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Energy subsidy reform and economic sustainability: Egypt vs. Iran

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Abstract. This paper illustrates the relationship between energy reforms and economic sustainable development in Egypt and Iran; through analyzing the relation between energy reform and four main macroeconomic variables, namely: budget deficit, energy consumption, inflation and economic growth. The methodology adopted in this paper is a comparative case study between Egypt and Iran, using qualitative descriptive analysis; focusing on the period from 2010 to 2014, as this period is characterized with active subsidy reform efforts for both countries. The paper concludes that reforming energy subsidies generally tends to relief the strain on the public budget, in case it is not accompanied with simultaneous economic difficulties which can deem the reform efforts obsolete, like in the case of Iran. In addition, the responsiveness of energy consumption of a certain fuel to the increase in its price is heavily reliant on its price elasticity of demand. This is represented in the availability of alternative energy sources. Moreover, the effect of the reforms on inflation is normally instantaneous and short-lived and could be mitigated through government intervention; that was clear in the case of Egypt. However, Iran did not show a similar trend as there was a weak correlation between subsidy reforms and inflation. Finally, there tends to be a very weak relationship between subsidy reforms and GDP growth, implying that the effect of other economic factors outweighs that of subsidy reforms.

Keywords. Energy subsidy reform, MENA region, Sustainable development.
JEL. E62, H23, Q01.

1. Introduction

Sustainable development is thought to be the intersection of three dimensions: the economy, society and environment; with economy acquiring the main attention from policy makers. Each of these facets is thought to have different motives and goals. For instance, the economy's main interest is the humans and their welfare through meeting their needs by the production of goods and services they demand. The environmental dimension has the protection of the environment as a central concern. While the social dimension is concerned with the relationship between people and one another, their values and the realization of their individual and collective objectives (Munasinghe, 2004).

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Fiscal policy affects the three dimensions of sustainable development; through its impact on growth, resource allocation, income distribution, human capital and social welfare. One of the tools of fiscal policy is energy subsidy, with an aim to guarantee underprivileged people access energy and ensure social coherence. On the other hand, energy subsidy exploits resources and escalates pollution due to excess consumption and incorrect pricing policy. Energy subsidy also exhausts public budget and increase probability of unstable economic growth.Hence, due to the adverse impact energy subsidies bring upon sustainable development, the rationale for implementing energy subsidies is often questioned (IEA, OPEC, OECD, & World Bank, 2010). As a result, efforts for reforming energy subsidies prevail in order to reverse such negative effects (Sauders & Schneider, 2009).

The magnitude of global energy subsidies is speculated to be around an alarming figure of $5.3 trillion or 6.5% of the global Gross Domestic Product (IMF, 2015). The harmful environmental, social and economic impact of such subsidies raised the urgency for reforming energy subsidies (UNEP, 2008). In the MENA region, a number of net importers such as: Jordan, Morocco, India, Turkey and Yemen, as well as net exporters such as Iran,have embarked on thesubsidy reform efforts. Egypt hasalso appliedseveral energy reform programs after years of swinging between a position of net importer and net exporter of oil.

The unsustainably large magnitude of energy subsidies and the substantial efforts conducted to reform them has raised research interest to explore the relationbetween reforming energy subsidies andeconomic sustainable development. This paper aims to contribute to that literature by comparing the relationship between energy subsidy reform and economic sustainability in Egypt and Iran. It also goes beyond comparative descriptive analysis by providing policy implications for the two countries. The concentration on sustainable economic development is mainly because the initial rationale behind implementing energy subsidies is often developmental, with a widespread fear that removing subsidies might prohibit such pursued economic development (Lechtenbohmer *et al.*, 2010). Hence, the research question this paper is trying to answer is: What is the relationship between reforming energy subsidies andeconomic sustainability in Egypt and Iran?

The methodology adopted in this paper is a comparative case study between Egypt and Iran, using qualitative descriptive analysis; focusing on the period from 2010 to 2014, as this period is characterized with active subsidy reform efforts for both countries. The reform effort is reflected by the magnitude of energy subsidies measured by price-gap approach, while the sustainable economic development will be reflected through key macroeconomic indicators, namely: budget deficit, energy consumption, inflation, and GDP growth.

For achieving the research goal, section 2 of the paper startsoff by giving more details of how energy subsidies affect economic sustainability as well

as provide a brief literaturereview of previous studies that examined the relation between these variables. Section 3 describes the methodology used in this paper. Section 4explores the situation of Iran vs. Egypt concentrating on the practical relation between energy reform and economic sustainability. Section 5 is the discussion section with researchers' insights and policy recommendations. Finally, section 6 sums up the paper and states the limitations of the study.

2. Literature review

Energy subsidies are introduced as a mean to correct market failures. Conceptually it is the government's responsibility to produce goods or provide services that are under-produced in the economy or not produced at all. Subsidies are also used to provide strategic goods with cheaper prices; as part of government objective to create social stability.

The main justification often given by the developed world indefense of their use of subsidies is the need to enhance their stance on unemployment (Khattab, 2008). While in developing countries, consumers' subsidies specifically are introduced to encourage certain industries and help in alleviating energy poverty through granting access to energy to those deprived of it (Ellis, 2010). This is specifically important as a portion of the world's population still suffers what is known as energy poverty where they lack any access to the energy resources (Fattouh & El-Katiri, 2012).

IEA, OECD, & World Bank (2010) summarized the main motives for governments to use energy subsidies under five main points. The first is alleviating energy poverty. The second is to boost the national production of energy rather than depending on imports. The third is that subsidies can help in achieving industrial development, as it encourages investing in industries which would be rather unprofitable if the government provides no subsidies. The fourth is distribution of national wealth; this is specifically when it comes to major energy-producing countries in which energy prices are kept lower so that everyone would benefit from the country's abundant resources. The fifth and final is, protecting the environment; this is the case when subsidies are paid to subsidize renewable energy.

Alleviating energy poverty is one of the most prominent reasons energy subsidies exist. It is estimated that 1.6 billion people have no access to electricity, while two billion still rely on biomass energy such as wood and charcoal in cooking and heating (Birol *et al.*, 2012: 3). Energy poverty minimizes the income earning opportunities of people in rural areas as most crafts, even the old ones such as agriculture, need energy to be efficiently conducted. Moreover, energy poverty can have negative social and health implications. The reason is that some facilities such as hospitals and schools need a strong communications infrastructure to adequately function; therefore, without energy, the quality of education and the advancement of medical care are limited. Thereby, the importance of energy poverty can be attributed to its linkage to economic poverty,

allowing the eradication of energy poverty to be closely linked to the UN Millennium Development Goals, though it is not explicitly mentioned as one of them (Krosinsky, 2013).

Respectively, energy subsidy would be used to achieve the first part of sustainability which is providing basic needs. Cheap energy would be a way for ensuring having energy regardless of income. It is also a tool to provide essential goods at lower cost through the effect of energy on production. On the other hand, there are substantial economic costs associated with energy subsidies. For instance, energy subsidies promote extensive consumption of energy which necessitates the country to import further energy or at least decrease its energy exports, affecting by that the balance of payments of such countries. This can cause a country's currency to depreciate, restricting by that its access to further non-energy imports. Moreover, subsidies manipulate the investment choices, by allocating so many resources to subsidize a certain type of energy; the government is hereby depriving other energy substitutes -such as renewable energy- of the funding needed to develop it (Mourougane, 2010). Furthermore, Subsidies directed towards a certain sector such as the energy sector inhibit technological advancement in that industry, as companies are no longer motivated to research and work on ways of enhancing efficiency knowing that the government covers them (Loris, 2013).

