Wuppertal Institute
for Climate, Environment
and Energy

IRAN ENERGY ASSOCIATION

German-Iranian Co-operation VI
"Development of three cornerstones for a sustainable Energy future in Iran "

Work package 2.

Energy Price Reform in Iran

Final Paper

Wuppertal, 27.11.2010

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1. Introduction

Energy is one of the most important sectors of Iran's economy. It drives almost all economic activities. Particularly for this reason energy pricing is more complicated than pricing of ordinary goods. It also involves issues of intergenerational resource allocation and external effects. Appropriate pricing is, however, a necessary condition for promoting energy efficiency and for achieving a sustainable energy sector. Energy prices that do not reflect the actual economic costs will encourage inefficient use of energy and discourage investment in new technologies and renewable energy sources. Therefore the first step of any energy efficiency policy is to set prices that send correct signals to consumers in order to provide them with incentives to use energy efficiently and to acquire energy efficient equipment or renewable technologies.

But clear price signals alone are not sufficient to lead to a rationalisation of energy use. Certain conditions are required to remove various barriers to a functioning market and to a significant improvement of energy efficiency and to develop and structure the market for efficient equipment and devices. Additional policy measures are therefore necessary to reinforce the role of energy prices and to create the appropriate market signals.

Considering the obvious importance of energy as an input factor to economy, policy makers and governments have "rediscovered" the topic of energy subsidies. On the one hand, subsidies promise to help achieving urgent policy goals. On the other hand, subsidies need to be abolished, as they create massive price distortions and lead to higher social cost of energy and undesirable environmental side effects. Iran is one of the countries in the world that heavily subsidize the energy sector. The substantial subsidising of energy prices over years has led energy consumption to grow rapidly, energy efficiency to decline, and environmental conditions to deteriorate. The subsidies have also become a huge burden on the government budget leading to macroeconomic disturbances.

To address the increasing economic and social problems associated with high energy subsidies, Iran has decided to reform its energy pricing policy. Although changes in energy pricing policy have been part of the third and fourth Five Year Development Plans (FYDP), governments have not been able to tackle the problem yet, probably due to lack of political will. In 2009, the government announced that it would undertake the energy price reform along with other economic reforms. After long debates and significant changes to the plan, parliament finally approved the change in the energy subsidy plan in 2010.

In this paper, we will review the energy subsidy program in Iran, based on an international overview on energy pricing policies and discuss problems and challenges for Iran linked with the current energy price reform.

2. Objectives of Subsidy

Subsidy is part of government expenditures to achieve certain objectives. The main objectives are as follows:

1. Overcoming market failure

The market fails to allocate resources efficiently when there are external effects, monopoly, public goods, or asymmetric information. In the energy markets, most causes of market failure are external effects and monopoly. In the former, goods are under/over produced, and in the latter, the price is set higher and the quantity lower than the competitive market levels, leading to a deadweight loss and inefficiency. To overcome the inefficient resource allocation when the market fails, the government can intervene by setting up a subsidy program. If there is a positive externality in producing a good, it will be produced at a less than efficient (competitive) level as the marginal social benefit will exceed the marginal benefit. In this case the producer does not receive all the benefits of his/her investment. If there is a negative externality, marginal social cost will exceed marginal cost, that is, a third party (society at large) will cover part of the production costs, and, therefore, there will be too much production.

i. In the case of a positive externality, the government can pay a subsidy to cover the difference between marginal social benefit and marginal benefit, generating incentive for more production. However, In the case of a negative externality, government levies taxes to cover the difference between marginal social cost and marginal cost, generating disincentive to produce more. Education is one example of a positive externality, which is usually subsidized by governments, and energy is a case of negative externality which is usually taxed. Almost all governments in developed countries and most governments in developing countries levy tax on energy, but few energy rich countries like Iran, not only do not levy tax on energy, but also subsidize it. The argument for subsidizing energy is that cheap energy will make local industries more competitive creating jobs and increasing economic growth. Similar to most other protection programs, however, the cheap energy inputs may lead to misallocation of resources, and therefore inefficiency, and low productivity.

ii. When a market is controlled by a monopoly, the government intervenes to ensure that prices and quantities are in line with the competitive market. Since a monopoly maximizes its profit by producing too little and charging a high price, governments can regulate a monopoly to reduce the price to its average or marginal costs.

2. Providing basic needs to the poor

One of the main objectives of subsidy programs across the world is to provide food security to the poor. Food subsidy is popular because the food market is rather volatile and there is a high level of uncertainty in the market, paving a road for speculator activities. The food market is also subject to many internal and external shocks, which adds to the degree of

uncertainly. Since food and nutrition are essential parts of basic needs and human development, governments often provide subsidies to avoid malnutrition and to generate healthy workers and, therefore, high productivity in the labour market.

3. Redistribution of income

Income distribution mechanism in the market system usually leads to a large gap between poor and rich. Unequal income distribution may have adverse effects on society as it may reduce people‘s participation in economic activities and therefore lower economic growth. Extreme unequal income distribution will also deprive the economy from using all human resource capacities as poor people do not have adequate access to education and health care and, therefore, cannot develop their skills. A large income gap in a society may also lead to social and political unrest which will create uncertainty lowering investment. To avoid economic and social problems arising from extreme unequal income distribution, government can use tax and subsidies to redistribute income from the rich to the poor and to provide support to deprived and disabled groups who could not otherwise develop their skills and participate in economic growth.

4. Alleviating the negative impacts of economic reforms or shocks

Economic reforms and adjustments are usually market oriented and the poor are the most vulnerable group whose economic and social condition is deteriorated under such programs. Similar results will take place when an economy faces major disturbances such as, an economic crash, natural disasters and war. During those turbulent events, poor will be affected the most, and, therefore, need to be protected. The government provides subsidy on basic needs such as food and shelter to support those vulnerable groups.

5. Political or Development Support

Another rationale for subsidy is to support production of strategic goods which are perceived as vital to the survival or development of the country. To create jobs and sustainable growth, developing countries tend to modernize their economies by investing in manufacturing industries. This industrialization policy is usually associated with a heavy subsidy to support the infant industries. In addition, most countries are willing to achieve a certain level of self-sufficiency in strategic goods to ensure their availability during anomalous conditions. For instance, agriculture is vital for society, but its market is volatile due to external shocks and speculations. It is one of the most commonly subsidized sectors in even developed countries. Military products are also perceived critical, particularly in the areas with high political tensions, and government subsidize the industry by keeping input prices low.

3. Energy Prices and Actual Costs

In many countries tariffs and pricing in the energy sector are far from "actual costs". Consumption of energy carriers and electricity involves social costs like environmental damages, climate change, and health damages. These external costs are not included in the prices, and therefore, their consumption and production will be more than the socially optimal level.

