Therefor it is highly recommended that government should focus on none-price policies in order to change inefficient energy use and improve energy intensity. Such an attempt will reduce the income elasticity of energy demand. By this way, the importance of the role of subsidy reduction, which Iranian government exaggerates must be moderate.

* Non-price policies can be handled by revenue come from reducing energy subsidies into the government budget. So our recommendation also helps economic allocation of resources in government activities.

* The enterprises of energy sector could be privatized even under subsidized situation. In other words, changing some rules and legislation could change non-profitable activities to a profitable and attractive ground for private investors. Privatizing gas stations is a good case for confirming the above implication. Gas stations are managing under both private and governmental ownership. Due to low profit margin especially in large cities private investor are willing to exit the market. So the approved policy for privatizing the gas stations has not been successful. Changing the current rules and making the energy enterprises profitable and competitive with other commercial enterprises would succeed the privatization in energy sector.

Energy policy makers
could change
the regulations
in order
to increase
the profit margin of
energy activities
making incentives
for private sector

Private gas station owners
gain a
fixed profit margin
under
subsidized platform,
which is
lower than
other commercial activities

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Table 3. Point of views of owner of gasstations in Tehran

Question	Accept (number)	Reject(number)
Labor problems	6	3
High level of costs	8	1
Desired profit	0	9
Desire to quit and enter to other commercial activities	9	0
Permission for other business activities in beside	8	1
Increase of mark-up with respect to the base price (subsidized price)	8	1

Source: Direct contact via questionnaire.

privatization but it couldn't guarantee the successes of the policy. The main problem with respect to energy privatization isn't the energy subsidy. But the profitability of the activities is a major source of consideration of privet investors. Comparing commercial and service enterprises with some down stream activities of energy sector show a lower profit margin for energy activities. This could be removed or adjusted via deregulation or changing current regulations. The new set of regulation in the light of making energy enterprise profitable, do succeed the privatization.

In the current situation, some energy activities are running by governmental and private sectors under subsidized platform. Private gas station's owner gained a fixed profit margin, which is lower than other commercial activities. They are working under mandatory conditions, i.e. they couldn't quit the activity and enter to other economic markets. While policy makers could change the regulations in order to increase the profit margin of such activities and in turn make incentives for private sectors to enter the activities. If some service and commercial activities be permitted by gas stations and also a wider flexible range of mark-up considered to the base price, the profit margin will go in a higher level. This makes good incentives for private sector to invest in this area.

Realizing the views of gas station's owners in Tehran via questionnaire show that all of them believe that the profit is lower than other activities. They would like to quit the enterprise while they couldn't change their activity, which has been band by law. As table 3 shows all of them would like to quit the activity and also want to have permission for other commercial and service business in beside of gas sales. They also are demanding a higher mark-up with respect to the base price, which is determined by energy authority. So this lowest level of privatization could be succeed if and only if profit margin be competitive to other economic activities. To this end, in a subsidized environment privatization could be handled. It isn't necessary to eliminate them sharply while they have harmful effects on economy. It is recommended a gradual elimination of energy subsidy while the current regulations should be changed in benefit of activities in the energy sector.

5. CONCLUDING REMARKS

The main concluding remarks of this study are as follows:

* Sharp reduction in energy subsidies has harmful effects on economic growth and inflation. Therefore it is recommended to reduce

energy subsidies gradually. Using non-price policies (Those policies that change infrastructures in economy, such as changing legislation for isolation of buildings, standardization, and applying high technology, etc.), the energy intensity can be improved as well as absolute imputed energy subsidies.

* Increasing real energy prices (reducing energy subsidies) have not considerable impact on energy demand in short run, whereas it has more in mid and long term. So the results show that one of the government objective has not been covered.

* Sharp reduction in energy subsidies has harmful effect on economic growth. This fact specifies the amount of possibilities to be scarified for achieving a marketed base privatization. Therefore it is recommended to reduce energy subsidies gradually.

* The model shows that income effect is more than price effect on the energy demand. The higher the demand income elasticity means the lower the energy intensity in economy. Using non-price policies (Those policies that change infrastructures in economy, such as changing legislation for isolation of buildings, standardization, and applying high technology, etc.), the energy intensity can be improved. This study shows that none-price policies have more effective results than price policies.

theses effects are more. In other words, although the policy of elimination of energy subsidies may be helpful for the process of privatization in long run, because of expanding the situation of stagflation in the economy it would impose harmful effects on the economy.