At the beginning subsidies tend to appear attractive due to the cheaper production. However, over time, it cripples the growth of the private businesses having taken away their incentives to research into ways to increase the efficiency of their available operations and rationalize when it comes to the use of non-renewable resources. Thereby, the real competitive disadvantage arising from subsidies will show itself in the long run (IMF, 2013). Moreover, energy subsidies represent an opportunity cost that takes away a large portion of government expenditures that could have been spent in alternative services (Besada & Olender, 2015; IMF, 2013; Robin *et al.*, 2003). In addition, energy is often considered a substitute to other factors of production such as labor or capital; thereby a decrease in the price of energy makes it more attractive to substitute the latter two factors by it (Mourougane, 2010). Thus energy subsidies are sometimes quoted as one of the reasons that promote unemployment (IMF, 2013).

Subsidies can give people an incentive to smuggle, by taking the subsidized energy product and selling it across the border for a higher price to make profit (UNEP, 2008). Smuggling puts additional strain on the budget of the subsidizing country, this is because the money spent on subsidies has gone to waste not reaching those intended. Added to that, the possibility of it receiving smuggled energy in return is out of the question due to the lower prices introduced by subsidies (IMF, 2013).

Furthermore, Subsidies can be a huge fiscal burden on the governments resulting in huge national debts (Besada & Olender, 2015). Subsidies tend to place a huge burden on the government's budget, since the government needs to pay transfers to compensate the companies that are forced to have

a price ceiling to what they can charge for their energy commodities. In addition, subsidies have a high opportunity cost, it drains government's resources that could have been spent in more beneficial means such infrastructure, human capital or social programs. Furthermore, energy prices are procyclical meaning they tend to increase when economy is better off and decrease when it is worse off; this makes the government expenditure prone to high variability associated with international price movements (Mourougane, 2010).

The IEA, OPEC, OECD, and World Bank (2010) issued a joint report in which they illustrated that energy subsidies should be given adequate consideration, so that the inefficient subsidies that put too much harm on the environment by promoting over consumption are reformed. They added that the rationale for which the subsidy was first introduced should be continuously revisited to see whether or not subsidies are still justified. Cost-benefit analysis can be conducted to see if the subsidy's benefits are worth keeping it. Simultaneously, the current subsidy strategy should be examined to see if it is the best possible one. The externalities are then reviewed to ensure they do not exceed the permissible limits. Finally, the relative urgency on the priority list is measured to view whether the subsidy policy is the best allocation of funds.

A number of studies have been conducted to analyze the effect of reforming energy subsidies on economic sustainability. Abouleinein *et al.*, (2009) undertook a study to simulate the impact of energy subsidies reforms in Egypt. In this study, it was anticipated that removing energy subsidies and increasing prices of fuel by 10% would cause Consumer Price Index (CPI) to inflate by 1.5%. Moreover, since the production of electricity primarily depends on natural gas, an increase of 6.9% in electricity prices is witnessed for every 10% increase in natural gas prices. The Computable General Equilibrium (CGE) model was used for further analysis. This is a widely used economic model for simulating empirical analysis and has been modified to account for the characteristics and features of the developing world. The effect of gradually increasing prices, to fully cover cost of production in a five years' time horizon plan, was simulated. The results showed that in the medium run, the consumption rate growth fell from 3.8% to 2.4% due to removing subsidies. Meanwhile, The GDP fell from 5.6% to 4.1%. The sectors heavily affected are the energy intensive ones.

Hamid & Rashid (2012) also used CGE to measure the impact of removing energy subsidies on the economy in Malaysia. The results showed that inflation occurs as a direct effect immediately after removing energy subsidies, especially in industries that heavily rely on energy, such as refineries, wholesale/retail, and transportation. This is the same finding as Abouleinein *et al.*, (2009). However, unlike Abouleinein *et al.*, (2009), Hamid & Rashid (2012) found out that removing energy subsidies did in fact increase the GDP and caused workers' incomes to elevate. These results were in line with Ellis (2010), who claimed that there is a direct

relationship between reforming energy subsidies and GDP. She believed that this is a result of the more efficient allocation of resources caused by better pricing decisions.

Saunders & Schneider (2000) used simulation to describe the economic effects of removing energy subsidies. Results displayed that removing energy subsidy, especially in economies that primarily rely on direct cash transfers as a method of providing subsidies, led to huge positive impacts on the government budget. This allowed the governments to allocate more money to other areas that are higher on the priority list. Moreover, just like Hamid & Rashid (2012) and Ellis (2010), they anticipated that GDP would increase as a result of the reforms.

3. Research methodology

To answer the exploratory research question "What is the relationship between reforming energy subsidies and economic sustainability?". A comparative case study between Egypt and Iran was undertaken using qualitative descriptive analysis of secondary data. In this paper, reforming energy subsidies is the process under investigation. Furthermore, the secondary data in this paper is obtained through various online databases and sources, namely: World Bank, World energy outlook, Earth Policy Institute, Regional Economic Outlook and BP statistical review.

The concepts in this study are energy subsidy reforms and economic sustainability. 'Economic sustainability' implies a system of production that satisfies present consumption levels without compromising future needs. The 'sustainability' that 'economic sustainability' seeks is the 'sustainability' of the economic system itself (Basiago, 1998: 150). The reason this study especially focuses on sustainable economic development is that the initial rationale behind implementing energy subsidies is often developmental, with a widespread fear that removing subsidies might prohibit such pursued economic development (Lechtenbohmer *et al.*, 2010). Energy subsidy reforms will be reflected through the energy subsidies magnitude. In measuring such energy subsidies magnitude, the paper follows the approach of the International Energy Agency, commonly known as the price-gap approach. This method encompasses the way of calculating energy subsidies through deducting the charged price for energy from the reference market price (Mourougane, 2010). Sustainable economic development will be reflected through: budget deficit, inflation, GDP growth and energy consumption. This is built upon the view that for a country to be economically sustainable it needs to have the capability of producing goods and services continually, have its debts at controllable acceptable level, and avoid poor allocation of resources between the different sectors (Harris, 2003).

The comparative case study is conducted between Egypt and Iran. The reason these two countries were chosen is that both countries are among the 25 most dependent countries on energy subsidies (Earth Policy Institute, 2011). In addition, they would present an interesting comparison

as Egypt is a net oil importer while Iran is a net oil exporter. The paper focuses primarily on the period from 2010 till 2014, as such period is characterized by active reform efforts in both countries. The relationship between reforms and inflation, however, would be studied for a longer period of time to easily detect any unusual observable inflation spikes associated with reform efforts.

4. Research findings/results

4.1. Case study: Arab Republic of Egypt

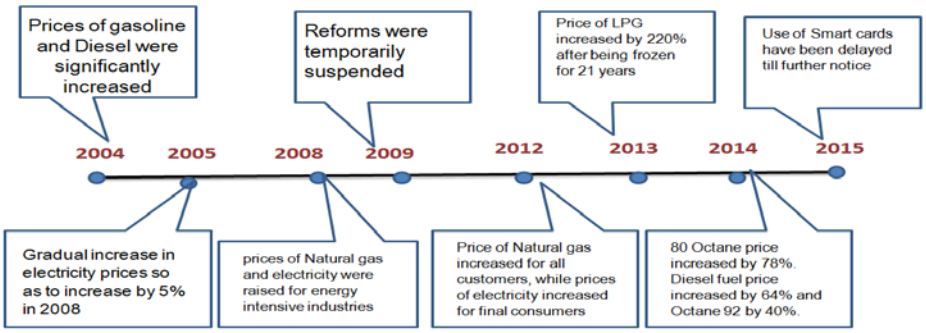
This section provides a comprehensive overview on the reforms of Egypt. It starts with some background information on the reform efforts undertaken. Then, a descriptive analysis is conducted, covering the relationship between reforming energy subsidies and economic sustainability represented in: budget deficit, energy consumption, inflation, and GDP growth.