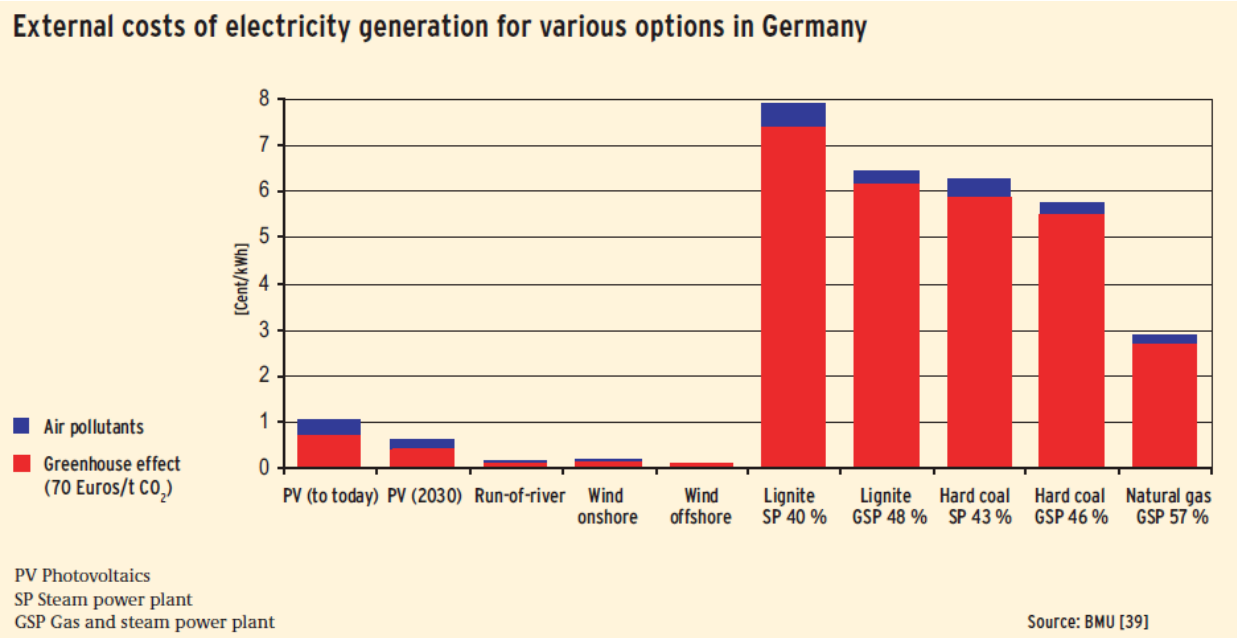

Figure 1: External cost of electricity generation for fossil and renewables options in Germany (Source: BMU, 2009)

As Figure 1 shows, conventional electricity generation causes significantly more environmental damage than electricity from renewable energy sources. These so-called external costs are not yet incorporated into the electricity prices as required by the polluter-pays-principle. According to a study carried out on behalf of the BMU[1], greenhouse gas emissions play a key role: The current best estimate of the cost of climate damage arising from such emissions is around 70 Euros/t CO2. Part of this is already taken into account in the electricity price via emissions trading within the EU. In addition, health and material damage caused by air pollutants and agricultural revenue losses are important.

External costs for electricity generated from hard coal and lignite – even allowing for modern technology – amount to 6 to 8 cents/kWh. For modern gas and steam plants, the external costs are still approximately 3 cents/kWh. By contrast, electricity generation from renewable energies causes comparatively minor external costs.[2]

In a competitive market, the existence of external costs will cause too much of goods to be produced and consumed in terms of overall costs and benefits to society. For instance, the price

[1] DLR 2006

[2] The construction and disposal of the plants are included in these calculations. BMU 2009

per gallon of gasoline may include the cost of production but not the expense of treating a respiratory illness from breathing polluted air or the repair bill from acid rain damage. Nor does it cover the cost of rising global temperature: more destructive storms, damage to agricultural productivity, or the relocation of millions of refugees forced from their homes due to a risen sea level. In fact, in some cases, the indirect (or external) costs of some products have become far larger than the market price. As the market is organized in the current situation and if there are no ecological taxes on gasoline, the motorist burning the gasoline does not bear these costs.

One way to change this unsustainable development is to incorporate the indirect cost into market prices by restructuring taxes (without raising them overall). If we can get the market to tell the truth, then we can avoid being blindsided by faulty accounting systems that lead to bankruptcy. As Oystein Dahle, former Vice President of Exxon for Norway and the North Sea, has pointed out: "Socialism collapsed because it did not allow the market to tell the economic truth. Capitalism may collapse because it does not allow the market to tell the ecological truth." (Brown, 2009)

4. The Energy Subsidies

In most countries, energy is taxed mostly because of its external effects on environment (see Figure 2). In a few countries including Iran, however, energy is subsidized[3]. The objectives of energy subsidy in these countries may fall into the political or development support category. They subsidize energy to provide inexpensive input to energy intensive manufacturing industries enabling them to develop and compete in international market. As the most developing countries experience show, the development or political support programs have rarely been able to achieve their original objectives, since they have run for much longer periods than was necessary, changed their priorities, and deviated from original objectives.

Figure 2 shows that in some energy rich developing countries, including Iran, gasoline and diesel prices are very low – lower than the production cost (cost for crude oil and cost of refinery). In 2008, the gasoline price of US $0.53 per litre, without any taxes, was required to cover the average cost of production (GTZ 2008). Consequently, prices below this level represent subsidised prices and tend to lead to distortions in the economy. On the other hand, reducing the subsidies for gasoline and diesel would have a significant effect on demand, especially in the long term. In the transport sector, this would lead to:

- a demand shift to more efficient cars and in the long run more investment to build or import higher efficient cars;
- changes in the driving behaviour;
- changes in modal split: more people would use public transport or bicycles;
- less investment needed for new streets and refineries;
- less import of gasoline and diesel or more export because of lower domestic consumption; and
- less environmental damages.

Those are the reasons why in many countries (OECD-countries, transition countries and developing countries) energy price subsidies have been eliminated or reduced for the last decade.

[3] As Figure 2 shows, there are 12 countries in the world in which retail gasoline price is lower than the crude oil prices in the world market. These countries are all energy rich countries in Middle East, Africa, and South America.