According to inflation equation we have applied the technique of rolled-up regressions to distinguish the effects of recent sharp increase in energy prices on inflation. The log-log specification has been applied for achieving unit free parameters, for comparison purposes. This analyzes the effects of elimination of energy subsidies via upward price adjustment on inflation rate.

Using whole sample, inflation elasticities of liquidity, nominal energy prices, and market exchange rate has been estimated as 0.62, 0.29, and 0.09 respectively. Figure 4 shows the results of the same regression for different samples, started for sample 1974-1990, up to 1974-1998. Generally speaking the inflation elasticity of liquidity is more than inflation elasticities of energy prices and market exchange rate. The latter has the lowest quantity. As it can be seen, when the liberalization policy started in early 90s by expanding domestic nominal energy prices, the inflation elasticity of energy prices starting to rise and reached to its peak. It has gradually started to turn back to a stable level, but higher than its value during 1974-1992. It indicates that the role of energy prices on inflation has become more important in the recent years.

To sum up, any sharp reduction in energy subsidies (i.e. drastic increase in real energy prices) tighten economic growth by increasing the production cost and inflation. This can be accelerated by a reduction in the level of capital formation and export revenues, which the latter is closely, related to oil export incomes in Iran. Therefor avoiding

The enterprises of energy sector could be privatized under subsidized situation, changing the regulation in order to increase their profit margin

Sharp reduction in energy subsidies has harmful effect on economic growth and inflation as costs of marketed base privatization, so gradual reduction of energy subsidies is recommended

Profit margin of commercial enterprises is higher than some downstream activities of energy sector, which in turn discourage entrance of private sector

harmful effects of elimination of subsidies on economic growth, the government should eliminate it gradually. Also it should be coincided with other macro policies such as exchange rate, monetary/fiscal policies to keep real energy prices not decreasing.

One-percent increase in energy prices, in long run, makes 0.8 percent reduction in real production, while it causes 0.29 percent increase on inflation. In other words, persuading such a policy pushes the economy toward stagflation. Therefor to approach to privatized economy the authority should be aware of such harmful effects.

In order to make price adjustment more efficient in the economy Government should lead another class of policies to guide the industry, construction, and other productive sectors to improve the energy intensity. This can be simply executable by an infrastructural reform in the legislation, standardization and etc.

4. Privatizing energy sector while energy is subsidized

In the previous section we showed that sharp reduction in implicit energy subsidies via increasing nominal energy prices has harmful effects on economic growth and inflation. While it has a low-level impact on energy conservation in short and midterm. Avoiding the harmful effects the gradual elimination of subsidies is suggested. But the main question is arising on privatization while the energy consumption is subsidized.

Some energy researchers believe that before privatization of the sector, regulation should be relaxed and market forces are replaced. It means all sub-sectors would be demanding the opportunity cost of inputs and outputs. But others believe that although this may simplifying the process of

one percent increase in the real energy prices promptly decrease 0.143 percent energy demand that is relatively low.

Because in short-run households and firms are not able to adjust the combination of inputs and the technology. The reaction can be reflected in the cost price of production (cost push inflation) and/or reducing of the quantity demanded. If the elasticity of demand for goods and services to be inelastic in market, the firms will have to decrease the level of their production that in turn reduce the demand for energy and other inputs. More over part of energy demand in industrial sector are captive energy demand that in turn is independent of production level. It could not be affected through energy prices. Therefor the energy price increase is unlikely to conserve energy consumption, so can not decrease the absolute amount of energy subsidy.

Impulse income elasticity of energy demand is 0.42, which is about triple times more than price elasticity. It interprets that one percent increase in the level of real production would cause 0.42 rise in the level of energy demand. The income elasticity of energy demand is a criterion of energy efficiency (energy intensity) which in turn is affected by

price and mainly non-price factors. The latter includes structural, technological, legislation, and etc changes. So for achieving high level of energy conservation, the non-price policy can mostly contribute.

The price elasticity of energy demand in mid-term and log-term are -0.163 and -2.368 respectively. Therefor, in mid and long term partial and full adjustment take place. It means that economic agents will be able to change the structure, technology, and combination of production factors.