4.1.1. Background on Egypt's subsidy reforms

Subsidies have been introduced in Egypt to make energy more accessible to the poorer sectors of the population. However, whether this rationale suffices was heavily questioned due to worldwide increase in energy prices, limitations in energy production and an ever-increasing budget deficit. This is why reforms were proposed in 2004; these reforms entailed significant increase in the prices of gasoline and Diesel. Moreover, gradual elevation in electricity prices at a rate of 5% was also to take place in the period from 2005 till 2008. Furthermore, in 2008, the prices of Natural gas and electricity were raised for energy intensive industries. At the time of implementation, full cost recovery resulting from reforms was speculated to be in 2014. However, this was not the case; as in 2009, the reform efforts were temporarily halted due to the unstable economic situation the world was going through (Castel, 2012: 1-2).

In the year of 2002 till 2013, the government spending on subsidies increased by a rate of 26%. However, after the revolution the government started to implement drastic subsidies reforms. For instance, after 21 years of being frozen, the price of liquid petroleum gasoline increased by 220%, and in 2013 the price of liquid gasoline 95 increased significantly to account for its full cost (Clarke, 2014: 1-2). Beginning from 2012, Natural gas prices were also adjusted for all sorts of consumers: residential, industrial and commercial; while the electricity prices increased for the final consumers. Nevertheless, the budget was still adversely affected by the subsidies which take more of the government expenditure than education, health and infrastructure all together. The combined effect of high costs of subsidies alongside the economic stagnation, which Egypt was going through, adversely affected the fiscal position of Egypt (Regional Economic Outlook, 2015). The main mitigation effort undertaken during the reforms was that, no changes in electricity prices occurred to the bracket comprised of the lowest consumption group (Sdratevich *et al.*, 2013).

In July 2014, the Egyptian government carried out one of the biggest subsidy reforms; this was a main step they thought was necessary to fulfill their goal of decreasing the budget deficit by 2%, from 12% to 10%, in the year of 2014 (Zayed, 2014). The reform efforts were mainly directed towards fuels which were not targeted by the previous reforms, or only witnessed insignificant price increases throughout the years. An example for such reforms is the price of 80 Octane Gasoline, which is primarily consumed by old cars, and witnessed price increase by 78%. Meanwhile, the price of Diesel fuel, which is mainly used in public transportation, increased by 64% and 92 Octane price was raised by 40% (Rizk, 2014). A smart card was then introduced as a way for citizens to get fuel subsidies. The purpose of this smart card was not rationing, but rather a way for the Egyptian government to observe consumption habits of each vehicle and prevent smuggling. The smart card system was supposed to be enacted starting June 15th, 2015. However, due to the fact that not all those entitled claimed their cards, the enactment was postponed till further notice (Mourad, 2015). The Egyptian government declared that tremendous efforts are being carried out so as to decrease energy subsidies by 90% in three years period (Daily News Egypt, 2014). A timeline of the reform efforts is shown in Figure 1.



Graph 1.*Timeline of Egypt's Reform Efforts*
Source: Constructed by Author

4.1.2. Descriptive Analysis for Egypt

In an attempt to describe the relationship between reforming energy subsidy -as represented by the energy subsidies magnitude using the price-gap approach- and economic sustainability; the key macroeconomic indicators are considered starting with the effect on budget deficit, followed by inflation. Then, the relation between energy consumption and the reform efforts is depicted. Finally, the relation between reforming energy subsidies and GDP growth is discussed.

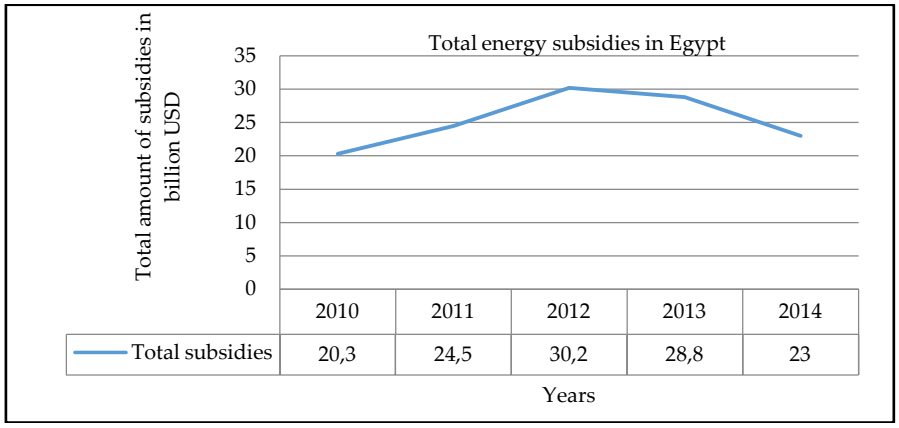
In the years 2010 and 2011 no major reform efforts were undertaken as the transitional government that came after the revolution feared that putting the proposed energy subsidies reform program of 2010 into action might provoke further political unrest, something which they tried to avoid at all costs (El-Katiri & Fattouh, 2015); hence, the rise of energy subsidies

expenditure from 20.3 billion USD to 30.2 billion USD, as shown in Table 1, was no surprise. However, as part of the reform process that comprised Natural Gas, Gasoline 80/92, Diesel and electricity in 2012; and that which comprised Gasoline 95 in 2013 and the most comprehensive one of 2014, the expenditure fell to reach 23 billion USD in 2014, as shown in figure 2. It is worth noting that oil witnessed the most significant fall in subsidies expenditure compared to both electricity and gas in those three years, as can be shown in figure 3.

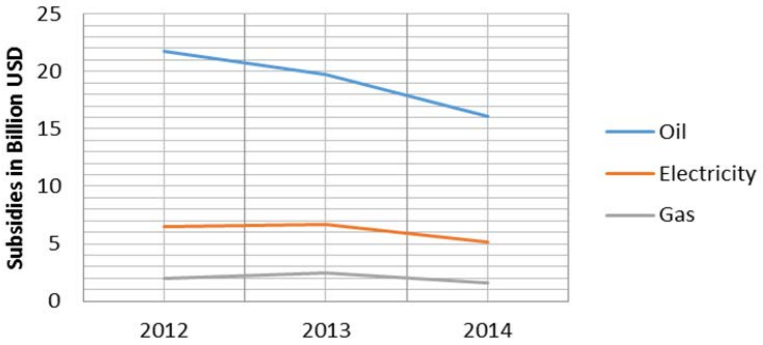
Table 1. *Magnitude of energy subsidies in Egypt*[2]

Egypt (In billion USD)		2010	2011	2012	2013	2014
	Oil	NA	NA	21.8	19.7	16.2
	Electricity	NA	NA	6.5	6.7	5.2
	Gas	NA	NA	2.0	2.5	1.6
	Coal	NA	NA	-	-	-
	Total	20.3	24.5	30.2	28.8	23.0

Source: World Energy Outlook (2015) & Earth Policy Institute (2010, 2011).



Graph 2. *Total Energy Subsidies inEgypt using Price-gap approach*
Source: World Energy Outlook (2015) & Earth Policy Institute (2010, 2011).

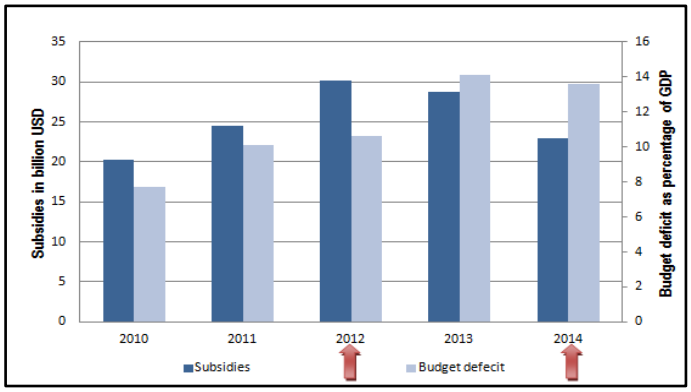


Graph 3. *Components of Energy Subsidies in Egypt*
Source: World Energy Outlook (2015).

