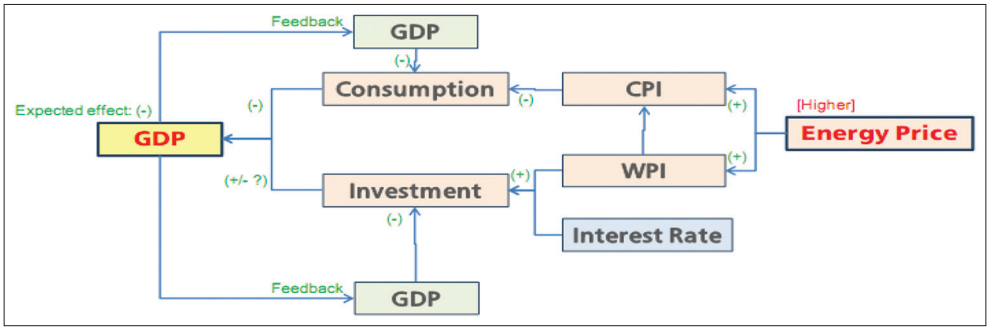
Source: (Subsidies, 2008)

Figure 4: Energy subsidies , budget effect and economic growth



Source: (Kimura, 2016)

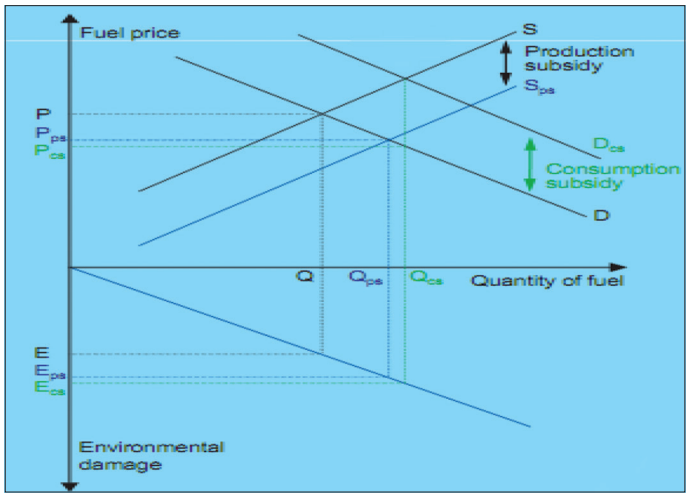
Figure 5: Impact of energy subsidies on general price



Source: (Kimura, 2016)

4. There is no doubt that the high expenses directed to energy subsidy will be at the expense of other fields necessary for the economic growth, such as education and health. In this regard, previous study shows how some countries spend more on energy subsidy than on education and health. So when, increasing energy subsidies by about 1% leads to a reduction in spending on education and health by about 0.6% (Clements et al., 2012; Commander et al., 2015; Ebeke and Ngouana, 2015; Krane and Monaldi, 2017)
5. Energy subsidy provides an environment for smuggling the subsidized commodities to other countries where the prices of these commodities are high. There is no doubt that this will negatively affect the State's economic growth. For example, the problem of fuel smuggling is common in many places around the world, including North America, North Africa, the Middle East and some Asian countries; thus, it was proven that (80%) of the gasoline used in Benin is smuggled from Nigeria (Heggie and Vickers, 1998; Africa, 2012)
6. Energy subsidy increases the difficulties faced by both the oil importing and exporting countries with regard to dealing with the fluctuations in the energy international prices. These high international prices pose a major threat on the balances of payments in many energy importing countries, which might in turn affect the economic growth negatively. This negative impact could be limited by passing the rise in international prices to the local prices, as well as providing more incentives in order to encourage the efficient use and low consumption of energy (Dudine et al., 2006). Moreover, the Continuous rise in the international prices of energy goods may also lead to a deficit in the balances of payments in some countries, which might negatively affect the volume of foreign currencies reserves in these countries, hence affecting their currency's exchange rate and their economic growth (Gelb, 1988)
7. The subsidy of the prices of some energy goods necessary to the different means of transportation (e.g. diesel and gasoline) may lead to negative economic impacts, which might negative effect on the country's economic growth. That is to say, the low prices of energy goods will lead to increasing the consumption of these commodities, which in turn leads to increasing the pollution resulting from this high consumption; as a result, the society as a whole will bear significant social costs as shown in Figure 6, which illustrates that there is a positive relationship between the energy subsidy (whether it was directed to production or consumption) on one hand,