Capital formation and export revenues increase the production possibilities, which in turn increase the level of energy demand. They can not take place in short rum. The energy demand elasticities of capital formation in mid-term and long term are 0.092 and 1.740 respectively. The energy demand elasticity of capital formation in mid-term and long term are 0.043 and 0.809 respectively. As it can be seen the total effect of capital formation and export revenues (as non-price variables) are more than the effects of energy
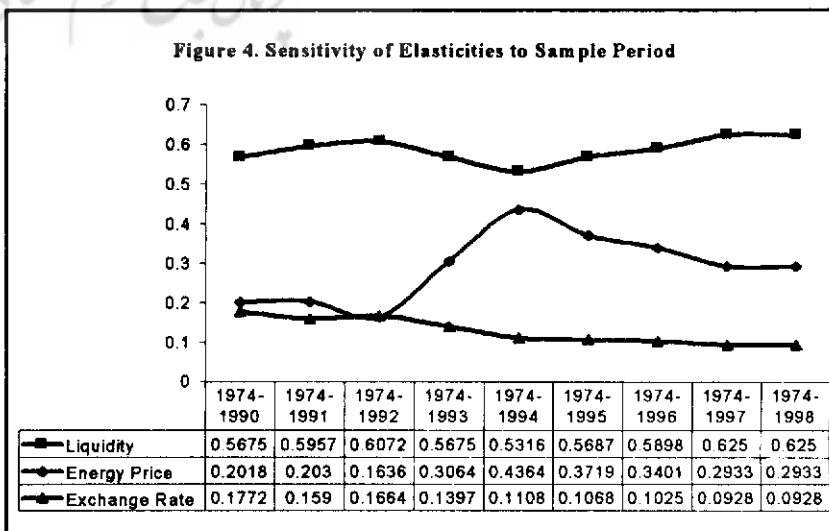
price in long term.

Table 2 shows real production elasticities for energy demand, capital formation and export revenues, in short, are 0.265, 0.196, and 0.091 respectively. Therefor, Real production has more sensitivity with respect to energy input than other two variables. In mid-term and long term, energy demand because of perfect adjustment has indirectly influenced real production.

In mid-term real production elasticities for energy price, capital formation and export revenues, are -0.043, 0.220, and 0.102 respectively, where as these are -0.801, 0.839, and 0.390, respectively in long run. So in long term one percent increase in real energy prices decrease real production relatively higher, amounted about 0.8 percent. Limitation in energy input may cause a bottleneck in economic growth in the long run.

In short, the impact of reduction of energy subsidies through upward energy price adjustment is deferent in short, mid-, and long-term on energy demand and economic growth. In long run

Table 2- Real Production Elasticities

Elasticity	Energy Price	Energy Demand	Capital Formation	Export revenues
Impulse	-	0.265	0.196	0.091
Mid-term	-0.043	-	0.220	0.102
Long-term	-0.801	-	0.839	0.390

The new set of regulation in the light of making energy enterprises profitable , succeed privatization

Figure 4. Sensitivity of Elasticities to Sample Period

	1974-1990	1974-1991	1974-1992	1974-1993	1974-1994	1974-1995	1974-1996	1974-1997	1974-1998
Liquidity	0.5675	0.5957	0.6072	0.5675	0.5316	0.5687	0.5898	0.625	0.625
Energy Price	0.2018	0.203	0.1636	0.3064	0.4364	0.3719	0.3401	0.2933	0.2933
Exchange Rate	0.1772	0.159	0.1664	0.1397	0.1108	0.1068	0.1025	0.0928	0.0928

natural gas were 7 and 9 cents per kWh and cubic meter, respectively. The implicit subsidies were ascribed with the same order among carries in 1997, but the magnitude has been decreased.

Figure 2 indicates total amount of implicit subsidies within 1990-1997 on the base of market exchange rates. Despite of energy authority's attempts for removing the subsidies, it has been almost steady around 12 billions of US Dollars, and in recent years jumped to over 15 billions of US Dollars. It was mainly because of devaluation of Rial with respect to hard currencies and increasing energy consumption. This figure also shows the composition of the imputed subsidies by fuels.