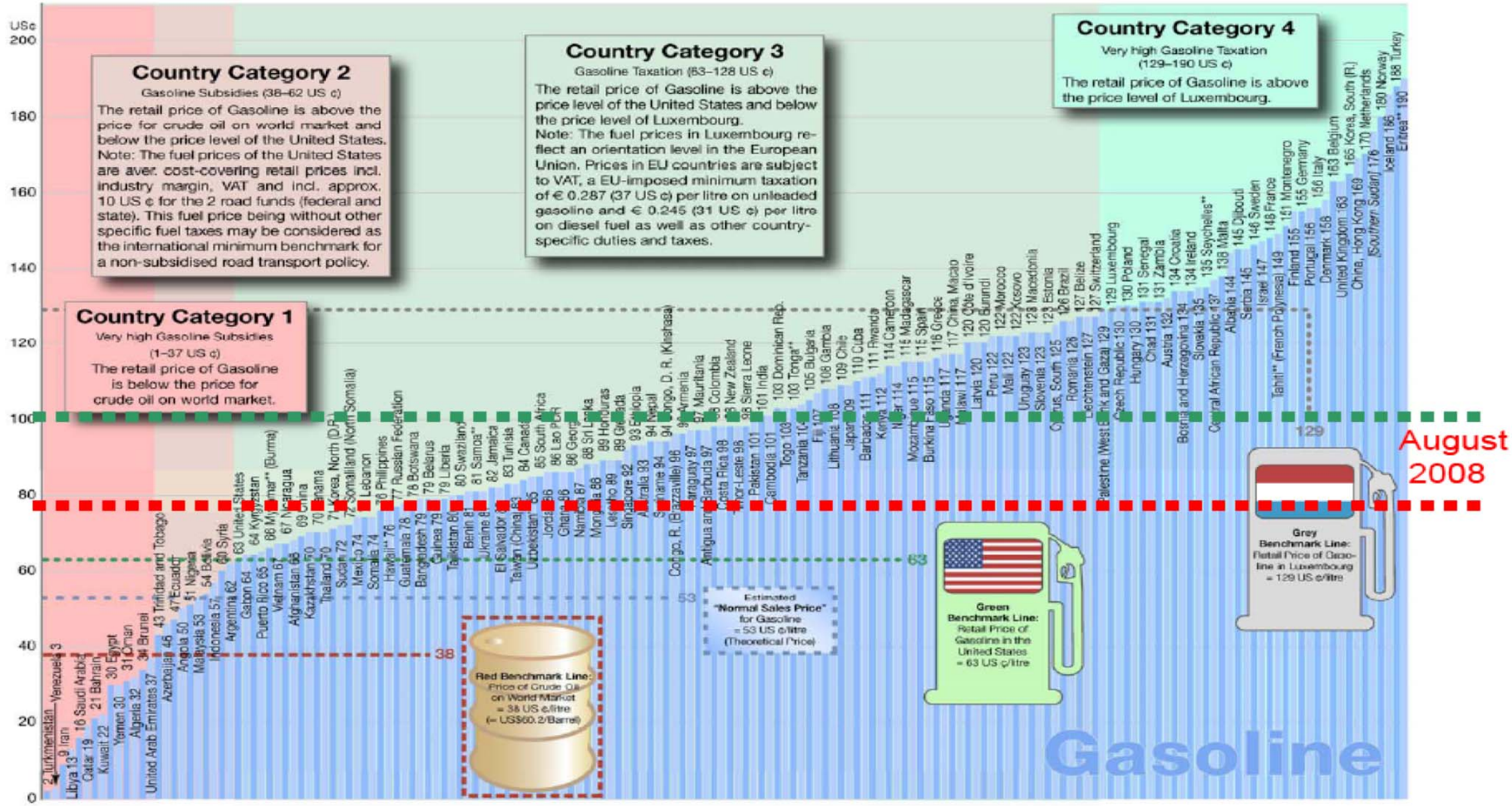

Figure 2: Gasoline Prices across Countries, Source GTZ (2008)

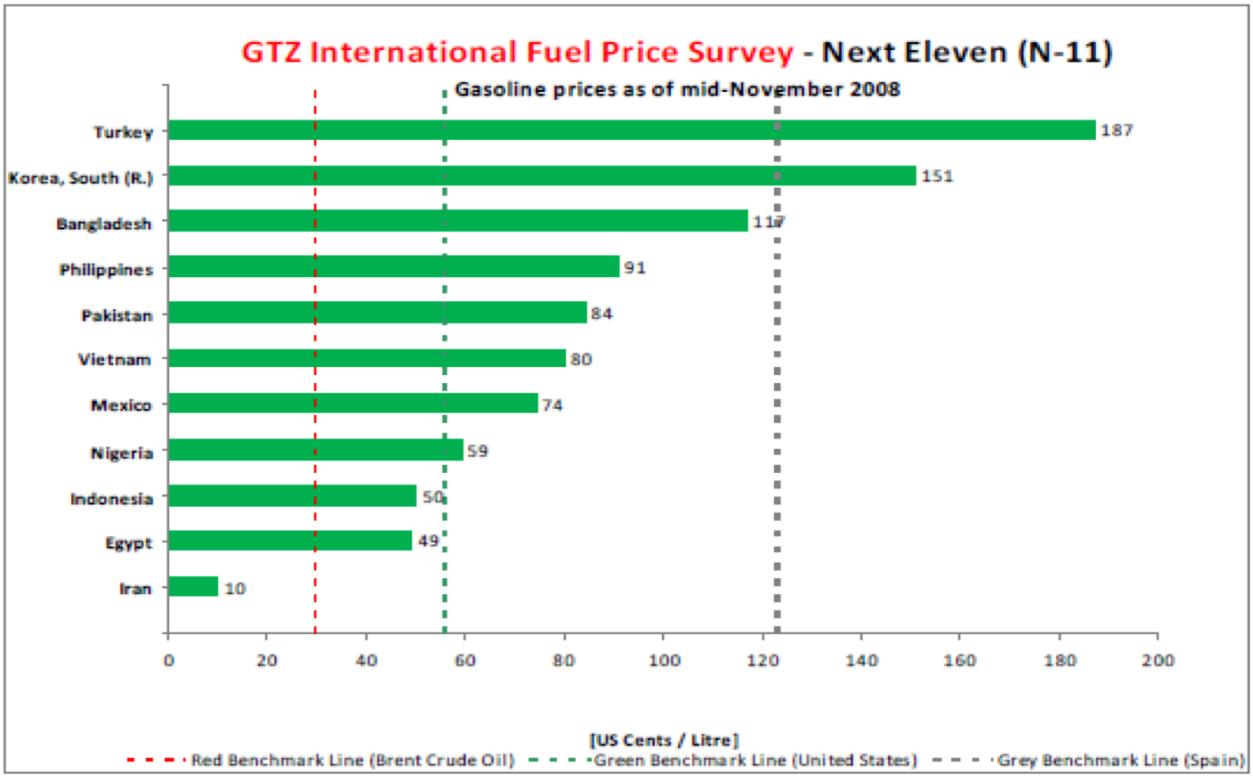

Figure 3: Gasoline prices in different countries in November 2008; Source: GTZ (2009)

Figures 2 and 3 also show that Iran still has one of the lowest prices for gasoline in the world. In November 2008, the price per litre of gasoline was only $ 0.10 for consumption below 120 litres per month per car. The price for gasoline above this quota was $ 0. 53.

In market economies, prices should at least reflect fairly accurately the supply costs. For our example (gasoline) that means that the price should not only include the costs of crude oil and refinery, but should also include the costs for investments on new roads and road maintenance, as well as costs for environmental damages. That is why, in many developed countries, gasoline is highly taxed. Gasoline tax is to cover the external costs such as environmental damages, incidents and the costs of the control-system, as well as to help balance government budgets, particularly when other government revenue sources are limited (European Commission, 2005). Figure 4 reflects the components of prices and taxes for gasoline and diesel in Germany.

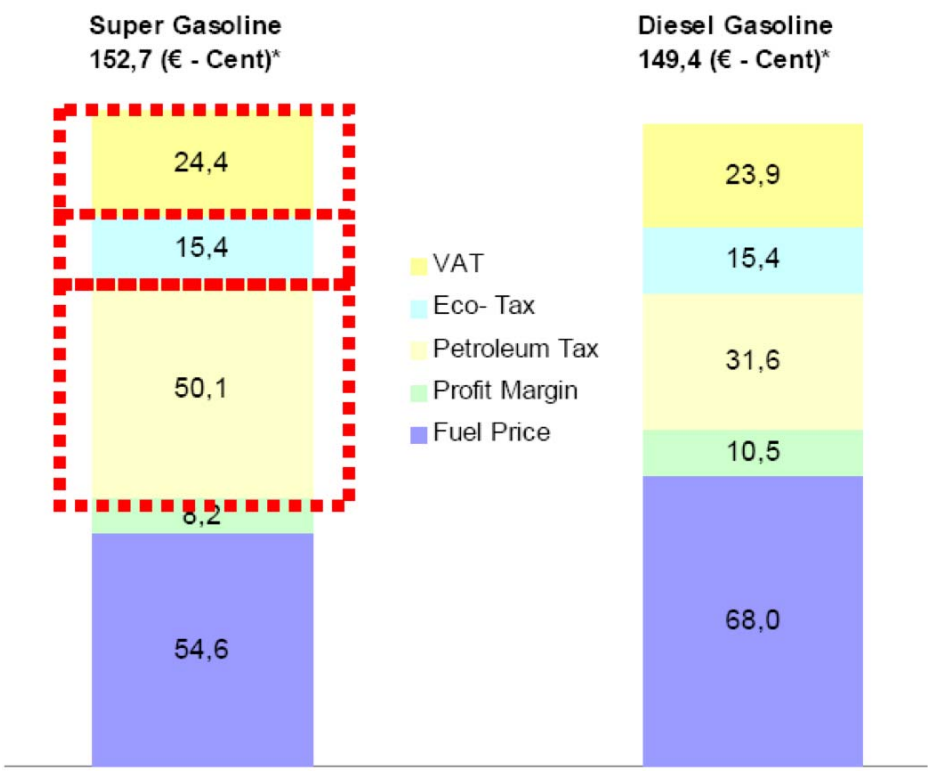

Figure 4: Price components in Germany in the year 2007; Source: Mineralölwirtschaftsverband, July 2008

