The Effects of Energy Subsidy on Macroeconomic Variables of Iranian Industry Sector (By Employing Simultaneous Equations technique)

Mahdi Safdari[1]
Mohammad NabiSheyhakiTash[2]
Mohsen Jafari[3]
Kamran Barghandan[4]

Abstract

Energy is known as an effective and strategic input in the consumption and production process. Energy subsidies which determined under the gap of domestic and regional prices have caused tremendous and non-economic increase in prices levels. Energy subsidies are posed one of the vital government policies to support the industries in Iran as well as in the entire world. This study by using EVIEWS software and applying three least square approach (simultaneous equations system) is trying to examine the effect of subsidies on the demand side of energy sector, productivity of industries and employment situation over 1998- 2009. Study is divided into four subsections. First part of study started with introduction of energy facts and figures in Iran and the entire world elaborately. Second subsection reviews former studies. At the third part, we introduce various equations and forms of simultaneous equations model and the main model specification. And eventually final part of paper represents conclusion and considerable recommendations for policy makers and students.The findings show that decreasing energy subsidies leads to down demand for energy. Meanwhile it finally causes to increase productivity of industry sector and employment rate.

Key Words: Energy, Energy Subsidy, Industry, Simultaneous Equations System, Iran.

1-Introduction

Energy as an serious input during the production process enjoys outstanding importance. Consuming non-economically and at the extreme level of this strategic good can impose tremendous economic-social costs on the country so that at future it faces the country with the shortage crisis of energy.Subsidy is posed as a one of the government tools which frequently allocated to the necesarygoods (both consumption and production sectors) to support economic agents.An example of that subsidy concerning the energy subsidy which has considerable role in sustainble development. Meantime it also works like scissors, because on one side it could have positive impact on different kinds of economic sectors and on other hand it acts as a pollutant in the environment pollution discussions as well as increasing irregular consumption(Von Moltke,2004).International Energy Agency (IEA) introduced Iran as the biggest energy subsidy payer in the world.

In compliance with this report, 37 large developing countries pay 557 billion dollars subsidy in the energy sector in 2008 so that this amount is 75 percent more than as expected before[3] (IEA,2008).This study by using EVIEWS software and applying three least square approach (simultaneous equations system) is trying to examine the effect of subsidies on the demand side of energy sector, productivity of industries and employment situation over 1998-2009. Study divided into four subsections. First part of study started with introduction of energy facts and figures in Iran and the entire world elaborately. Second subsection review former studies. At the third part, we introduce various equations and forms of simultaneous equations model and the main model specification. And eventually final part of paper represents conclusion and considerable recommendation for policy makers and students. There are three the main hypothesis in this study such as: 1- Decreasing energy subsidies have a negative impact on the demand side. 2- Applying these vital reforms in energy sector finally incline the productivity of industry sector. 3- Employment rate will increase in long term after implementing policies.

[1]Assistant Professor in Economics, University of sistan&Bluchestan, Economics Department, zahedan, Iran.
[2]Assistant Professor in Economics, university of sistan&Bluchestan, Economics Department, zahedan, Iran.
[3] M.A student in Economics, university of sistan&Bluchestan, Economics Department, zahedan, Iran.
[4]M.A student in Economics, university of sistan&Bluchestan, Economics Department, zahedan, Iran.
[3] They expected the subsidy payments will be near to 300 billion dollars