Figure 6: Impact of energy subsidies on Market forces and environment



Source: (Subsidies, 2008)

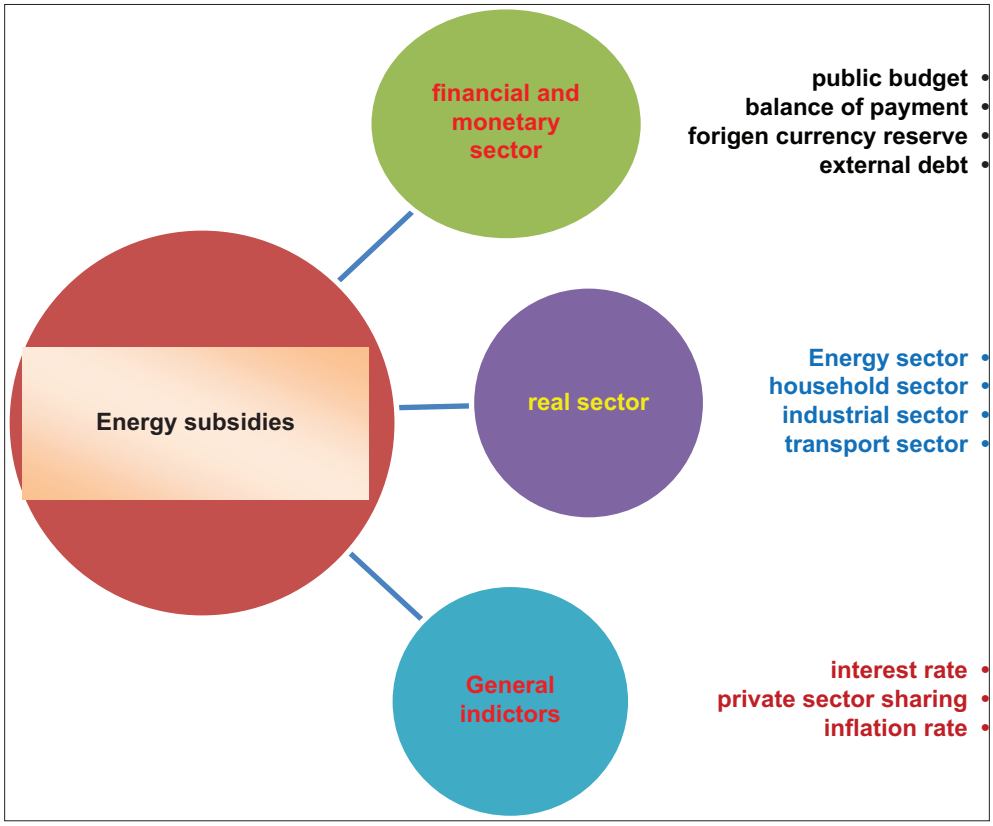
and the volume of environmental damages on the other hand; i.e. the volume of environmental damages has increased as a result to the energy subsidy from (E) to (Ec). Moreover, the environment pollution shall also contribute to increasing the mortality rate in the country, hence negatively affecting the economic growth (Parajuli et al., 2015). In addition, the low prices of fuel shall lead to increasing the demand on vehicles with all of their different types; this increase in the number of vehicles due to the low prices of fuel may lead to a rise in the number of car accidents, hence increasing the mortality rate and depriving the economy from more human elements that could have contributed to its growth (Commander et al., 2015).

In light of the previous studies, we may say that (Figure 7) illustrates the most important channels through which the energy subsidy could affect the economic growth.