Figure 3 shows that in 1997, electricity has got the highest share of total energy subsidies equal to 28 percent, where as gas oil and NG are in the second and third level in this regard. The lowest share is for Jet fuel.

3. AGGREGATE IMPACTS OF REDUCTION OF ENERGY SUBSIDIES

In this section, in order to evaluating the impact of energy price increase (i.e. Reduction of implicit subsidy) on some macro variables, the following system of equations has been applied. The system has been estimated with data of 1974 to 1998 after testing cointegration (Fathollahzadeh et. al., 2000b).

where E_t is the physical desired quantity demanded for energy, y_t is the real aggregate production (GDP) and p_t is the real weighted energy price ($p_t = P_t/cpi$, which P_t is the nominal weighted energy price), k_t is the physical capital formation, X_t that has been introduced in the linear specification, as the export revenue in terms of US Dollar, cpi_t is consumer price index, M_t is the amount of liquidity, and XR_t is the non-official market exchange rate. The t statistics are in the parenthesis. All the parameters are statistically reliable and the singes of the coefficients are consistent with economic theories.

On the base of the estimation results, one can analyze the impulse, mid-term and long-term effects of the reduction of energy subsidies on energy demand and real production by increasing nominal energy prices. These impacts can be estimated via reduced and final forms.

Figure 3. Share of implicit subsidies by Energy Carries (1997)
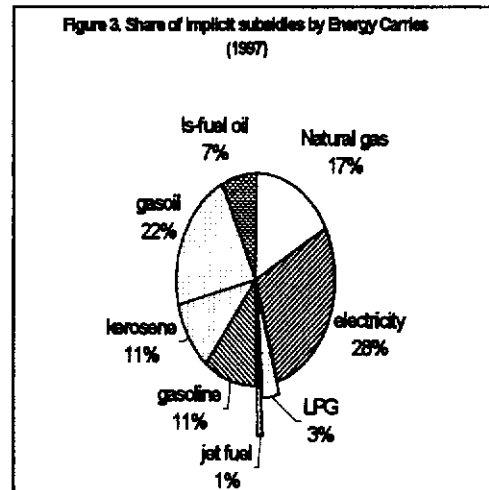
Price of production factors, together with other market variables and current available technologies determine the level of different production factors in micro and macro level. Since technology is unchangeable in the short term, any changes in input prices will cause a little substitution among production factors. So any drastically change in prices of inputs including energy, may be act as a bottleneck in the process of production and ultimately will cause an economic

Table 1- Energy Demand Elasticities

Elasticity	Energy Price	Income	Capital Formation	Export revenues
Impulse	-0.143	0.42	-	-
Mid-term	-0.163	-	0.092	0.043
Long-term	-2.368	-	1.740	0.809

Hint: Elasticities are calculated by $\varepsilon = \dfrac{\partial y}{\partial x} \cdot \dfrac{\bar{x}}{\bar{y}}$, where $\bar{x}$, and $\bar{y}$ are means.

$$E_t = \underset{(-0.32)}{-8.04} + \underset{(3.66)}{0.01}y_t - \underset{(-2.50)}{0.04}p_t + \underset{(10.63)}{0.80}E_{t-1}$$

$$\bar{R}^2 = .993; \quad DW = 2.153$$

$$y_t = \underset{(3.20)}{2658.93} + \underset{(7.01)}{9.09}E_t + \underset{(4.00)}{1.06}k_t + \underset{(2.20)}{.06}X_t + \underset{(1.83)}{0.22}y_{t-1} \qquad (1)$$

$$\bar{R}^2 = .960; \quad DW = 2.028$$

$$Lcpi_t = \underset{(-19.92)}{-3.43} + \underset{(6.71)}{0.62}LM_t + \underset{(1.58)}{0.09}LXR_t + \underset{(3.58)}{0.29}LP_t + \underset{(5.84)}{0.74}\hat{\theta}_{t-1}$$

$$\bar{R}^2 = 0.997, \quad DW = 1.71$$

stagflation.