[2] The magnitude of subsidies is measured using the price gap approach. The data for 2010 and 2011 are obtained from the Earth Policy Institute database and only the totals were accessible. Meanwhile, the data for 2012, 2013 and 2014 were obtained from the database of the World Energy Outlook.

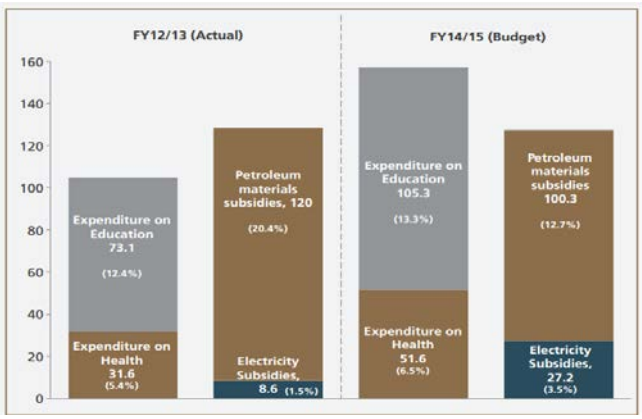
4.1.3. Energy subsidy reforms and budget deficit

The urging budget deficit is often the primary cause for the many reform efforts that took place in Egypt throughout the years (Clarke, 2014). Thereby, in analyzing the economic aspect of sustainability, energy subsidies should be given significant attention as it represents the largest burden on the public budget (World Bank, 2011). However, as can be seen in figure 4, the reform efforts of 2012 were notaccompanied with an improvement in the public deficit as contrary to what was to be expected, the budget deficit actually rose in the period from 2012 to 2013, which can be explained by the simultaneous rise in international oil prices, causing the efforts of the reforms to reduce the budget deficit to be deemed obsolete. However, the deficit started falling in 2014, for which an attributing factor could be the further, more comprehensive reforms of July 2014 and the supporting fall in international energy prices.



Graph 4. *Subsidies and Budget Deficit in Egypt*
Source: World Bank (2016) & World Energy Outlook (2015).

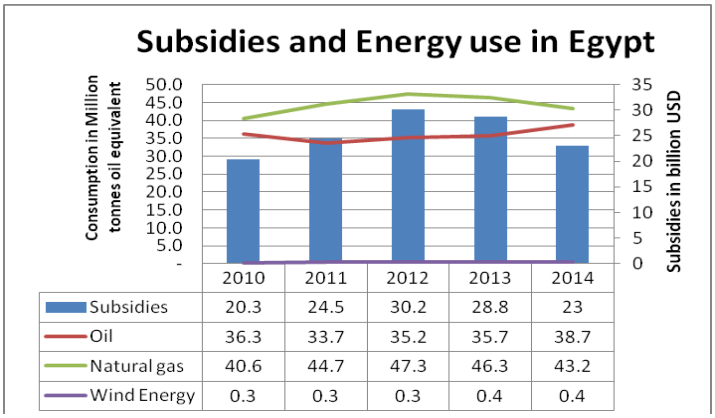
One of the main goals of the Egyptian government is to be able to attain a sustainable fiscal position that would entail it to direct its expenditures to more worthy sectors of the economy, such as health and education. This would allow it to achieve a more comprehensive growth and thereby help in regaining the confidence of private investors, which is crucial at this point; as investments- including foreign direct investments- represent a vital aspect in accelerating economic growth. Figure 5 shows the better allocation of government resources that is likely to be caused by freeing up funds that were previously spent on subsides. The government plans envisaged that subsidy reforms would result in an increase in expenditure on education by 0.9% from the period 2012/2013 to the period 2014/2015, while the increase in expenditure on education would increase by 1.1% during the same period (MOF, 2015: 15).



Graph 5. *Sector Public Spending as Percentage of Total Expenditure*
Source: Ministry of Finance (2015: 15).

4.1.4. Energy subsidy reforms and energy consumption

Energy consumption is another aspect that should be adequately examined tin the light of reforming energy subsidies. The reason this aspect is important is that the energy consumption in Egypt has been relatively stable throughout the years, while it has been on the decline in almost everywhere else (ENID, 2012). The overly cheap energy prices promoted capital intensive industries in Egypt rather than labor intensive ones that would have been more adequate to Egypt, being a labor-intensive country. Moreover, reforming energy subsidies would allow Egypt to free funds to invest in developing alternative energy such as the solar and wind energy. It would also allow the government to create a broader grid to deliver natural gas to homes and reduce the dependence on the costlier LPG, commonly used by lower income households (MOF, 2015).

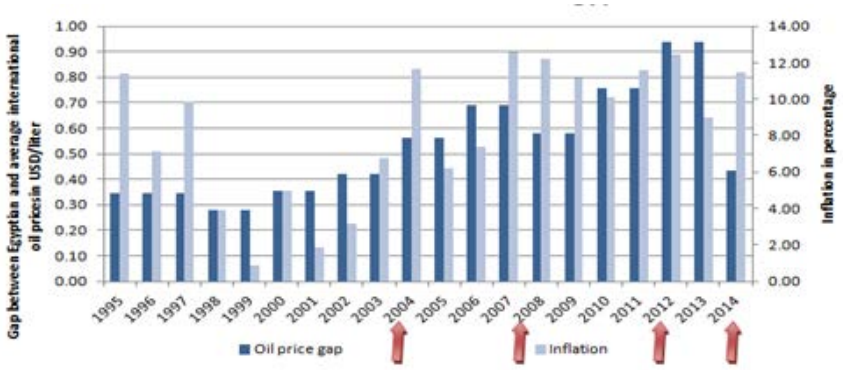


Graph 6. *Subsidies and Energy Use in Egypt*
Source: World Energy Outlook (2015) & BP Statistical review (2015).

Figure 6 shows that the Natural gas consumption was on the rise till 2012 and started to decrease after the 2012 reforms, and decreased at even a steeper slope with the 2014 reforms. Oil consumption, however, showed a different trend, increasing after the two major reforms of Egypt- that of 2012 and that of 2014. One reason could be that the reliance of oil can be relatively inelastic compared to natural gas, which the government is trying

to change by giving households access to the natural gas grid. It is also notable that the dependence on the use of wind as an alternative energy source is no longer merely in the pipeline but has been actually implemented, as it is seen increasing at a very slow pace since the reforms of 2012.

4.1.5. Energy subsidy reforms and Inflation

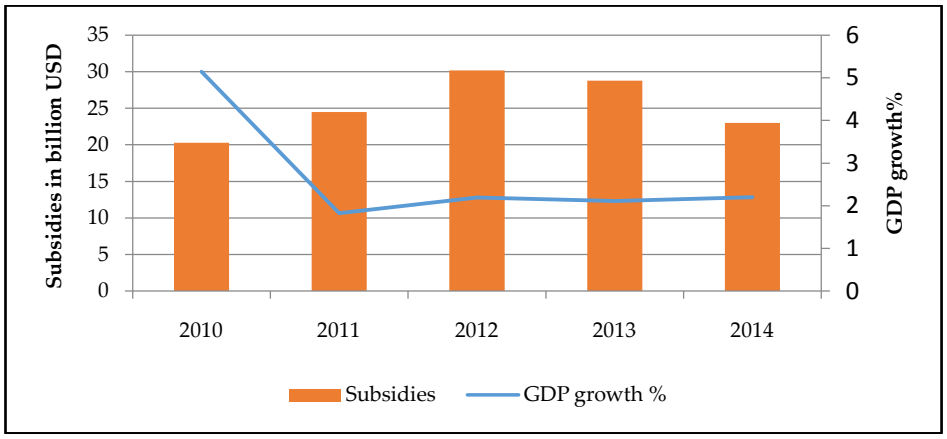


GRAPH 7.*Oil Prices & Inflation*[3] *in Egypt*
Source: World Bank (2016).