3. ENERGY SUBSIDIES REFORM IN EGYPT

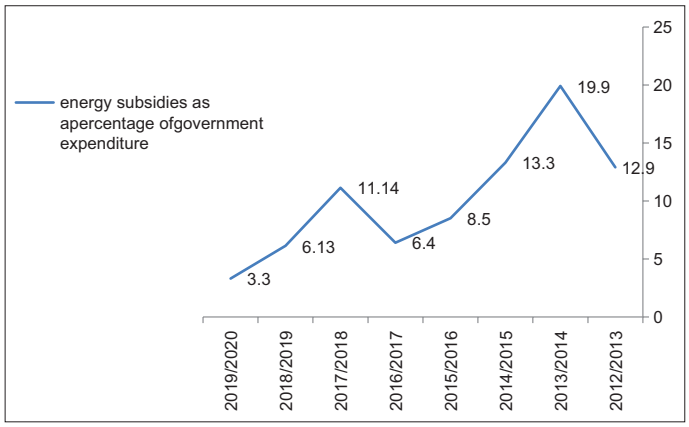
Egypt is one of ten largest countries with energy subsidies (IEA, 2018). Energy subsidies in Egypt constitute a large proportion of Government expenditure, as shown in Figure 8. The value of energy subsidies as a percentage of government expenditure amounted to about 12.9 % in 2012/2013, but starting from

Figure 7: Channels which energy subsidies effect on economic growth



Source: Author

Figure 8: Energy subsidies as a percentage of government expenditure and inflation in Egypt from 2012/2013 to 2019/2020



Source: Author

July 1, 2014, the Egyptian government began implementing a 5-year program to reform this subsidy. Therefore, we find that energy subsidies as a percentage of government expenditure have decreased from about 19.9% in 2013/2014 to about6.7% in 2016/2017 and then increased again due to liberalizing the exchange rate of the Egyptian pound against the dollar. After that, this percentage decreased again until it reached about 3.3% in 2019/2020. The Egyptian government implemented this policy in response to the International Monetary Fund's instructions, which required it to implement an economic reform program to benefit from the financial aid it provides.

4. DATA AND METHEDOLOGY

4.1.Data

Table 1 shows the variables used in the study. Data covers the period from fiscal year 2012/ 2013 to 2019/2020 Fiscal year. The selection represents this period because it marks the beginning of the implementation of real procedures related to the energy subsidy.

4.2. Methodology

Purpose of the study is to determine the impact of energy subsidies reform on economic growth in Egypt. In order to do this,we will spilt the impact OF Energy subsidies into direct and indirect effect.

4.2.1. Indirect effect

There is no doubt that energy subsidies reform would have indirect effects on Egypt's economic growth. And this happen throws intermediate channels, which affect in turn, to economic growth. To calculate these effects, the AMOS program will be used and the following model will be applied.

4.2.2. Direct effect

Energy subsidy reforms in Egypt have direct impacts on economic growth. These effects may be short, long term, or Together. So to determine these effects, the researcher will use ARDL (Autoregressive Distributed Lag) model.

The following steps are needed to be applied in the ARDL method to be used in forecasting:

Table 1: Variables and source of data

Variables	Measurement	Symbol	Source
Economic growth	GNP (cost of production factors) (million Egypt pound)	EconomicG	Ministry of planning and economic development
Energy Subsidies	Energy subsidies as A percentage of government expenditure (%)	ENGYSUBS	Ministry of Finance and Ministry of planning and economic development
Consumption	Consumption expenditure) (billion Egypt pound)	Consumption	Ministry of planning and economic development
Balance of payment	Billion dollar	Balancepayment	Egyptian central bank
Industrial exports	Billion dollar	Industexport	Central Agency for Public Mobilization and Statistics
Industrial imports	Billion dollar	Indusimport	Central Agency for Public Mobilization and Statistics
Industrial growth rate	%	Industgrowth	Central Agency for Public Mobilization and Statistics
Inflation rate	CPI	Inflation	Egyptian central bank and UNCTAD database
Foreign currencies reserves	Billion dollar	Foregcurrency	Egyptian central bank
Exchange rate	Egyptian pound equivalent USD	EXCHANGERATE	Egyptian central bank and UNCTAD database
Total of external debt	Billion dollar	Externaldebt	Egyptian central bank
Interest rate	Loans interest rate (%)	Interestrate	Egyptian central bank
Private sector sharing	As a percentage of GNP	PRIVATESECTOR	Ministry of planning and economic development
BUDGET defecit	As a percentage of GNP	Budgetdefect	Egyptian central bank
Energy consumption	Million tones	Energyconsum	BP STATISTICAL REVIEW OF WORLD ENERGY

Source: Author

4.3. Unit Root Test

The application of ARDL model requires determining the degree of integration of the variables under study, which is determined through the time-series stationary tests using the Augmented Dickey-Fuller test (ADF) or the Phillip – Peron test.