When the government rises energy price for reduction of subsidies in order to preparing suitable conditions for privatization, economic agents' response to this policy. The magnitude of the reaction is different with respect to the time. As the table 1 shows the instant energy price elasticity of energy demand is -0.143, which indicates prompt reaction after imposing the policy. The interpretation is that, ceteris paribus,

by many factors, including different exchange rates, applied approaches, and other assumptions. Therefor the calculated amounts of subsidies have had a wide range, among the different works.
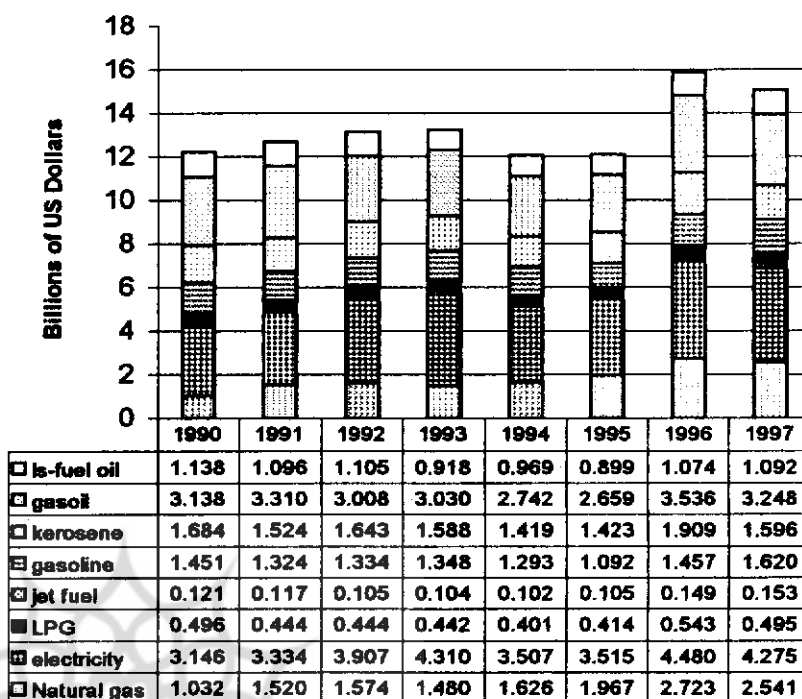
Total amount of implicit subsidy has been estimated in the range of 3.2 to 11.15 billion dollars in 1996. In that year, the amount of subsidies on petroleum products, electricity and natural gas were 7.3, 2.5, and 1.35 billion dollars respectively for the upper case; and they were 1.15, 1.3, and 0.75 billion dollars respectively for the lower case (Payam-e-energy, 1997). In another research the amount of subsidy on petroleum products is estimated as 2.4 and 2.3 Billion dollars for 1994 and 1995 respectively as the lower case versus 6.19 and 6.5 for the same years as the upper case (Mazraati, et. al. 1996). This research gives a sectoral estimation for implicit energy subsidy. It concludes that the amounts of paid subsidies were allocated between transportation, residential/commercial, industrial, power generation, and agricultural sectors in a descending order. In addition, the ratio of the subsidy over real GDP and government expenditure was estimated around 14.5 and 62.7 percent respectively, in 1996. Further more per capita energy subsidy was equal to 110 dollars.

Our independent estimation on implicit subsidies are based on the following assumptions:

* The Singapore FOB prices for Petroleum products are considered as the opportunity cost. It excludes the freight rates from Singapore market to the Persian Gulf. So our calculations may underestimate the subsidies for petroleum products.

* The End-Use pre-tax price of electricity in Turkey is used as opportunity cost of this carrier. This

Figure 2. Total Implicit Energy Subsidies By Feuls

	1990	1991	1992	1993	1994	1995	1996	1997
☐ is-fuel oil	1.138	1.096	1.105	0.918	0.969	0.899	1.074	1.092
☐ gasoil	3.138	3.310	3.008	3.030	2.742	2.659	3.536	3.248
☐ kerosene	1.684	1.524	1.643	1.588	1.419	1.423	1.909	1.596
☐ gasoline	1.451	1.324	1.334	1.348	1.293	1.092	1.457	1.620
☐ jet fuel	0.121	0.117	0.105	0.104	0.102	0.105	0.149	0.153
■ LPG	0.496	0.444	0.444	0.442	0.401	0.414	0.543	0.495
☐ electricity	3.146	3.334	3.907	4.310	3.507	3.515	4.480	4.275
☐ Natural gas	1.032	1.520	1.574	1.480	1.626	1.967	2.723	2.541

price is closed to the average price of electricity in OECD countries.