In figure 7, the major reforms are denoted with arrows. It can be viewed that in the light of the intense 2004 reforms which comprised a broad range of energy products, inflation increased significantly in that year rising from 6.78% to 11.67% in the same year; however, such increase in inflation was short-lived, falling immediately in the year after. The 2008 reforms, which were not as comprehensive and only targeted energy intensive industries, did not yield similar result as inflation fell in that year and the two following years. This could also be attributable to the fact that the government increased the deposits rate to reach 11.5% in March 2008, in a try to restrict inflation expectations (MOF, 2008). This is why the residential sector was the sector thatconstituted the biggest percentage of electricity subsidies the inin 2009/2010 (Castel, 2012). The 2012 reforms faced the same fate as that of 2004, with increasing inflation during the same year of its implementation and falling quickly afterwards. However, it should be noted that the intensity of increase of inflation in 2012 was not as high as that of 2004, as based on figure 7, it only increased from 11.60% to 12.44%, which could be understood in the light of possible decrease of private consumption due to the increase in the electricitysubsidies for which the residential sector was the largest recipient in 2009/2010 (Castel, 2012). Finally, the ambitious reforms of 2014 were associated with significant increase in inflation, even though it was only implemented in July that year.

[3]As the magnitude of energy subsidies for periods prior 2010 is not available, and calculating it is not feasible; the subsidies were reflected by the difference between average international oil pump price and Egypt's oil pump price.

4.1.6. Energy subsidy reforms and economic growth



Graph 8. *Subsidies and GDP growth in Egypt*
Source: World Energy Outlook (2015) & World Bank (2016)

The effect of subsidies reform on economic growth can be studied as the relationship between the change in magnitude of subsidies and GDP growth percentage. As can be viewed in figure 8, even though energy subsides' magnitude increased in the period from 2010 to 2011, the GDP growth percentage declined terribly, but this could be mainly contributed by the unstable political situation accompanying the 2011 revolution. In the year from 2011 to 2012, a rise of both subsidies magnitude and GDP growth percentage is observable; this was followed by a slight fall in both variables in the period from 2012 to 2013. Oddly, the GDP growth rate increased in 2014 although the subsidies magnitude fell significantly by the 2014 reforms. This could be partially explained by the fall in international prices that luckily coincided with the 2014 reforms; this allowed the benefits of the reform to be magnified narrowing the gap between oil prices in Egypt and the international prices even further (Griffen *et al*., 2016).

Moreover, the immense 2014 reforms are often referred to as courageous especially in the light of the political instability Egypt was going through. These reforms were not met by the anticipated unrest as it was accompanied with a huge deal of transparency, asking people to embark on the wave of sacrifices to make the country better by reallocating its financial resources towards areas that can be considered worthier such as education and health. In addition, the mitigation techniques adopted by the country are thought to be successful. For instance, the government left the price of LPG unchanged as it is primarily consumed by the lower income households (El-Katiri, & Fattouh, 2015).

4.2. Case study: Islamic Republic of Iran

This section provides a comprehensive overview on the reforms of Iran. It starts with some background information on the reform efforts undertaken. Then, a descriptive analysis is conducted, covering the relationship between reforming energy subsidies on sustainable economic

development represented in: budget deficit, energy consumption, inflation, and GDP growth.

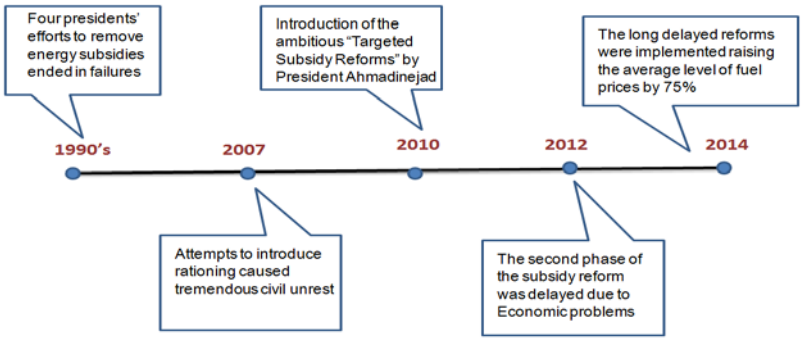
4.2.1. Background on Iran's subsidy reforms

Iran has subsidized its fuel and fuel products ever since 1980. In the 1990's, four presidents conducted efforts to cut subsidies but failed. For example, President Akbar Rafsanjani's plan to cutback subsidies caused huge nationwide unrest, forcing him to disregard the idea. Likewise, President Mohammad Khatami was incapable of obtaining the parliament's support to his plan of gradually increasing fuel prices (Nikou & Glenn, 2015). In 2006, Iran had to import $4 billion worth of fuel to meet the tremendously large fuel consumption patterns created by energy subsidies. Iran suffered from oil smuggling that reached up to 40,000 barrels of gasoline per day. This was the case up until Iran introduced rationing in 2007. Nevertheless, rationing efforts were met with immense civil unrest (UNEP, 2008).

On December 18th 2010, the Iranian government announced that Iran was to take what is known by Targeted Subsidy Reform (TSR). This entailed restructuring prices for fuels by significantly cutting subsidies and replacing them with direct transfers to the population. This action saved the government an amount between $50-60 billion (Guillaume *et al*., 2011: 3). This reform is often quoted as the most ambitious reform effort ever undertaken, as it entailed an exceptional significant increase in energy prices in a relatively short notice (Sdralevich*et al*., 2014). The whole process started smoothly in 2010. However, the second phase of energy subsidies reforms, which was supposed to take place in 2012, was postponed due to the economic difficulties Iran faced which made it complex to implement the reforms then. Such economic difficulties were mainly attributed to the new wave of sanctions that were enacted against Iran due to its nuclear program, restricting the Iranian oil exports and further strained its budget. Furthermore, the high level of inflation Iran encountered resulted in a decrease in the value of cash transfers. This adversely affected the low income, vulnerable groups of the population. (Demirkol *et al*., 2014). The main problem with TSR is that, due to the lack of sufficient information on who should receive transfers, the government decided to provide them to everyone (Esfahan, 2014).

The long-delayed reforms were implemented in 2014 by the Iranian government where the prices of fuel were raised by 75%. The reforms were deemed a necessity due to the high amounts that the government spends yearly to subsidize energy that ranged between $40 to 100 billion. This explains Iran's extremely high consumption levels that exceed the Middle East's consumption average by a dreadful figure of 80% (Esfahan, 2014). It is noted that in these reforms, the government launched public campaigns to discourage the people who do not need transfers from re-applying for them; it used public personas in the process. Even with these reforms the price of fuels in Iran is still below the international market price (Nikou &

Glenn, 2015). The timeline for Iran's energy subsidy reforms in shown in figure 9.