The application of the "ARDL" model is requiring that the time series of the variables under study should not be stationary at second order, so as not to be misleading results. It is also not required that time series be integral of the same degree or stationary at the same degree (I0, I1, 00).

In general, unit root tests aim to examine the time-series properties of variables and ensure their stationary. As the estimation through time series of non-stationary variables gives misleading results, in what is called "spurious regression."

Therefore, before analyzing any economic phenomenon, it is necessary to ensure the stationary of the time series. A stationary time series is one whose levels change with time without the mean changing by increasing or decreasing.

The unit root test was applied and the results shown at Tables 2 and 3. The results indicated that all time series for variables are stationary at first difference (I1).

4.4. ARDL Model

Throughout the implementation of this methodology, we can determine whether there is a long term relation between the energy subsidies reform (X or EnergySUB) and the economic growth(Y OR ECONOMICG) in Egypt. In addition, we can also provide an evaluation for this relation in case of its existence, as well as estimating (ECM) the error correction vectors in the short term in order to conclude the equilibrium relation in the long term. In order to estimate this relation, we will use the Unrestricted Equilibrium Correction Model (UECM) as follows:

$$\Delta Y_t = a_0 + \sum_{i=1}^{m} \gamma_{t-i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{t-i} \Delta X_{t-i} + \lambda_1 Y_{t-i} + \lambda_2 X_{t-i} + \cup_t$$

ΔY_t: First Difference Coefficient of the Time Series of the Variable.
$\cup_t$: Random Error.
$(\lambda_1, \lambda_{2)}$: Parameters of Long-Term Relation.
(β_{t-i}, γ_1): Parameters of Short-Term Relation.
(t–i): Optimum Length of Lags for the First Different of the Variables in the Unrestricted Equilibrium Correction Model (UECM), as we select the lag which lowers the value of AIC and SC, according to the Akaike Information Criterion (AIC) and the Schwarz Criterion (SC).
X: The Energy Subsidy as a ratio from the government expenditure (**EnergySUB**).
Y: The Dependent Variable or the Economic Growth (**ECONOMICG**).