* Imported Natural Gas (NG) price in Netherlands is taken as its opportunity costs. That is equal to 0.09 US Dollars per cubic meter in 1997, which is closed to long-term committed NG price for exporting Iran's NG to Turkey (0.08 US Dollars).

* Calculation of subsidy on the base of our definition is closely dependent on exchange rates to express domestic energy prices in terms of US Dollars. Three relevant exchange rates, including market, export, and official exchange rates have been applied in our estimations.

* The calculated energy subsidies are just focused on final energy demand. Intermediate energy sectors has not been taken into account.

Energy subsidies based on market, export, and official exchange rates have estimated about 15.02, 13.63, and 11.64

Billions of US Dollars respectively in 1997. Supposing the market exchange rate as realistic rate, total implicit energy subsidies in Iran has amounted 106.2 billions of US Dollars within 1990-1997 indicating an average of 13.3 billions of U.S. Dollars per year.

As Figure 1 shows, after imposing the policy of elimination of energy subsidies on 1990, the trend of energy subsidies for almost all of energy carries were diminishing, up to 1996. The subsidies per common units of each carrier are affected by oscillation in exchange rate, international energy prices, and domestic energy prices. Therefor, in spite persuading the policy of upward adjustment in energy prices, the energy subsidy per unit has increased after 1996. Subsidy of kerosene was 19 US Cents per liter in 1990, which is highest among other petroleum products. The minimum amount of subsidy was for fuel oil. Where as the subsidy for electricity and

1. INTRODUCTION

After nationalization of Iranian oil industry, energy sector has been in charge of government that not only disturbs market mechanism but also mostly makes harmful effects on some critical macro variables. Reducing excess financial loads, increasing government incomes, improving energy conservation, and most of all, expanding liberalization and privatization policies in energy sector are the major goals for reduction and/or elimination of energy subsidies.
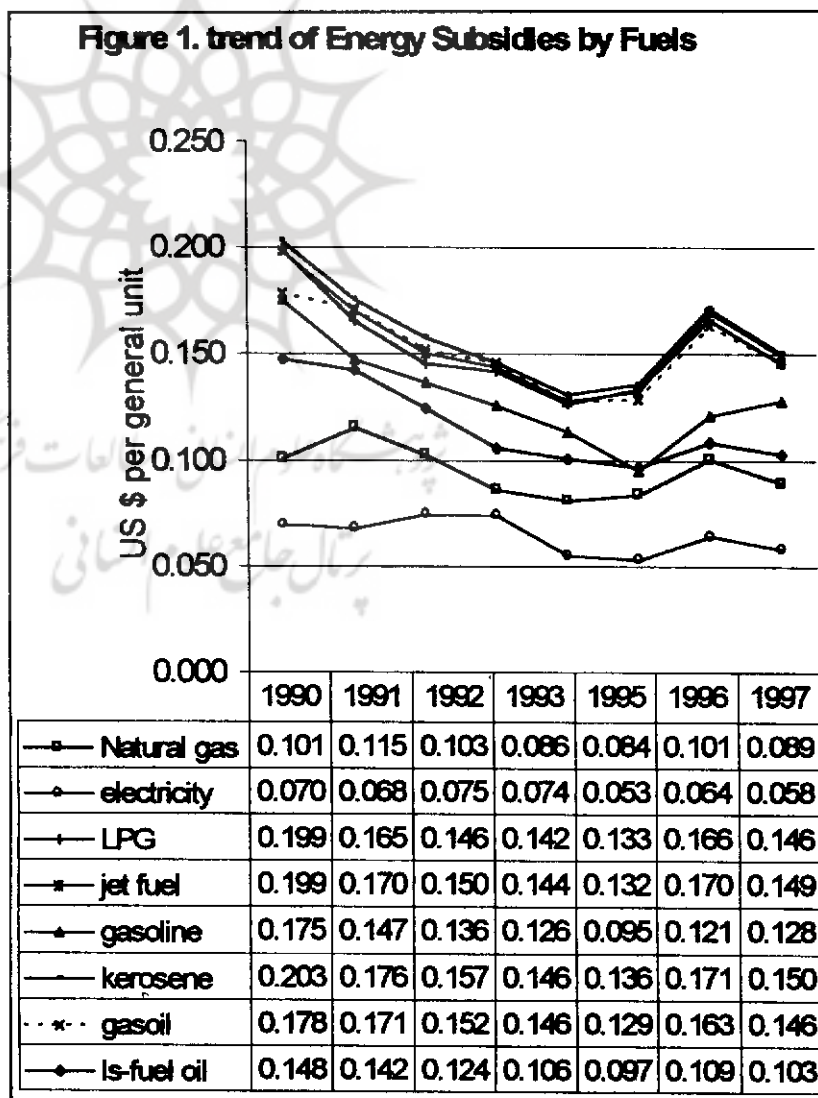
In economics, subsidy is defined as "A payment made by the government (or possibly by private individual) which forms a wedge between the price consumer pays and the costs incurred by producers, such that price is less than marginal costs" (Pearce, 1986). Using the above mentioned definition for calculation of energy subsidies is practically impossible. In this study, in order to achieve a simple and specific definition of energy subsidies, the subsidy is defined as a difference between domestic and international (or border) prices. So the international prices are considered as the opportunity costs of energy. We call the calculated subsidy on the base of this definition as an implicit subsidy.