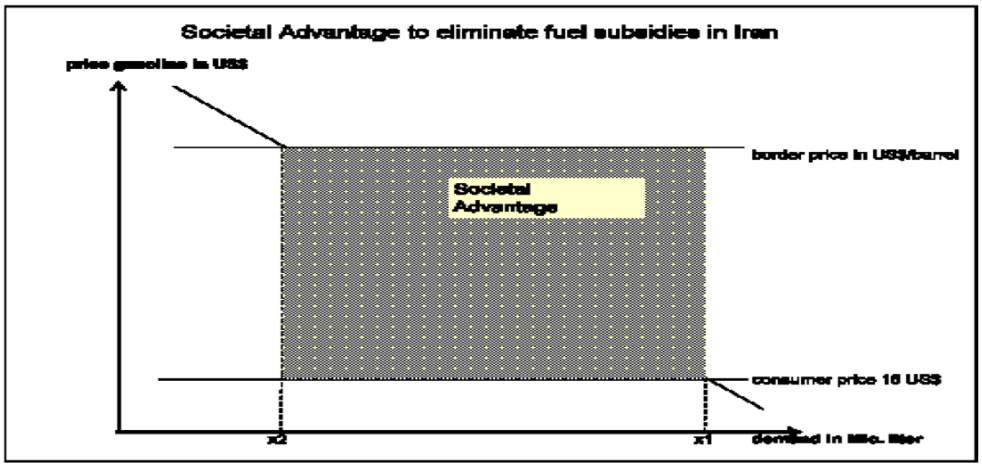

Figure 5: Social Benefits of a Gasoline Price Reform in Iran

Figure 5 shows the situation in Iran today: The price for fuel and gasoline are extremely low and heavily subsidized. If the price of fuel rises to the border price, the demand for fuel will decrease. The difference between fuel demand x_1 and x_2 could be sold in the world market at the border price. The additional income, (x_1-x_2)*(border price-price in Iran), could be used for additional investment or imports. To calculate the potential revenues due to lower consumption in Iran, we need gasoline price elasticities for different income groups. The estimates of price elasticities for gasoline in Iran are generally very low as they are based on the very low prices from the past. Those elasticities are not reliable for predicting future consumer behaviour when prices are high. In this study, we use estimates by Blooki (2007), which uses the most recent data that includes higher prices and estimates the elasticities for different income groups. Table 1 shows that price elasticities decrease with income. That is,

given the same price change, the lower price groups would cut their consumption more proportionally than the upper income groups. Overall, if the price rises by 1 percent, urban households would cut their gasoline consumption by more than a quarter million litre per day and rural households by about 185,000 litre per day. If the price rises to the current border prices, ($0.40/liter), the total household consumption will decline by 1.37 million litre per day. This translates to more than 250 million dollars savings because of lower imports. In addition, the government would receive about $7.5 billion extra revenues due to higher gasoline prices in the domestic market.

Income Group	Elasticity[a]	Change in Consumption, litre/day (1)[b]			Change in Consumption, litre/day(2)
		Urban	Rural	Total	
Lower	0.92	64,425	52,017	116,442	349,325
Mid	0.76	98,267	60,171	158,438	475,314
Upper	0.55	110,951	72,412	183,363	550,088
Total		273,643	184,599	458,242	1,374,727

a. Gasoline demand price elasticities are from Blooki (2007).

b. Total gasoline consumption was 66.8 million litre per day in 2007, which is divided by 60-40 ratio between urban and rural households. The non-household gasoline consumption is not considered. The first change in consumption is for one percent change in gasoline price, but the second (last column) is for 300 percent change ($0.40/liter)

Source: Authors calculations

Table 1: Change in Gasoline Consumption Due to a Change in Gasoline Price

5. Consequences of subsidies in Iran

5.1 Energy Subsidies Problems

The continuous energy subsidies program in Iran has caused various economic and social problems some of which are listed below:

- Increasing energy consumption and waste;
- Reducing incentives for using more efficient technologies and innovation;
- Degrading environment by lowering quality of air in urban areas;[1]
- Placing a heavy burden on government budget, and contributing to budget deficit by increasing direct payments as well as foregone income through reduced oil exports;[2]
- Cross-border smuggling of oil products to neighbouring countries; and
- Exacerbating the unfair distribution of income by allocating more subsidies to rich people.

Although the government has raised the energy prices for the past 15 years, the real energy prices have decreased because of higher inflation rates. Since the start of the third FYDP,

1If oil and gas are an alternative to wood fuel, fuel oil subsidies may have a positive effect on the environment by discouraging deforestation in the rural areas. The size of this subsidy (and positive effects), however, would be very small given the small rural population and their low consumption level.

[2] OPEC quotas are for total production not exports. Therefore, Iran can always export more oil and earn foreign income without violating its quota, should its domestic consumption reduces.

energy prices have risen, on average, by only 10 per cent per year, but the average inflation rate in this period has been more than 15 percent. The fourth FYDP called for a more aggressive measure to reform the energy market, that is, to increase the gasoline prices to the border prices. However, the newly elected government and parliament did not implement the plan and froze the fuel prices in 2006 and 2007.

The subsidy problem is more prominent in the case of gasoline consumption, which receives about one third of the total energy subsidies. Gasoline is sold below the market price at around 10 cents per litre, which is about one quarter of the border price and about one fifteenth of the European prices. The very low price of gasoline has encouraged high level of gasoline consumption. The growth rate of gasoline consumption has averaged 10 percent annually, over the period 2001-2007, and the consumption reached about 70 million litres per day in 2007. It has also led to a high concentration of air pollutants along with other social and economic problems. In response to a rapid growth in gasoline consumption, government drew on the Oil Reserve Fund to import about 40 per cent of domestic consumption in 2007. Iran is now the second biggest gasoline importer in the world after the United States. In June 2007, the government instituted a gasoline rationing system to curb the rapidly growing consumption. In the new system, each private passenger car would receive 30 litres gasoline per month at the fixed price of 1000 rials or about $0.11 per litre. The rationing scheme did not have any significant effect on domestic consumption, but it apparently reduced the amount of gasoline smuggled to neighbouring countries. The rationing system later allowed for consumption to exceed the quota at the price of 4000 rials ($ 0.44) per litre. The quotas were reduced to 80 litres per passenger car and month in 2010 and expected to be removed in part because of gasoline import restrictions imposed on Iran.