5. RESULTS AND DISCUTION

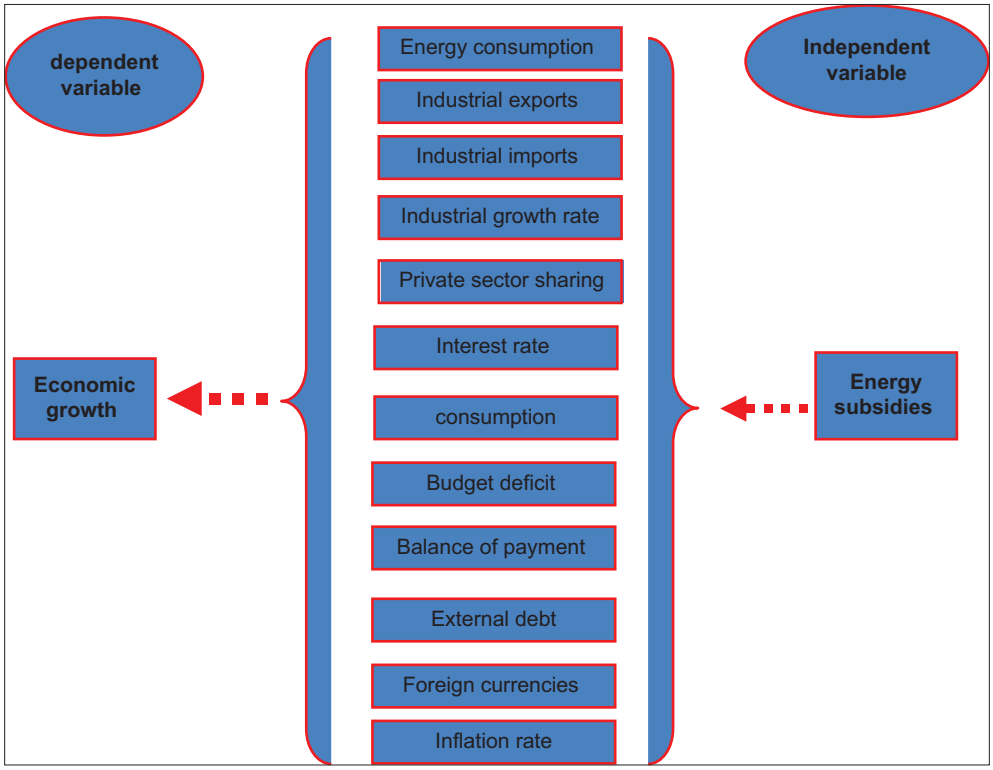
5.1. Indirect Impacts

When drawing The model that showed in Figure 9 by AMOS program and data entry expressing each variable, we get the following result:

Tables 4-6 Shows that there are direct effects of reforming energy subsidies in Egypt on the Moderating variables, and these variables, in turn, affect economic growth. We can explain this effect as follows:

1. Energy subsidies have insignificant effect on consumption, industrial growth, industrial exports, industrial imports, interest rate, external debt, exchange rate, inflation rate and foreign currencies reserves
2. The channels through which energy subsidy reform affect economic growth in Egypt are (budget deficit, energy

Figure 9: Model



Source: Author

Table 2: Unit root test for level (I_0)

Group unit root test: Summary
Series: LOG_ECO_G, LOG_ENGSYN
Date: 02/01/21 Time: 15:13
Sample: 1 9
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Obs	Cross-sections	Prob.**	Statistic	Method
Null: Unit root (assumes common unit root process)				
14	2	0.0839	−1.37920	Levin, Lin and Chu t*
Null: Unit root (assumes individual unit root process)				
14	2	0.3201	−0.46735	Im, Pesaran and Shin W-stat
14	2	0.1454	6.82496	ADF - Fisher Chi-square
14	2	0.1503	6.73895	PP - Fisher Chi-square

Source: output of e-views v10, *Meaning significance at level 10%, **Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

Table 3: Unit root test for first difference (I_1)

Group unit root test: Summary
Series: LOG_ECO_G, LOG_ENGSYN
Date: 02/01/21 Time: 15:12
Sample: 1 9
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Obs	Cross-sections	Prob.**	Statistic	Method
Null: Unit root (assumes common unit root process)				
12	2	0.0000	−5.76477	Levin, Lin and Chut*
Null: Unit root (assumes individual unit root process)				
12	2	0.0159	−2.14637	Im, Pesaran and Shin W-stat
12	2	0.0159	13.1890	ADF - Fisher Chi-square
12	2	0.0159	19.8684	PP - Fisher Chi-square

Source: output of e-views v10. ***Meaning significance at level 10%, 5% and 1%, **Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

consumption, balance of payment and private sector sharing in GNP. So when Reducing the value of energy subsidies by about 1% will result in an increase in energy consumption by 0.25, budget deficit decrease by 0.33, balance of payment achieving surplus by 0.49 and sharing of private sector on GNP decrease by0.41

3. The reform of energy subsidies in Egypt has had a significant indirect impact on economic growth. Thus, as energy subsidies increase by 1%, economic growth indirectly rises by moderating variables by 0.492. This means that there is a significant indirect positive relationship between energy subsidies and economic growth in Egypt, and this relationship can be explained by the fact that increasing subsidies, with its positive impact.

5.2. Direct Impacts

5.2.1. Short-run impacts

Based on the data shown in Table 7, we find out that the energy subsidies reform in Egypt has short-term negative impacts on the economic growth. These negative impacts occur due to the existent of a positive and significant relation between the energy subsidy and the economic growth; thus, whenever the energy subsidy is

Table 4: Effect of energy subsidies on channels that impact on economic growth in Egypt

Variables	Path	Variables	Estimate	S.E	P-value
Energyconsum	←	ENGYSUB	−0.255	0.012	***
Consumption	←	ENGYSUB	−0.197	96.76	0.592
Budgetdeficit	←	ENGYSUB	0.339	0.139	***
Balancepayment	←	ENGYSUB	−0.496	0.220	***
Indusimport	←	ENGYSUB	−0.163	11.12	0.659
Industexport	←	ENGYSUB	−0.170	7.33	0.645
Industgrowth	←	ENGYSUB	−0.048	0.180	0.898
Inflation	←	ENGYSUB	−0.036	0.501	0.923
Foregcurrency	←	ENGYSUB	−0.174	0.869	0.638
Exchangerate	←	ENGYSUB	0.324	0.003	0.362
Externaldebt	←	ENGYSUB	−0.249	2.08	0.492
Interestrate	←	ENGYSUB	−0.092	0.209	0.805
Privetsector	←	ENGYSUB	0.410	0.094	***