"Privatization can refer to a wide range of policies, for example, the sale of council houses, and the transfer of one-time public sector services, such as refused collection, to private companies. It also includes denationalization or the transfer of at least fifty percent of the shares in a nationalized industry from public to private hands." (Pearce, 1986).

International financial organizations, such as World Bank, advise countries to privatize state-owned enterprises. They suggest elimination of energy subsidies as a necessary step toward this process beside other components of a composite package of steps. Because of financial load on government budget, Iranian policy makers have tried to exaggerate the importance of this step and ignore others. They address the main objectives of the elimination of energy subsidies to improving energy efficiency, conservation, and privatization. They don't concern harmful effects of this policy on inflation and economic growth. This study explains the impacts of reduction of energy subsidies on macroeconomic variables, applying an econometric model. It addresses useful implications of the constructed model for privatization of energy sector in Iran.

The organization of the rest of the paper is as follows: Section 2 presents the Situation of energy subsidies in Iran. Section 3 explains aggregate impacts of reduction of energy subsidies on macroeconomic variables including economic growth, energy demand, and inflation. In this section policy implication of the study is expressed. Finally Section 4 concludes the remarks.

2. ENERGY SUBSIDIES IN IRAN

The estimation of the implicit energy subsidies in Iran on the base of the above mentioned definition is influenced

Figure 1. trend of Energy Subsidies by Fuels

	1990	1991	1992	1993	1995	1996	1997
Natural gas	0.101	0.115	0.103	0.086	0.084	0.101	0.089
electricity	0.070	0.068	0.075	0.074	0.053	0.064	0.058
LPG	0.199	0.165	0.146	0.142	0.133	0.166	0.146
jet fuel	0.199	0.170	0.150	0.144	0.132	0.170	0.149
gasoline	0.175	0.147	0.136	0.126	0.095	0.121	0.128
kerosene	0.203	0.176	0.157	0.146	0.136	0.171	0.150
gasoil	0.178	0.171	0.152	0.146	0.129	0.163	0.146
ls-fuel oil	0.148	0.142	0.124	0.106	0.097	0.109	0.103

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Elimination of Energy Subsidies and Privatization Of Energy Sector in Iran[1]

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ABSTRACT

Privatizing the energy sector in Iran is faced with many bottlenecks including the energy subsidies. Some researcher believed that the first stage in privatizing is removing energy subsidies while, sharp reduction of energy subsidies by increasing energy prices have several impacts on macroeconomic variables, such as inflation, energy demand, economic growth, government budget, and balance of payments. Quoting World Bank's proposals for liberalization and privatization, some Iranian energy authorities follow such a belief. The purpose of this paper is to elaborate that whether the reduction of energy subsidies could help privatization while it has harmful effects on the macroeconomic variables. The effect of energy price increase is evaluating through econometrics method. The study concludes that gradually reduction of energy subsidies together with privatizing downstream energy enterprises (make them profitable via changing restrictive regulations) as well as imposing non-price policies are the fundamental steps toward privatization process.