5.2 Macroeconomic Effects of Price Reform

Energy price reform in Iran is imminent as the prolonged subsidy program in the energy sector has led to high levels of distortion in the economy and imbalances in different sectors, including the government budget. If the current policy of subsidizing energy consumption continues, government has to cut oil exports or increase gasoline imports in response to the growing domestic demand. This will add extra pressure on the government budget, leading to higher inflation and balance of payment deficit, and lower growth. The government has decided to finally tackle the growing problem in the energy sector by reforming the energy pricing system and cutting back the subsidies. However, there are many challenges the policy makers and society at large have to face regarding the price reform policy. There is a need for a clear road map for the price reform policy which shows what type of energy subsidies would be removed, by how much and how. Moreover, the macroeconomic impacts of price reform on inflation, economic growth, unemployment, and balance of payments should be studied and dealt with carefully. The government also needs to have a plan on how to spend the additional revenues that will be generated with the removal of subsidies. The plan should identify vulnerable social groups, among both consumers and producers, who would suffer the most under the price reform scheme, and lay out the details on how to compensate for their loss of income. In the following, we review some of the macroeconomic impacts of the energy price reform. Throughout our analysis, we define subsidies as government direct transfers to consumers or producers, which appear in the government budget, as well as the opportunity costs or implicit subsidy arising from the difference

between domestic and border prices[3]. The latter is the most important part of the energy subsidy in Iran as the differences between the domestic prices and the border prices are highly significant.[4]

Government Budget

For the past 40 years, the government budget has always had deficits. The only exceptions are the period 1993-1995 and 1999 when the government devaluated rial and reported its revenues with the new exchange rates. Subsidies on basic goods have traditionally been one of the major government outlays comprising more than 12 percent of the budget. The budget also includes energy subsidies (fuel and gasoline), which have been increasing from 2 percent to more than 8 percent of the budget. If we include the implicit subsidy, the share of total energy subsidies of total budget would amount to between 20 to 40 percent, depending on oil prices. Reducing or removing direct subsidies will alleviate the budget deficit problem. Price reform will also generate significant revenues for government by selling energy carriers at border prices, which are at least four times greater than current domestic prices. Depending on the international energy prices, additional government revenues from energy price reform are estimated at $10 billion (about 100,000 billion rials) in 2010. The final effect of price reform policy on the government budget will depend on fiscal policy regarding how to spend additional revenues. If government does not expand its spending, the budget deficit will be reduced and government will be able to repay its debt to the central bank. However, if additional revenues are spent on compensation and welfare programs, the budget deficit will continue.

There are other channels through which the budget deficit might be affected. One possibility is the wage adjustment due to inflationary effects of price reform, which will contribute to a higher level of deficit. The second channel is the exchange rate changes due to balance of payment imbalances. Higher energy prices will weaken the industries position in international markets, therefore, lowering exports. If government devaluates the exchange rate to support exports, its oil exports revenues will increase, reducing budget deficit. The final effect of this channel will depend on government import expenditures, which will also rise.

Inflation

Removing energy subsidies will have strong effects on prices, exchange rates, and cost of living. Consumers will have to pay higher prices for different energy carriers, non-energy goods whose prices will increase to offset the increase in their energy costs, and all other goods whose costs in turn will be affected by energy price rises. There are studies which predict the inflationary effects of energy price reform. As Table 2 shows, these effects vary

[3] Since implicit subsidy is not included in the government budget, some argue that there is no or very low energy subsidies in Iran, and, therefore, no need for an energy price reform. Some also argue that comparing higher gasoline prices in other countries with the low domestic prices is not right, as domestic wages are much less than those countries' wages. This argument ignores the fact the oil and gasoline are trade-able goods whose prices are determined in the international market, whereas labor is not traded internationally and, therefore, its price is set domestically.

[4] The direct subsidy for gasoline and oil was about $2 billion and the indirect (implicit) subsidy for all energy careers $18 billion in 2004.

from 1.47 percent (Komijani, 2004) to 103 percent (Manzoor, 2004). The huge variations in estimation of inflationary effects of energy price reform are due to the models used (IO, SAM, and CGE) and the assumptions made. The lower end of the inflationary effects are based on the assumption that a price reform policy will be implemented gradually in four to five years, whereas, the higher end of the effects assume that price changes will materialize once. Moreover, the types of energy carriers subject to price changes are different in the studies.

One of the common shortcomings in studies of inflationary effect of energy price reform is that they are static, leading to unrealistic implications, which generates unsubstantiated fears among policy makers and society. Economic theory suggests that a rise in energy prices alone will not have a continuous inflationary effect, since it will only increase the aggregate price level in the short-term. It is true that energy is an important sector in the economy that is used in most economic activities and therefore its price change will have an economy-wide chain reaction. However, the inflation rate will return to its past trend after the economy adjusts to its new equilibrium level. The theoretical and empirical research results indicate that the major source of inflation in an economy is government and central bank policies on budget deficit, money supply, and exchange rates. If the government adopts non- or anti-inflationary fiscal and monetary policies during the energy price shock, the economy will not necessarily experience a higher inflation rate. In fact, experiences of energy price reform in some developing countries suggest that the inflation rate may even be lower after the reform. For instance, while a rise in diesel and kerosene prices in Indonesia and Turkey led to higher inflation rates by 0.6 and 16 per cent, the inflation rates in Malaysia and Zimbabwe were lower by 80 percent and 40 percent, respectively, after two years of price change (Hope and Singh,1995).

Study	Inflationary effect (%)	Method	Assumptions
Davoodi, Ahmad (2004) – MPO	2.31 – 5.84 a	4th FYDP model	gasoline, oil gas, and fuel oil
Komijani (2004) - CBI	1.47 – 26.5 b	IO	gasoline, gas oil, and fuel oil
Komijani (2004) - CBI	2.26-29.50 b	ECGE	gasoline, gas oil, and fuel oil
Komijani (2004) - CBI	2.35	IO	1. All energy carriers 2. liquid gas, natural gas, and electricity will change with inflation rates
Komijani (2004) - CBI	4.15	ECGE	1. All energy carriers 2. liquid gas, natural gas, and electricity will change with inflation rates
Manzoor (2004)	103	IO	1. 10 percent increase in all energy carriers 2. 2002 data
Sharifi, Sadeghi, and Abedin Ghasemi (2008)	45.62-54.38	IO	1.All energy carriers 2. all three scenarios: 10%, 35%, and 65% energy price increase
Tasdighi (2008) - PRC	10.5- 48.6c	IO	1. all energy carriers 2. One time price change
Parvin and Banooie (2009)	38	SAM (80)	Removing direct energy and non-energy subsidies
Parmeh (2005)	35.6	SAM	All energy carriers
Khiabani (2008)	35	CGE-SAM	All energy carriers
World Bank (1999)	40	IO	All energy carriers

a. With and without wage and interest adjustments
b. Gradual price change (in 5 years) and one time price change
c. Gradual price change (in 5 years) and one time price change
MPO= Management and Plan Organization
CBI = Central Bank of Iran
PRC = Parliament Research Center
IO = Input-Output Model
CGE=Computational General Equilibrium Model, SAM = Social Accounting Matrix

Table 2: Inflationary Effects of Energy Price Reform in Iran[5]

Income Distribution

Energy subsidies in energy-rich countries are often seen as a means to distributing rents among their citizens.[6] They are also perceived as a means to redistribute income from rich to poor. The rent distribution argument is flawed as it ignores the multigenerational aspects of the natural resources. As oil is non-renewable, its benefits should accrue to not only current

[5] Price reform is defined as increasing prices to the border prices.

[6] Rents are the differences between the world oil prices and the domestic production costs the oil exporting countries receive.

generation, but also the future generations. Redistributing rent to current generation deprives the future generations from their rights to the natural resources they own. The income redistribution argument for the energy subsidy can also be challenged, since the redistribution objective is not usually achieved in practice, particularly when subsidy applies to goods whose consumption increases with income and all income groups receive the same amount of subsidy per unit. Energy subsidy is one example that benefits the rich more than the poor as the latter consumes more (subsidized) energy than the former. Energy price reform will increase energy prices and will decrease consumption. The effect on household's expenditures will depend on the price elasticity of demand. If elasticity is low, energy expenditures will increase, which means that, given income, households will have to cut consumption of other goods or cut savings. Table 3 shows that the energy price index has increased on average by 13 percent per year and the non energy price index by 16 percent per year for the period 2001-2008. The share of energy expenditures of total expenditures by household has been declining from 4 percent to 2.7 percent.