Source: Output of AMOS V22 program, ***Meaning significance at level 10%, 5% and 1%

Table 5: The effect of channels on economic growth in Egypt

Variables	Path	Variables	Estimate	S.E	P-value
EconomicG	←	Energyconsum	−0.150	0.240	***
EconomicG	←	Consumption	0.471	0.000	***
EconomicG	←	Budgetdeficit	−0.289	0.021	***
EconomicG	←	Balancepayment	−0.236	0.006	***
EconomicG	←	Indusimport	0.308	0.000	***
EconomicG	←	Industexport	0.111	0.000	***
EconomicG	←	Industgrowth	0.004	0.17	***
EconomicG	←	Inflation	0.137	0.006	***
EconomicG	←	Foregcurrency	0.245	0.003	***
EconomicG	←	Exchangerate	−0.263	1.088	***
EconomicG	←	Externaldebt	0.386	0.001	***
EconomicG	←	Interestrate	−0.067	0.014	***
EconomicG	←	Privetsector	0.086	0.015	***

Source: Output of AMOS V22 program, ***Meaning significance at level 10%, 5% and 1%

Table 6: The total Indirect effect of energy subsidies on economic growth in Egypt

Variables	Path	Variables	Estimate	S.E	P-value
ENGYSUB	→	EconomicG	0.492	1.84	***

Source: Output of AMOS V22 program

Table 7: Short run impacts of energy subsidy reform

Dependent variable: LOG_ECO_G
Method: ARDL
Date: 02/01/21 Time: 15:02
Sample (adjusted): 2 8
Included observations: 7 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LOG_ENGSYN
Fixed regressors:
Number of models evalulated: 2
Selected Model: ARDL (1, 0)

Prob.*	t-Statistic	Std. Error	Coefficient	Variable
0.7108	0.392572	0.363396	0.142659	LOG_ECO_G(-1)
0.0797	2.194048	0.269422	0.591126	LOG_ENGSYN
0.668757	Mean dependent var		-0.208197	R-squared
0.187055	S.D. dependent var		-0.449837	Adjusted R-squared
0.091577	Akaike info criterion		0.225231	S.E. of regression
0.076123	Schwarz criterion		0.253645	Sum squared resid
-0.099435	Hannan-Quinn criter.		1.67948	Log likelihood
			2.604365	Durbin-Watson stat

*p-values and any subsequent tests do not account for model selection

ARDL Long Run Form and Bounds Test
Dependent Variable: D (LOG_ECO_G)
Selected Model: ARDL (1, 0)
Case 1: No Constant and No Trend
Date: 02/01/21 Time: 15:04
Sample: 1 9
Included observations: 7
Conditional error correction regression

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0648	-2.359245	0.363396	-0.857341	LOG_ECO_G(-1)*
0.0797	2.194048	0.269422	0.591126	LOG_ENGSYN**

Source: e-views v. 10 output. **Variable interpreted as Z=Z(-1) + D (Z), *Meaning significance at level 10%

reduced, the economic growth will decrease, and vice versa. There is no doubt that this finding has its justification in the Egyptian economy. That is to say, the Egyptian economy is mainly based on consumption; hence, reducing the energy subsidy along with the limited incomes of individuals may negatively affect the overall demand, which will in turn affect the economic growth negatively.

5.3. The Bound Test and the Long-Run Impacts

The Bound Test is used to identify the existence of the co integration relation (i.e. the long-term relations) in a model. In addition, the significance of this test is identified through the calculated value of its (F-statistic) (Nkoro and Uko, 2016); as it is compared to the tabular critical values presented by (Pesaran et al., 2001).