Graph 9. *Timeline of Iran's Reform Efforts*
Source: Constructed by author

4.2.2. Descriptive Statistics for Iran

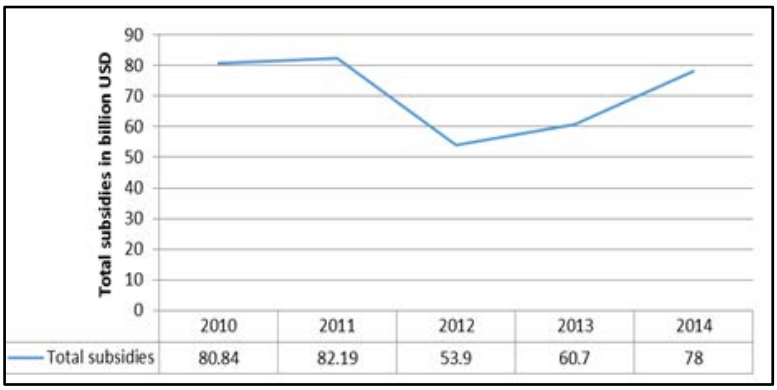
Imitating the methodology used in the case of Egypt, the key macroeconomic indicators of Iran, namely: budget deficit, inflation, energy consumption and GDP growth will be thoroughly observed to inspect the relationship between subsidy reforms and each of them.

In the 18th of December 2010, the Iranian government announced a fierce wave of change regarding liquid fuel prices which became too unsustainable. Shortly afterwards, in a day; the prices of gas, electricity and water were also said to be revised. This was accompanied with strict rules regarding ceiling for transportation tariffs increases in response to the announcement. The 2010 reforms were known as the first phase of the Targeted subsidy reform program and its main mechanism was to depend on cash transfers instead of subsidizing fuel prices (Guillaume *et al*., 2011). This however, did not decrease the subsidies in 2011 as per price-gap approach calculations as shown in table 2 and figure 10. This can be attributed to the significant worldwide increase in oil prices during 2010 and 2011, as well as the devaluation of the Iranian Rial as a result of printing money to cover the budget deficit. The magnitude of subsidies falls in 2012, but begins to rise again in 2013 and 2014; which can be explained by the increasing oil consumption. The most significant factor contributing to the rise in subsidies' expenditures is oil subsidy as reflected in figure 11.

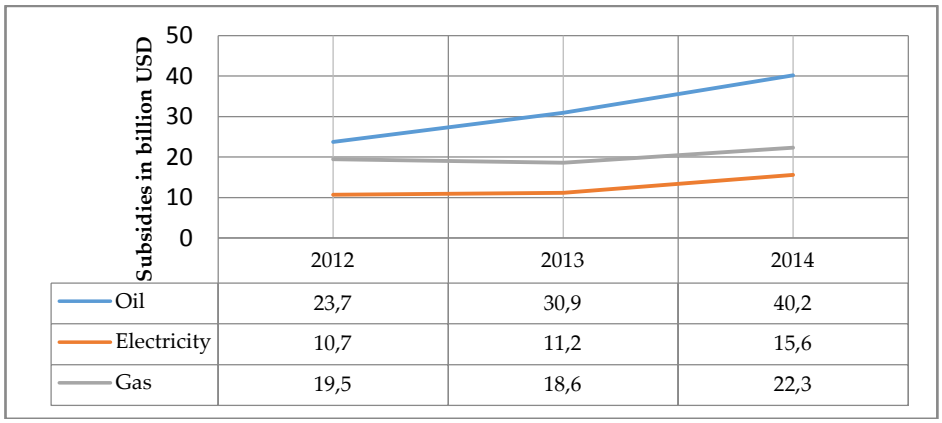
Table 2. *Magnitude of Energy Subsidies in Iran*

Iran (In billion USD)		2010	2011	2012	2013	2014
	Oil	NA	NA	23.7	30.9	40.2
	Electricity	NA	NA	10.7	11.2	15.6
	Gas	NA	NA	19.5	18.6	22.3
	Coal	NA	NA	-	-	-
	Total	80.84	82.19	53.9	60.7	78.0

Source: World Energy Outlook (2015) & Earth Policy Institute (2011).



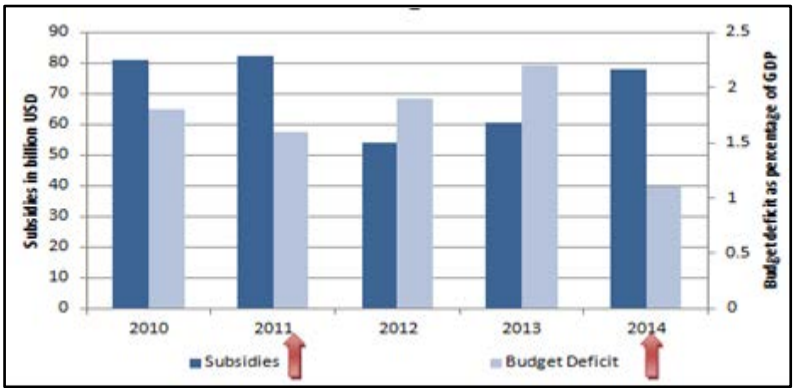
Graph 10. *Total Energy Subsidies in Iran using Price-gap approach*
Source: World Energy Outlook (2015) & Earth Policy Institute (2011).



Graph 11. *Components of Energy subsidies in Iran*
Source: World Energy Outlook (2015) & Earth Policy Institute (2011).

4.2.3. Energy subsidy reforms and budget deficit

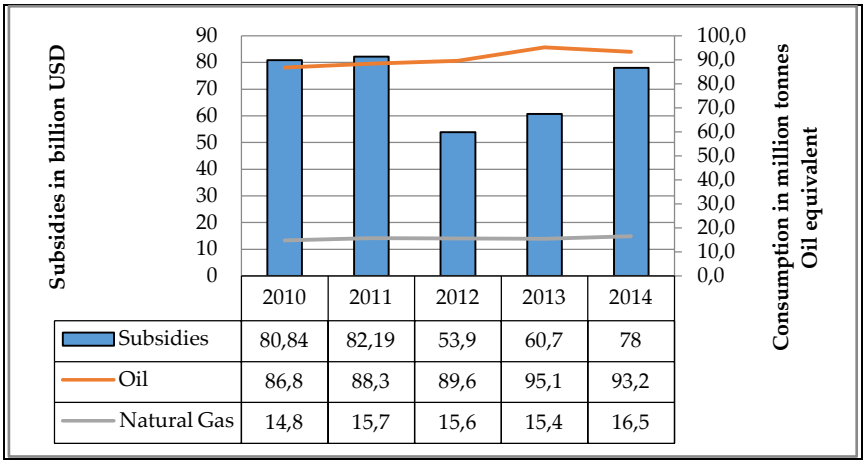
A useful insight is that unlike most developing countries who undertake energy subsidy reforms with the reduction of budget deficit as a primary driver, Iran did not share such motive. The reason is that Iran is an oil exporter whose costs of subsidizing energy is considered more as an opportunity cost of what could have been the gain, instead of being an actual burden on the government's budget. It was not till 2007, when the over consumption patterns demonstrated by the Iranian life style led the government to import further fuel. This is when the real cost of subsidies started to appear; the problem was magnified by the limited importing capabilities of Iran as a result of international sanctions on it (Salehi-Isfahani *et al.*, 2015).



Graph 12. *Subsidies & budget deficit in Iran*
Source: World Bank (2016) & Regional Economic Outlook (2015).

As shown in figure 12, the budget deficit decreased subsequent to both reform efforts- denoted by arrows- in the period from 2010 and 2014. In the Target Subsidy Reform of December 2010, the reliance on cash transfers to compensate people for the overnight substantial increase in fuel prices caused the budget deficit to decrease by a very small percentage; as the cash transfers were widely inclusive rather than being directed to the most vulnerable sectors of the population. Moreover, such decline in budget deficit was utterly short-lived, as the deficit increased immensely afterwards in the years of 2012 & 2013, for reasons attributable to the limitations on the exports of Iranian oil as part of the sanctions on it. Nevertheless, the further increase in fuel prices, campaigns discouraging people who do not need subsidies from reapplying for cash transfers, and the decrease in international oil prices can all be linked to the observable significant decrease in budget deficit (Regional Economic Outlook, 2015).