	Energy Expenditures Share*	Price Change Difference	Non- energy Price Change	Non-energy Price Index	Energy Price Change	Energy Price Index
2001	0.040			86		93
2002	0.040	0.08	0.16	100	0.08	100
2003	0.044	-0.17	0.15	115	0.32	132
2004	0.042	-0.12	0.15	132	0.27	168
2005	0.038	0.08	0.11	146	0.03	173
2006	0.032	0.12	0.12	164	0.01	174
2007	0.030	-0.02	0.18	195	0.20	209
2008	0.027	0.24	0.26	245	0.02	213
Average		0.03	0.16		0.13	

Source: Author's calculations

Table 3: Energy and Non-energy Price Changes and Household Energy Expenditures Shares

Figure 6 also shows the trend for prices and energy expenditures shares. As the figure shows, there is a lag in changes in energy expenditure shares as prices change, which indicates that it takes time for households to adjust their consumption.

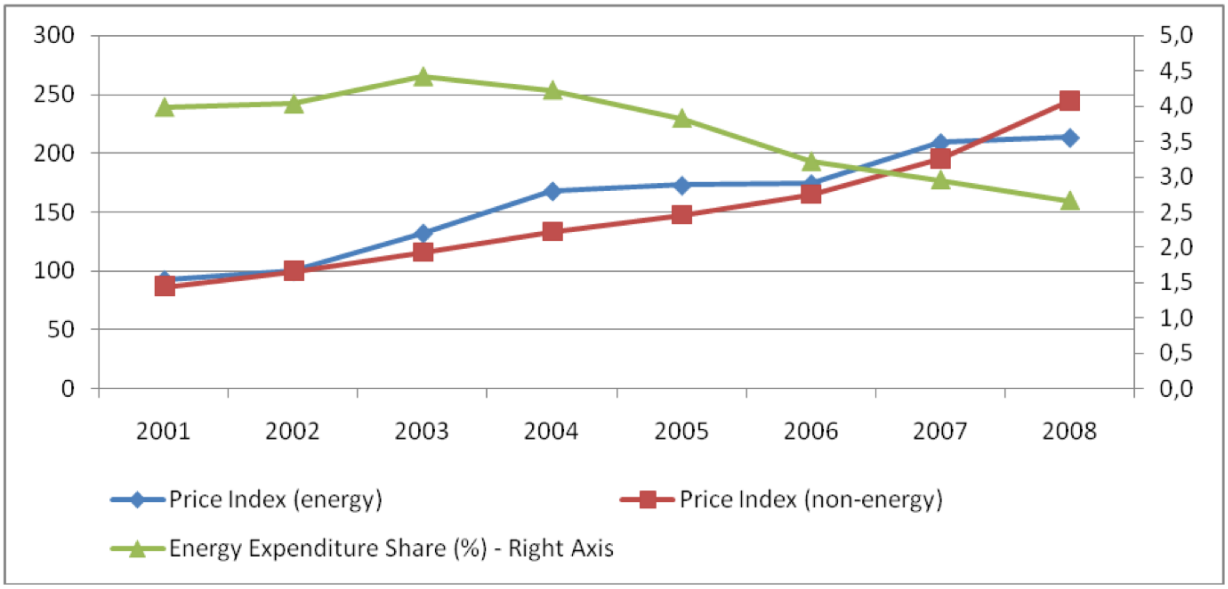

Figure 6: Energy and Non-energy Price Indices and Energy Expenditures Shares (2001-2008); Source: Authors' calculation

The change in expenditures will vary in different income groups depending on their preferences as well as price and income elasticities of demand for energy. As Figures 7 and 8 show, energy expenditures shares change inversely with the level of income in both urban and rural households. They also show that changes in expenditures are more pronounced in lower income groups than higher income groups. Based on the trends of the energy expenditures shares when energy prices have been rising, we can conjecture that lower income households will be more severely affected by energy price reform.

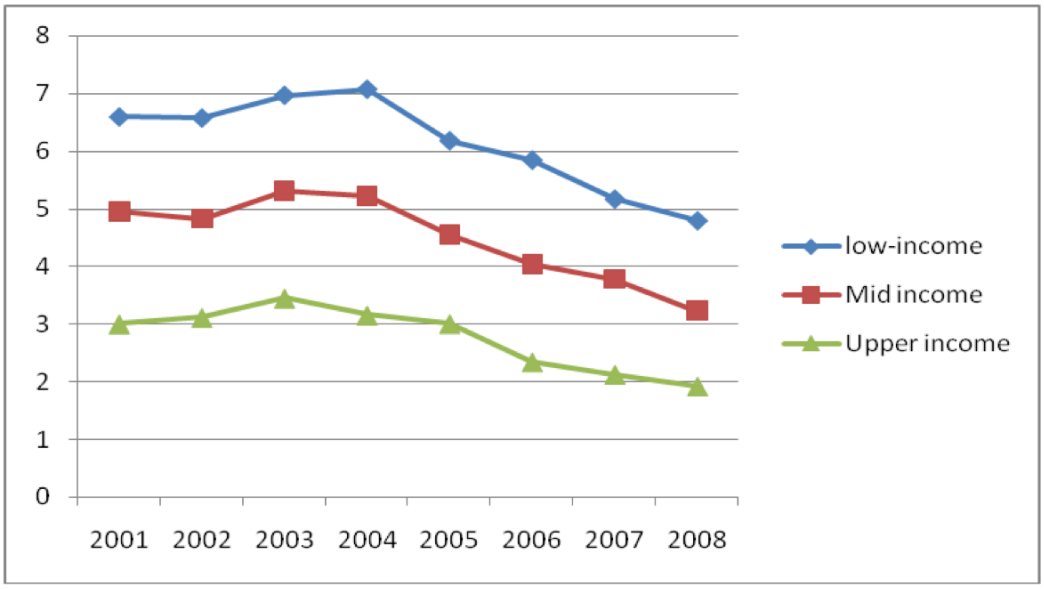

Figure 7: Shares of Urban Household Energy Expenditures of Total Expenditures (percent)

Low income includes the first three income deciles in the Household Budget Survey, mid income the fourth to eights deciles, and the upper income the last two deciles.
Source: Household Budget Surveys, Statistical Centre of Iran, and the author's calculation

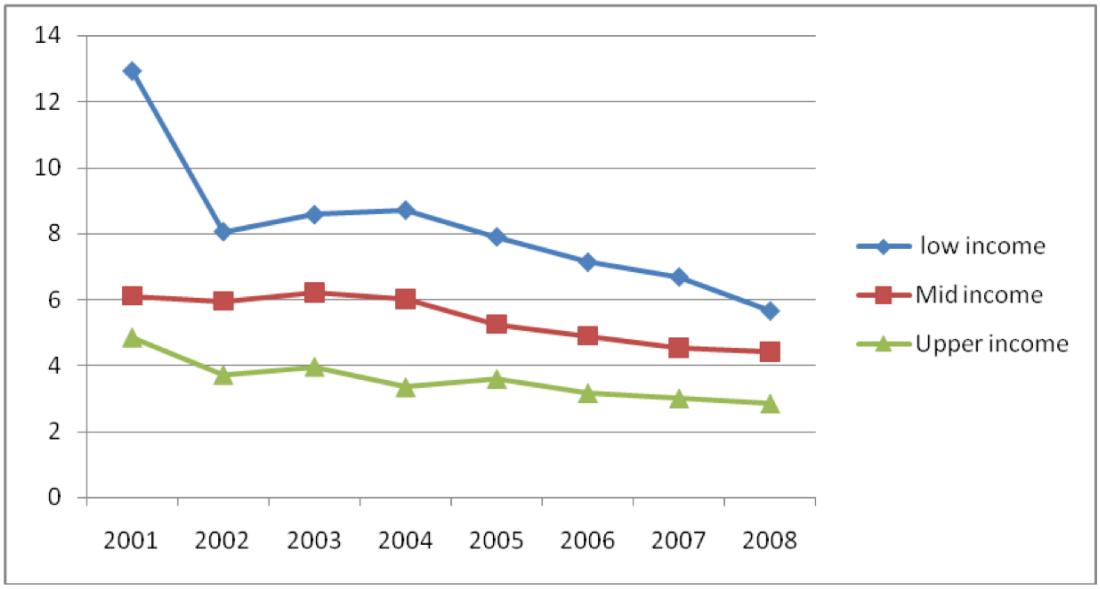

Figure 8: Shares of Rural Household Energy Expenditures of Total Expenditures (Percent)