1-2- Investigating Energy subsidy Trend in Iran

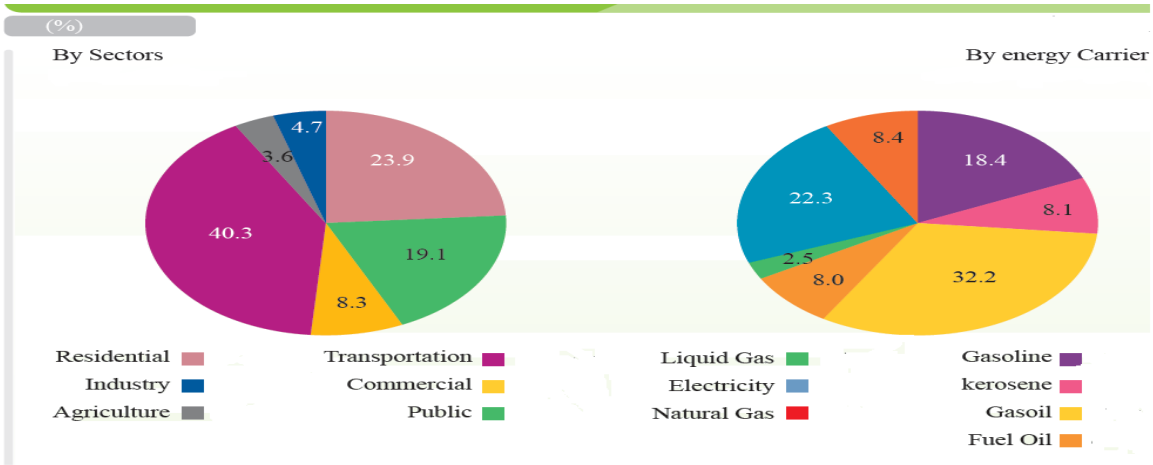
The supportive policies and paying subsidies started in 1932 in Iran. At 1300 solar year along with spread of urbanization and adopting special industrial and economic policies, shortage of proper transportation facilities, Drought and food security issue for cities forced government to make new system for people support. The law of building silo by the government in Tehran to purchase and storage wheat for the critical times was the turning point for subsidy payment in 1931 (Moradipoor,2009). The chief share of energy subsidy payments is related to oil, natural gas and electricity products. Because of lower consumption of coal in industry sector, the amount of its subsidy payments is less than fossils fuels and electricity. Iranian government paid 71.74 percent of total subsidy payments for oil products, 13.88 percent to natural gas and 14.38 percent to electricity sectors in 2006. So it means that, country power plants only consumed mature to 14.64 percent of energy subsidies worth 347 billion rials. Total energy subsidy reached to 469 billion rials in 2007. Transportation, residential and industry sectors consumed 42.2%, 24.6% and 17.1 percent of energy subsidy in Iran respectively in 2007 (Iranian Ministry of Energy, 2008). At this part of study we are trying to display the important energy indicators of Iran and other reigns through facts and figures presented by the power ministry of Iran:

Table1: Energy carries Subsidies in Iran (2008)

Year	Residential	Commercial	Public	Industry	Transportation	Agriculture	Total
Gasoline	-	7.6	418.6	242	96853.4	136.3	97657.9
kerosene	39406.4	2051.9	1066.7	452.1	-	193	43170.1
Gas oil	3898.1	4482.3	6953.8	19200.5	110411.6	25548.2	170494.5
Fuel oil	17.4	6162.7	610.3	31645.7	3920.9	93.7	42450.7
LPG	(2)10829.6	-	-	1743.3	944.5	-	13517.4
Electricity	46972.8	4153.2	15390.7	33573.2	151.8	18137.8	118379.4
Natural Gas	25554.7	2249	738.5	14520.5	1278.7	143.6	44485.1
Total	**126679.0**	**19106.6**	**25178.7**	**101377.3**	**213560.8**	**44252.7**	**(3)530155.1**

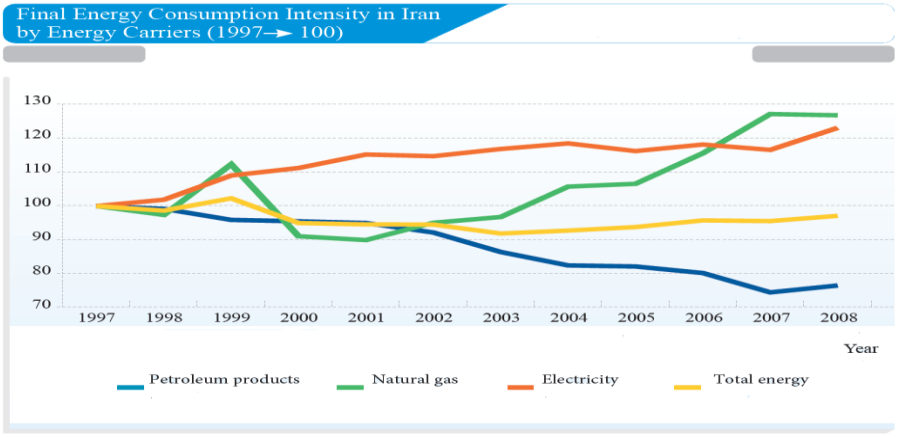
Source: Ministry of Energy (2008).