4.2.4. Energy subsidy reforms and energy Consumption



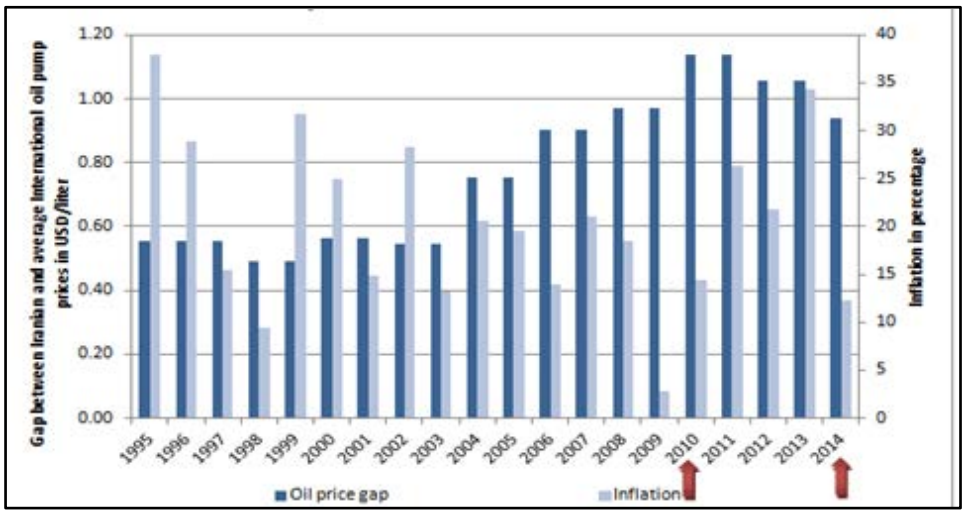
	2010	2011	2012	2013	2014
Subsidies	80,84	82,19	53,9	60,7	78
Oil	86,8	88,3	89,6	95,1	93,2
Natural Gas	14,8	15,7	15,6	15,4	16,5

Figure 13. *Subsidies and energy consumption in Iran*
Source: World Bank (2016) & BP Statistical Review (2015).

Energy is one of the most vital pillars in the Iranian Economy; hence properly pricing it to promote efficient use of resources is one of the most

urging issues for the government (Lechtenbohmer *et al*., 2010). However, according to the above data in figure 13, the reforms of 2010 neither associated with a decrease in the consumption of oil, nor natural gas. This came as a disappointment to Iran, which had the reduction of consumption of fossil fuels as a main goal of the reforms (Salehi-Isfahani *et al*., 2015). Iran wanted the fall in consumption to compensate for the encountered sanctions related to the Iranian Nuclear program. The reason for such increase in consumption can be linked to the enormous amounts of cash transfers used to mitigate the effects of increasing energy prices, which surpassed the savings arising from higher prices (Nikou & Glenn, 2015). The consumption of natural gas kept rising even with the reforms of 2014, while the consumption for oil did show a decrease attributable to the 2014 reforms. This reflects how the government was capable of achieving one of its goals; namely, directing consumption towards natural gas rather than its oil alternative, as it much cleaner and entails less opportunity cost (Hassanzadeh, 2012).

4.2.5. Energy subsidy reforms and inflation



Graph 14. *Oil prices*[4]*& inflation in Iran*
Source: World Bank (2016).

As observable in figure 14, Iran encountered many inflation spikes throughout the years which are not attributable to any subsidy reform efforts. The case is no different with the 2010 inflation spike, which was the outcome of many factors combined together. For instance, the sanction on the Iranian government was one of them. Moreover, the fact that the government found no way out other than printing money to reduce the deficit from the cash transfers caused the Rial to devaluate, and further

[4]Because the data for the magnitude of subsidies using the price-gap approach from the period of 1995 to 2014 is not accessible and calculating it is not feasible due to the absence of many of the required data; the magnitude of subsidies in the graph was depicted through the difference between the world average pump price and Iran's pump price. These data are obtained from the World Bank database.

contributed to the inflation spike (Salehi-Isfahani *et al.*, 2015). Furthermore, before the enactment of the subsidy reform of 2010, the government took precautionary measures of placing the reduction of inflation prior the reform as a main policy, and in fact succeeded. The government also placed a price ceiling to the price increases resulting from the reforms and enforced it with regular inspections (Guillaume *et al.*, 2011). It is also that the rate of inflation actually decreased after the 2014 reform which implies that inflation is not really a side impact of energy subsidy reforms in Iran.

4.2.6. Energy subsidy reforms andeconomic growth

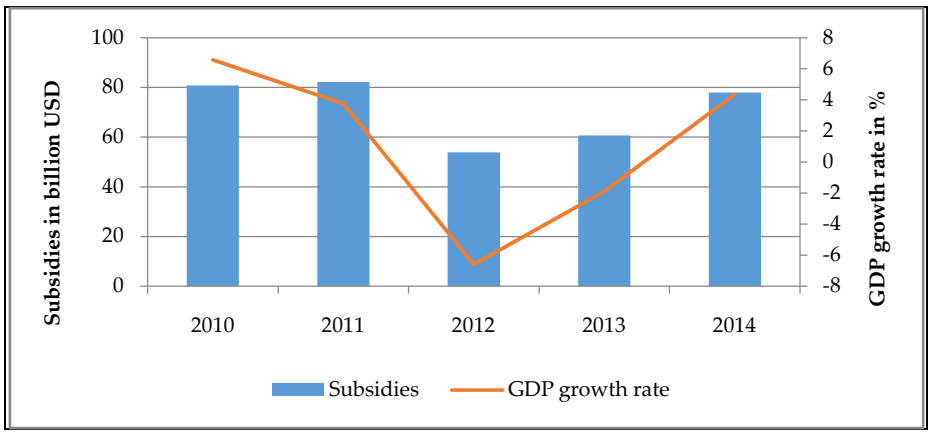


Figure 15. *Subsidies & GDP growth in Iran*
Source: World energy outlook (2015) & World Bank (2016).

It can be viewed in figure 15 that the GDP growth rate suffered a significant fall after the 2010 reforms recording a significant decrease in the GDP growth rate reaching -6.6% in 2012 (World Bank, 2016). Such persistent fall in GDP growth rate is odd, as commonly, the fall in GDP growth that results from subsidy reforms should be short-lived as industries normally adjust their technologies to be more efficient and modify their employment levels accordingly (Lechtenbohmer *et al.*, 2010). However, the GDP growth rate did not suffice by the decline in 2011 but decreased significantly in 2012. This could indicate that the GDP growth is not reliant on the energy subsidy reforms alone in Iran and the sharp decline that occurred in the period from 2010 till 2012 can be also linked to the sanctions, which led the government to devaluate the Rial. Furthermore, the GDP growth rate of 2014 did not suffer from similar effect as it continued its trend of increasing as shown in figure 16. Hence, there appears to be no obvious direct effect of reforming energy subsidies on economic growth.

5. Discussion

Regarding the relationship between reforming energy subsidies and budget deficit, Sauders & Schneider (2000) used simulation and found that reforming energy subsidies had a huge positive impact on the budget

balance allowing governments to allocate more money to other areas that are higher on the priority list. This was the case with Iran, as it witnessed improvements of its deficit in relation with subsidy reforms; however, these improvements were not huge as Iran mitigated its reform efforts with large transfers. In Egypt, the reforms of 2014 were also associated with positive relation with budget balance. However, the 2012 reforms were not successful in decreasing the deficit, as it coincided with an international rise in oil prices that deemed the reforms' efforts on the budget deficit obsolete. As for energy consumption, while it seems that Egypt witnessed a decrease in the consumption levels in relation with reforms with varying degrees depending on the elasticity of the fuel under reform, the same decrease in energy consumption was not encountered by Iran especially in the amidst of 2010 reforms which can be attributable to the enormous cash transfers that it offered to the public.