Low income includes the first three income deciles in the Household Budget Survey, mid income the fourth to eights deciles, and the upper income the last two deciles.
Source: Household Budget Surveys, Statistical Centre of Iran, and the author's calculation

The differences in energy expenditures in different income groups are more evident in Table 4. Overall, total income of higher income groups is 4.43 times more than that of lower income groups in urban areas and energy expenditures increase with the level of income. Specifically, higher income groups spend on average 1.77 times more than lower income groups on energy. This ratio is much higher in gasoline, followed by electricity, and natural gas. Levels of income and energy expenditures are generally lower in rural areas rather than urban areas, but the structure is rather similar. However, the disparity in total energy expenditures between income groups is higher among rural households than urban households; upper income households spend 2.05 times more than lower income households on energy. Akin to the urban households, the difference is higher in gasoline expenditures. It is also important to note that lower income urban households are poorer than mid and upper income rural households and spend less on energy.

	Total Income	Electricity	Natural gas	Gasoline	Total Energy	Non-energy
Urban						
Low income	48,779,260	678,842	747,078	914,618	2,340,538	46,438,722
Mid income	97,047,567	843,182	802,876	1,482,346	3,128,404	93,919,163
Upper income	215,912,279	1,226,028	905,650	2,021,587	4,153,264	211,759,015
ratio (up/low)	4.43	1.81	1.21	2.21	1.77	4.56
Rural						
Low income	35,988,255	527,484	820,764	689,290	2,037,539	33,950,716
Mid income	67,412,831	749,996	1,031,789	1,189,456	2,971,241	64,441,590
Upper income	146,854,021	1,027,129	1,481,349	1,672,193	4,180,671	142,673,351
ratio (up/low)	4.08	1.95	1.80	2.43	2.05	4.20

Low income includes the first three income deciles in the Household Budget Survey, mid income the fourth to eights deciles, and the upper income the last two deciles.

Source: Household Budget Surveys, Statistical Centre of Iran, and the author's calculation

Table 4: Energy and Non-energy Expenditures by Household Income Groups- rial (2008)

The above figures indicate that although the level of expenditures on energy is lower among lower income households, their shares of total expenditures are higher as their income level is disproportionately lower. They also show that the difference between energy expenditures in different income groups is more for gasoline than other energy carriers. We therefore, can conclude that lower income groups will be affected the most by the energy price reform, particularly when it applies to gasoline.

The government can use additional revenues generated by removing subsidies to compensate low income households for higher energy prices. Since the levels of expenditures on energy vary with the level of income, i.e. higher income groups spend more on energy than lower income groups, equal direct payments to all households will redistribute income from the rich to the poor. This will be more evident in the case of gasoline price change as the disparity in energy expenditures between rich and poor is the highest in gasoline. Table 5 shows, more explicitly, that the shares of energy subsidies received by higher income groups are much greater than those by lower income groups. Specifically, the gasoline subsidy share received by urban households is 20 percentage points greater than that by rural households and upper income groups' share of subsidy is about 8 times greater than lower income groups. The ratio is much higher in the case of fuel oil, which is used

mostly in rural areas. Therefore, the removal of energy subsidies and transferring the proceedings to all income groups equally will adjust income distribution in favour of lower income groups.

		Lower Income* (in %)	Mid Income (in %)	Upper Income (in %)	Total (in %)	ratio (up/low)
Gasoline						
	Urban	4.7	17.4	37	59.1	7.87
	Rural	3.4	12.3	25.2	40.9	7.41
	Total	8.1	29.7	62.1	100.0	7.67
Fuel Oil						
	Urban	0.4	1.5	4.9	6.8	12.25
	Rural	2.6	26.4	64.1	93.1	24.65
	Total	3.0	27.8	69.1	100.0	23.03
Liquid Gas						
	Urban	5.4	5.9	3.2	14.5	0.59
	Rural	18.1	35.1	32.3	85.5	1.78
	Total	23.5	41.0	35.5	100.0	1.51
Kerosene						
	Urban	2.9	4	2.1	9	0.72
	Rural	13.2	35.5	42.3	91	3.20
	Total	16.1	39.5	44.5	100.0	2.76
Gas Oil						
	Urban	14.4	0	0	14.4	0.00
	Rural	7.4	36.3	41.8	85.5	5.65
	Total	21.8	36.3	41.8	100.0	1.92

*Low income includes the first three income deciles in the Household Budget Survey, mid income the fourth to eights deciles, and the upper income the last two deciles.
Source: Energy Balance (2008) and author's calculations

Table 5: Share of Income Groups of Energy Subsidies (percent), 2007

Income redistribution from the rich to the poor will have implications on production and price levels as well. Since marginal propensity to consume is rather high in low income groups, most of the additional income received from government will be spent immediately leading to a higher aggregate demand and, therefore, prices. On the other hand, since energy elasticity in upper income groups is low, higher prices will lead to lower savings rather than lower consumption.

Production

Removing energy subsidies will increase energy costs in the industry and transportation sectors. The effect will vary in different industries depending on the specific energy intensity. Higher energy intensive industries and businesses will have to bear higher costs of energy

and adjust the production and employment levels accordingly. In short run, this may prove difficult, particularly for industries which have been heavily subsidized and supported for the long period. In the medium and long run, industries will have to eventually change their technologies and production processes to lower their energy intensities. Otherwise, they cannot survive.

Using large manufacturing industries data, Mousavineek and Tootoonchi/Maleki (2009) show that direct production cost of manufacturing industries will almost double on average if energy prices are adjusted based on the OPEC oil price in 2009 ($78 per barrel). Khiabni (2008) also shows that price reform will lead to production cuts in manufacturing industries and mining by 2 to 8 percent. The increase in cost to industries and the production cut would vary in different industries depending on their energy intensities and demand elasticities. For instance, cement, aluminium, and steel industries will experience the highest costs followed by petrochemical, textile, and copper industries. Moreover, basic metals, chemicals, textiles, paper, and food industries will cut their production the most. How much of the increase in production costs these industries can pass onto output prices depend on demand elasticities. If price elasticity of demand is very high (e.g. luxury goods), producers have to bear the entire costs, and if price elasticity is very low (e.g. necessary goods), producers will be able to pass the entire costs onto consumers. Industries most affected by energy price reforms are those whose products are used by other industries such as auto and construction, which do not have very low demand elasticity. Therefore, higher energy costs will be shared by both producers and consumers. In the long run, industries with high demand elasticity are expected to take more aggressive measures in using more energy efficient technologies. The auto industry will be hit more because of both direct and indirect effects of the energy price rise. The energy intensity in the industry and its output are high. As the price of input materials like steel rises, the price of cars will have to increase, which will have an adverse effect on its demand. Moreover, higher gasoline prices will also have an adverse effect on demand for cars. The industry will, therefore, have a golden opportunity to undergo dramatic technological changes and to produce more efficient cars[7].