Figure1: final report of Iran Energy Subsidies (2008)



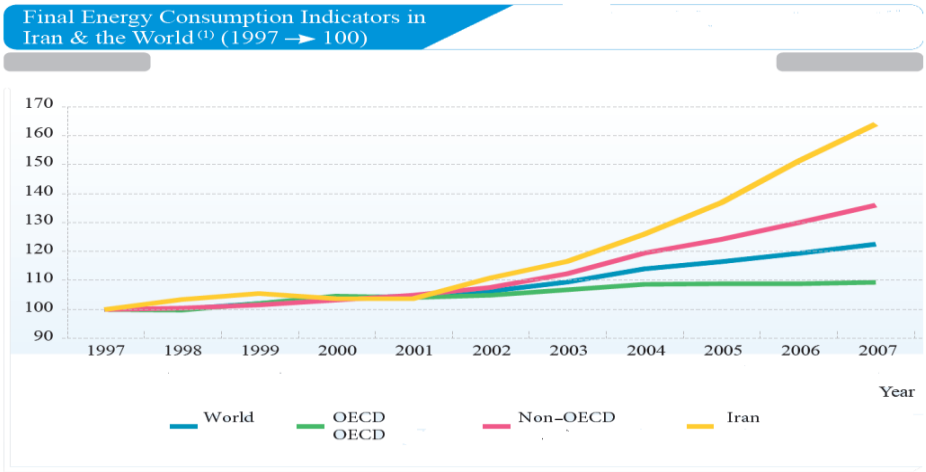
Source: final report of Ministry of Energy (2008)

Figure2: Final Energy Consumption Intensify In Iran by Energy Carriers



Source: final report of Ministry of Energy (2008).

Figure3: Fianl Energy Consumption Indicatores in Iran & the World



Source: final report of Ministry of Energy (2008)

Figure4: Comparison of Public and Development Budget with Energy Subsidies in Iran in 2008

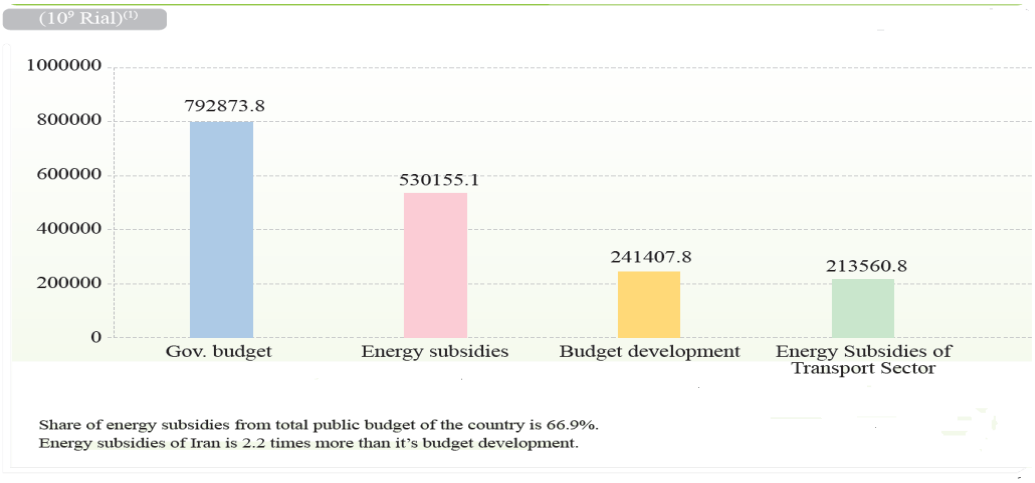
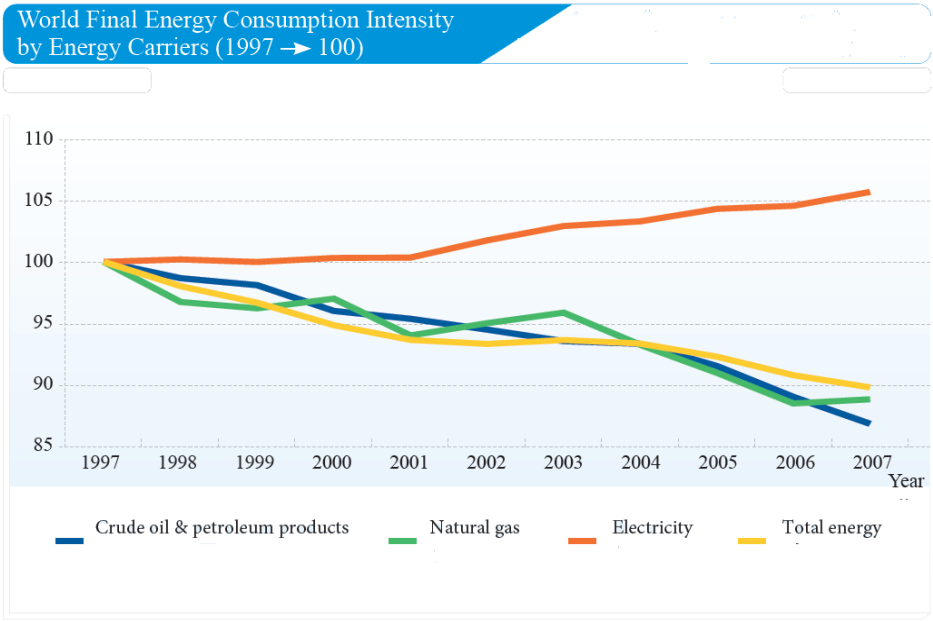
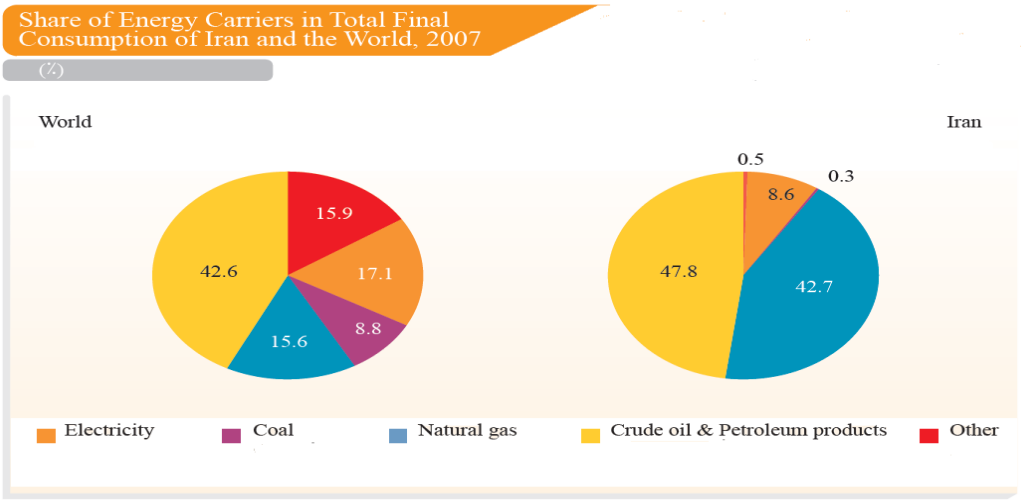