Moreover, Abouleinein *et al.* (2009) and Hamid & Rashid (2012) used CGE models to study the effects of reforming energy subsidies on different macroeconomic variables in Egypt and Malaysia respectively, and found that immediate rise in inflation was often a side effect associated with reform efforts. This came in line with the analysis of the case of Egypt in which there was an immediate rise in inflation with almost every reform; however, when mitigated with an increase in deposit rate to control inflation expectations, the subsidy reforms were not accompanied with inflationary effects. In Iran, on the other hand, inflation is not as evident in the aftermath of subsidy reforms which could be understood in the light of some measures taken by the Iranian government, such as in 2010 where it placed a price ceiling to the increase in prices resulting the reforms and enforced them with regular inspections.

The effect of reforms on GDP growth did not receive consensus in the empirical literature. Abouleinein *et al.* (2009) found that GDP growth was negatively related to removing energy subsidies having used a CGE model on Egyptian data adding that the sectors heavily affected are the energy intensive ones. However, having also used a CGE model, Hamid & Rashid (2009) found out that removing energy subsidies did in fact increase GDP and caused workers' incomes to elevate. These results were in line with Ellis (2010), who claimed that there is a direct relationship between reforming energy subsidies and GDP. She believed that this is a result of the more efficient allocation of resources caused by better pricing decisions. Nonetheless, in the analysis of the cases of Egypt and Iran in this study, there was a very weak relationship between energy subsidy reforms and GDP growth rate.

Hence, after thoroughly examining the case studies, the following policy implications were uncovered. To begin with, the political stability that accompanies the subsidy reforms is heavily dependent on the mitigation techniques adopted by the country in protecting the vulnerable groups, including both producers and consumers. In the Egyptian model, this was done through leaving the prices of LPG unchanged as it is primarily

consumed by the lower income households. On the other hand, even though the mitigation technique of substantial cash transfers accompanying the reform efforts in Iran was successful in dodging political unrest, it managed to take away the benefits arising from savings resulting from increasing energy prices. Thereby, a better targeting program is needed to narrowly select those most entitled for the cash transfers, so as to reap the benefits of the cash transfers without losing the benefits of the reforms. Nevertheless, it should be mentioned that both countries were also quite successful in communicating the reform efforts to the public, allowing the public to embark on the wave of change and minimize resistance.

Moreover, government intervention can also help in mitigating the effects of increasing energy prices on inflation. This measure was undertaken by Egypt in the 2008 where the Central Bank of Egypt increased the interest rate prior subsidy reforms, resulting in a humble effect of the reforms on inflation. It should be noted, however, that such measures are not always feasible as they can contradict the expansionary monetary policy needed to boost-up the economy at a certain point of time. Another way of government intervention that proved to be successful, is that adopted by Iran in 2010, where Iran placed a ceiling to the acceptable increase in prices after enacting the subsidy reforms. Such regulations were reinforced by regular inspections.

Furthermore, although energy subsidies drain both the budgets of oil exporters and importers, importers suffer explicitly while the exporters' budget suffer implicitly represented in the opportunity cost of the lost revenue which could have been gained if the oil has been exported at the world price. Thereby, reforming subsidies is often a primary priority for the oil importing countries and often results in significant fall in budget deficit. However, that was not apparent in the case of Egypt in the reforms of 2012, as the increase in energy prices occurred simultaneously to increase in world prices so no budget improvements were witnessed.

In addition, reforms accompanied with fall in international energy prices tend to be more beneficial than those happening simultaneously with rising energy prices. This could be attributed to the fact that- based on the price-gap approach- if both international and domestic prices rise by the same amount, the total expenditure on subsidies would remain unchanged. Hence, no better allocation of expenditures is likely to be exhibited. Nevertheless, it would prevent the government from incurring further subsidy costs. This, however, needs to be communicated to the public who are not well informed about such insights and might only dread the apparent lack of better allocation of public funds.

Furthermore, the effect of reforming any type of energy on the consumption of such energy source is heavily dependent on its price-elasticity of demand which is affected by the presence of alternative energy sources. This was apparent when oil consumption did not fall in the light of the reforms in Egypt, as natural gas grids are not fully installed failing to provide an adequate alternative to oil. The case was similar in Iran, apart

from the fact that after the reforms the consumption of Natural gas increased as well, giving hopes to the Iranian government that the much cleaner and cheaper Natural gas can soon replace gasoline oil.

6. Conclusions

This paper discusses the relationship between reforming energy subsidies and economic sustainability which is an important topic in the sense that the negative consequences of energy subsidies on the economy, society and environment are becoming too dangerous to be overlooked. That is why the paper attempts to contribute to the literature of the topic through comparing the relationship between energy reform and economic sustainability in Egypt and Iran. It also goes beyond comparative descriptive analysis by providing policy implications for the two countries.

The descriptive analysis provided valuable insights regarding the research question by discussing the effect of energy subsidies on sustainable economic development, which allowed for the following conclusions. To start with, reforming energy subsidies generally tends to relief the strain on government budget. This is in case it is not accompanied with simultaneous international energy price increases, or if there are no other economic difficulties that the country is encountering. Such difficulties can deem the reform efforts obsolete, like with the case of Iran and the international sanctions causing the relation between subsidy reforms and budget deficit to differ from the strong positive relation anticipated by the empirical literature such as Sauders & Schneider (2000).

In addition, the responsiveness of energy consumption of a certain fuel to the increase in its price is heavily reliant on its price elasticity of demand. This is represented in the availability of alternative energy sources. Moreover, the effect of the reforms on inflation is normally instantaneous and short-lived and could be mitigated through government intervention; that was clear in the case of Egypt. However, Iran did not show a similar trend as there was a weak relation between subsidy reforms and inflation disagreeing with results obtained in the empirical literature such as Abouleinein *et al.* (2009) and Hamid & Rashid (2012), where an increase in inflation was found to be an adverse side effect of reform efforts.In Iran, however, inflation was mainly influenced by other factors such as sanctions and currency devaluation. Finally, there tends to be a very weak relationship between subsidy reforms and GDP growth in both Egypt and Iran, implying that the effect of other economic factors outweighs that of subsidy reforms which differs from the two streams of empirical literature; both which found a negative relation such as Abouleinein *et al.* (2009), or a positive relation such as Hamid & Rashid (2012) and Ellis (2010).

Therefore, this paper outlines how energy subsidy reforms efforts are context based and do not only differ from one country to another but from a round of reforms to another. This depends on many different factors that interact together in the framework of the reform such as political stability, government efforts in mitigating the reforms, the efficiency of the

government in implementing those efforts, international oil prices,the type of fuel under reform and the main category of users affected by that fuel. Hence, these are all factors that should be taken into consideration when launching a reform program as such factors can equally support or hinder the success of the reforms.

Nevertheless, the generalization of such findings is relatively limited, as the study was only conducted on two countries in the MENA region. Moreover, the study mainly focused on the reform efforts for a short period of time of five years and was merely qualitative using descriptive analysis. Hence, recommendation for further research could entail comprising more countries, for longer periods of time. In addition, a long-term analysis - using econometric techniques- for the variables reflecting economic sustainable development, namely: budget deficit, energy consumption, inflation, and GDP growth; alongside with the magnitude of energy subsidies; studies could even consider dummy variables for different mitigation measures to further enrich the study. Finally, a research could be done on the impact of reforming energy subsidies on all the three pillars of sustainable development simultaneously, so as to provide more comprehensive insights.

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