To alleviate the adverse effects of the energy price reform on production and employment in the short run, the government needs to have a compensation plan for producers and workers who lose their jobs. Furthermore, part of the additional revenues generated by energy price reform can be allocated to support employment training programs, R&D investment, and investment in advanced and efficient technologies. The use of better technologies in industries will increase the energy efficiency leading to products of higher quality and lower prices, quality adjusted prices.

Balance of Payments

Rising energy prices will increase the costs of domestic products, particularly in the energy intensive industries, weakening their position in the international market. This will likely lead to a change in trade balance as exports will decline and imports will increase. On the other hand, energy price reform will curb domestic energy consumption freeing oil resources for more exports and improving the balance of payments. The net effect on balance of payments will depend on the import/export elasticities and the magnitudes of the two opposing effects,

[7] The US auto industry faced with the same challenge during the first oil shock in 1973 and under the government regulation was able to produce more efficient cars.

noted above, as well as the exchange rate and trade policies. Energy price reform will put pressure on the value of rial as exports decline and imports rise. If the current policy of supporting rial continues, the non-oil trade deficit will increase. However, if exchange rates are allowed to change, production may not suffer and exports may not decline. The downside of this policy is, however, an increase in price level as imports become more expensive.

6. An Alternative Energy Policy Reform

An energy price reform can have many different social and economic objectives in short run and long run. Some of these objectives are decreasing energy consumption, increasing efficiency, increasing government revenues, increasing productivity, and redistributing income. An active energy price reform would choose an objective which would maximize social welfare in the long run without compromising economic growth and with a minimum short run cost. A passive energy pricy reform, however, would choose a shortcut to be able to continue with the status quo. For instance, when the higher levels of government budget deficit and dept do not allow the current subsidy program to continue, it will have to remove subsidies to be able to generate revenues to cover its budget. Therefore, increasing government revenues will be a real objective behind the subsidy reform plan. Depending on the existing economic conditions, the adverse effects of such a passive policy reform may prove more harmful than beneficial.

The current government energy price reform plan seems to be a passive policy and is criticized by many prominent economists in Iran[8]. Although most economists are, in principle, for the energy price reform, and have been advocates of removing subsidies policy in the past, they oppose the current plan based on the environment in which the reform is implemented. They argue that the current economic condition characterized by high inflation and high unemployment rate is not ready to absorb such a dramatic shock. Therefore, should the plan implemented, it will lead to higher inflation and unemployment rates, lower production and exports, higher levels of uncertainty and instability, and exacerbating unequal income distribution. To avoid such dire consequences, the opponents suggest postponing the plan or at least slowing down its pace. Here, we highlight the important elements of an active energy price reform as follows.

1. An active energy policy plan clearly identifies its short run and long run social and economic objectives. For instance, the main objective of an energy price reform could be increasing energy efficiency without compromising economic welfare. The objective can also specify certain restrictions such as avoiding inflation, and not exacerbating income distribution.
2. The plan specifies targets in line with the objectives. The targets should be clearly stated and reasonably achievable. Examples of targets are decreasing energy consumption, increasing oil exports, improving environment by reducing emissions.
3. The plan also identifies instruments which will be used to achieve the targets and the objectives. The instruments should be effective and readily available. Some examples

[8] For instance, see the some of the research reports published by the Majles (Parliament) research Center that cited in this report, and Renani (2010), Nili (2010), and GhaniNejad (2010).

are consumption quota, price control, and public education through media and public education system.

4. The plan should be approved by the legislative authorities and becomes a law before it is implemented. This will increase public trust in the plan and will prevent any discretionary measures by different authorities, which will lead to uncertainty.
5. As the energy price reform will have important economy wide effects, its success will depend on peoples' attitude and their level of participation in the plan. To increase peoples' participation in the reform plan, it should be communicated with public continually, effectively and honestly.
6. The plan should have a transparent budget, specifying the revenues will be generated and the expenses will be made. The current scheme of distributing most of the revenues among households is not sustainable and may not be consistent with the objective of energy efficiency and lowering energy consumption. The lower income group, which is not the main energy consumer, will not change its consumption as its nominal income will rise, and higher income groups' consumption will likely remain unchanged as their demand elasticities are very low due to high income level.

An effective energy policy reform would link the policy to energy efficiency. One way to reform the energy prices and achieve efficiency is to provide incentive to people and businesses to undertake energy efficiency measures. In other words, the current energy subsidy, which encourages consumption, can be substituted with the efficiency subsidy. For instance, households who substitute their inefficient appliances with new efficient appliances, or improve the energy standard of their building, would receive subsidies. Likewise, industries that decrease their energy intensity or use or develop renewable energy resources would receive efficiency subsidy. Another important sector which needs to be tackled in the energy price reform is transportation. The revenues generated from removing energy subsidies would be best spent on developing public transportation system including expanding subways, trains, buses, and roads.

7. Conclusion

Energy price reform is inevitable in Iran, but it may have striking adverse economic and social impacts, should it not be done properly. Therefore, it is imperative to study all various effects using economic models that take into account all different sectors of the economy and to analyze alternative scenarios. The outcome of such detailed studies will help policy makers foresee potential benefits and challenges and thus design appropriate policies that would capitalize on advantages and alleviate the adverse effects. The important effects and implications of the energy price reform are as follows.

- Higher energy prices will increase the price level in the economy. This will decrease the purchasing power and, therefore, the welfare of consumers and will increase production costs, which will contribute to higher prices;
- Price effects are not symmetrical across households and industries. Lower income groups will be affected more than higher income groups, and energy-intensive industries will be affected more severely;
- Short run inflationary effects of energy price reform is stronger if it is done once than when it is done gradually. In any case, the inflationary effect will depend on the fiscal and monetary policies and inflation expectations. If government adopts expansionary

policies, following energy price reform, the short run shift in price will turn into high inflation rates. For instance, if government adjusts wages or increases transfer payments more than the level predicted by the price reform plan by borrowing from the central bank, the inflation rate will increase. Inflation will increase if people do not trust in government policy due to either miscommunications, lack of transparency and ability, or political tensions;

- Energy price reform will have a drastic effect on manufacturing industries. In the long run, industries will have to undergo dramatic technological changes to reduce their energy intensities. In the short run, however, higher energy costs will cause industries with high energy intensity and older technologies to scale down or shut down, increasing unemployment;
- The exchange rate policy will have an important effect on production, employment, and price levels. Energy price reform will lead to a depreciation of rial which will alleviate negative effects on exports, production and employment. It will, however, contribute to higher price levels. The continued controlled exchange rate policy will exacerbate the negative impacts on exports, production and employment;
- Government can use extra revenues from higher energy prices to alleviate the short run negative impacts of the price reform. It can allocate revenues to lower income groups and people who lose their jobs, and support vulnerable industries. It can also make an investment on R&D to help industries adopt more efficient technologies; and
- Price reform is an important economic change that will affect all sectors of the economy. Since the reform will reallocate resources and income, it will cause social tensions among various groups in the short run. Therefore, the success of such an important reform will primarily depend on how society will participate and cooperate. If there is trust between people and government, that is, if society believes that the government is able to implement such a critical reform and that the reform will benefit everybody in the long run, it may be willing to sacrifice in the short run. This requires a transparent plan and effective communication on the government side.
- The energy price reform should be linked to energy efficiency. The revenues raised by removing subsidies would be best spent on energy efficiency measures that will reduce energy consumption and will improve environment. Rather than distributing money to all households, it may be better to direct the resources to encourage efficiency in household, transport, and industry sectors.

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