Figure5: World Final Consumption Intensify by Energy Carriers



Source: final report of Ministry of Energy (2008)

Figure6: share of Energy carriers in Total Final Consumption of Iran and the World (2007)



Source: final report of Ministry of Energy (2008)

2- Literature Review

The studies related to energy subsidies almost disscus the size and volume of them. The extensive study which was implemented by the World Bank in 1992 showed governments pay 230 billion dollars for the fossil fuels per each year (UNEP/IEA, 2002). The World bank (1997) estimated 10 billion dollars the annually amount of energy subsidies of fossil fuels in OECD countries.They also estimated subsidy payments aboat 48 billion dollars for the 20 of the biggest countries in NON-OECD.Greenpeace International (1997)stated that 90 percent of direct subsidies of European countries targeted to energy industry (63% in fossil fuels and 28% in nuclear energy sectors) so that only 9 percent (1.5 billion dollars) directed to the renewable energies.Myers and Kent (2001)estimated that the amount of global energy subsidies may be more than 131 billion dollars for each year which 100 billion dollars have error or diversion from the main goals.

IEA (1999) founded out that the energy subsidies in 8 of the biggest NON_OECD countries have been more than 94 billion dollars in 1998.DOE(1999) showed that the energy subsidies of federal in United States mature to 6.2 billions of dollars are more than 1percent of whole energy supply.De Moor (2001) stated that the global energy subsidy was about 240 billion $ which approximately 151 billion dollars of them allocated to fossil fuels.Riedy and Diesendorf (2003) measured 6.54 billion dollars for the fossil fuels in Australia. European Environment Agency (EEA) 2004 demonstrated that whole devoted subsidies were stand at 29 billion dollars in 2001. So that fossil fuels, oil, nuclear energy and renewable energies gained 13, 8.7, 2.2 and 5.3 billion euros respectively. Iinternational Energy Agency (2006) accounted energy subsidies of 20 of the biggest NON_OECD countries. Their findings show that from 220 billion dollars of that sources for the period of 2005 only 170 billion dollars allocated to fossil fuels. As well, they estimated that the global subsidies should be 280 billion dollars per each year, or in a sense it is 0.6 percent of global gross domestic products. IEA's report (2008) illustrated that those subsidies in NON OECD countries inclined to 310 billion dollars in 2007 so that the main parts of those concerned to consumption subsidies.