Based on the bound test, which is shown in Table 8 there is a cointegration relation between the energy subsidy and the economic growth in Egypt; thus, the value of (F-statistic) equals (2.78), which is more than the lower bound and near to the higher bound of the tabular critical values presented by (Pesaran et al., 2001), which equals (3.28) at the significance level of (10%). Hence, (H_0) is assumed (i.e. there is no cointegration), and (H_1) is accepted (i.e. there is a cointegration relation); that is to say, there is co integration and a long-term relation between energy subsidy and economic growth.

Furthermore, the table Table 8 also shows that there is a long-term equilibrium relation between the energy subsidy and the economic growth in Egypt. This relation is a positive and significant relationship, indicating that the Egyptian government has to slow down when reducing the subsidy directed to energy, because this reduction has negative impacts on the Egyptian economy in both the short and long terms. Moreover, the subsidy reduction results in a high production cost in this sector, hence making it unattractive to any new investments in general. On one hand, this will undoubtedly damage the Egyptian economy; on the other hand, reducing the subsidy along with raising the prices

Table 8: The bound test and the long-run impacts

Levels equation

Case 1: No Constant and No Trend

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0012	6.658557	0.103549	0.689488	LOG_ENGSYN

EC=LOG_ECO_G - (0.6895*LOG_ENGSYN)

Null Hypothesis: No levels relationship			F-Bounds Test	
I (1)	I (0)	Signif.	Value	Test Statistic
	Asymptotic: n=1000			
3.28	2.44	10%	2.788257	F-statistic
4.11	3.15	5%	1	K
4.92	3.88	2.5%		
6.02	4.81	1%		
	Finite Sample: n=35		7	Actual Sample Size
−1	−1	10%		
−1	−1	5%		
−1	−1	1%		
	Finite Sample: n=30			
−1	−1	10%		
−1	−1	5%		
−1	−1	1%		

Null Hypothesis: No levels relationship			t-Bounds Test	
I (1)	I (0)	Signif.	Value	Test Statistic
−2.28	−1.62	10%	−2.359245	t-statistic
−2.6	−1.95	5%		
−2.9	−2.24	2.5%		
−3.22	−2.58	1%		

Source: e-views v. 10 output

of gasoline and kerosene shall contribute to raising the costs of transportation, which will be reflected by a spike in the prices of all agricultural and industrial products; taking into consideration the low average incomes of individuals, this shall eventually affect the economic growth negatively.

6. CONCLUSION AND POLICY IMPLICATIONS

Energy Subsidies play an important role in the economic policies set by developing countries in particular because of their special importance in reducing inequality in income distribution and in achieving social justice. The studies that looked at the impact of energy subsidy reforms on economic growth reached mixed results, as some believe that it has a positive effect on economic growth, while others believe that it has a negative impact.

In general, this study showed that in addition to the direct impact of energy subsidy reform on economic growth, there is an indirect effect through a set of channels: the industrial sector, the transport sector, the energy sector, the household sector, the extent of the private sector participation in the GDP, external debt. The Public budget deficit, the balance of payments, the inflation rate, foreign reserves, and both the interest rate and the exchange rat

After the January revolution in 2011, global energy prices witnessed a steady rise, which resulted in the bill for energy subsidies in Egypt nearly doubling. As a result, the public budget deficit was also continually increasing. The Egyptian government has been encouraged to borrow in the face of these conditions and other economic circumstances. The International Monetary Fund was one of the preferred options for the government.

Moreover, the study showed a positive indirect relationship between energy subsidies and economic growth in Egypt, which indicates that energy subsidy reforms have indirect adverse effects on economic growth. The most important channels through which it affects economic growth are: (1) the public budget deficit, (2) the balance of payments, and (3) the extent of private sector participation in the GNP. Through the sum of these three channels together, the negative indirect effect of reforming energy subsidies on economic growth appears.

The study also showed that, regarding the direct impacts, there is a positive and significant relationship between energy subsidies and economic growth in Egypt, which means that energy subsidy reforms in Egypt have adverse effects on economic growth in the short and long term.

In Egypt, the negative impacts resulting from reducing the energy subsidy is considered as one of the most serious problems that could face the Egyptian economy. Therefore, a number of social policies shall be adopted in order to support the subsidy reduction policies and to face this problem efficiently. In addition, there shall be a comprehensive vision for the energy subsidies reform, as well as the application of a gradual and selective approach.

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