Stern report (2006) for the 2004 year demonstrate that government at whole allocated 33 billion dollars for energy subsidies which renewable energies (10B$), neculer energies ($16Billion) and foosil fuels ($6.4 Billion) acquired these amounts.GTZ(2007) calculated that the amount of fuel subsidies of transportation sector under the data of 2004 has been near to 90 billion dollars which 28 and 61 billion dollars have been devoted to gasoline and diesel respectively.GSI (2009)founded that allocated subsidies on fossil fuels are about 100 billion dollars per year. As well as their findings indicate that $700 billion of energy subsidies are equivalent with 1 percent of world GDP. Lin and Jiang (2009) concluded that implementing subsidies programs have not been efficient. So that those energy subsidies instead of having a positive impact on the poor, they have had a negative impact on them.Chattopadhyay (2004,2007) derived that cross tariffs have to be declined as well as the effect of reducing energy subsidies is a basic way for optimization goal. Burniaux et al (1992)founded that removing energy subsidies decline the pressure on the price of fossil fuels. At 2050 year the demand of global energy and CO2 emission will be decreased about 16 and 18 percent respectively. Anderson and McKibbin (1997) showed in spite of the potential impact of subsidies reforms, they concluded that it has not caused to more efficiency in the economy and CO2 emission decrease.IEA (1999) examined the effect of energy subsidy on the consumption and CO2 emission in eight OECD countries.

Their findings indicated 13 and 16 percent decrease in initial energy consumption and CO2 emission respectively. This is while GDP amount increase roughly 0.73 percent.OECD's study (2000) by investigating the impact of subsidy reformspredicted that if these reforms happen in industry and electricity sectors caused to decline CO2 emission about 6 percent.Saunders and Schneider (2000) by employing GTEM model attempted to show that will be increased energy prices for the energy producers immediately after removing energy subsidies? Their results verified a sudden fall in the energy consumption.Burniaux et al (2009) by using ENV-Linkages model forecasted the effects of gradual remove of energy subsidy in OECD for the period of 2013 to 2020. They concluded that if consumption subsidies in 20 non-OECD countries phased out leads to reduce the CO2 and GHG emissions by 2020.Meh Abadi (1994) by using Input-Output pattern tried to examine the subsidy policies of oil product on the Iranian economy. His results show effective impact of that policy on consumption sector.Mehnat Far et al (2007) in a comprehensive survey in Iran studied the possible impacts of gasoline subsidy on the macroeconomic variables. Their concluded positive and significant of these subsidies on the variables.Kiyavar and Nahidy (2010) employed ARDL approach to investigate the relationship between energy process and energy consumption in Iranian industries sector. According to their results, energy price affects the consumption negatively.

3- Methodology

There is a simultaneous equations system, when set of variables could be determined by other variables simultaneously. Therefore, a simultaneous equations system can't estimate parameters only with one equation rather some variables have endogenous relation to on other (Wooldrige, 2000). There are three different methods to estimate the parameters of simultaneous equations model which including:

1-simple approach

2- Estimating parameters by using limit information which included three various methods: a- indirect least squares approach (ILS) b- two stages least squares approach (2SLS) c- Limited Information maximum likelihood (LIML).

3- Estimating parameters by using full information so that this approach also has different methods:

a) Three stage least squares method (3SLS) b) Generalized Moment Method (GMM) c) full information maximum likelihood method (FIML)(Green, 2001).

3-1- Three stage least squares method

The three stage least squares is a version of two stage least squares method of seemingly unrelated regression (SUR). Where this technical method is appropriate that the right hand variables have correlation with the residual terms as well as there is a simultaneous autocorrelation and hetrocsedasticity among the residuals (Green, 2001).

At this stage of study we show simultaneous equations system for G simultaneous equation as follows (Johnston et al, 2000):

(1)

Now, we pre-multiply both sides of above equation in $P'X'$:

$$y_i = Y_i\gamma_i + X_i\delta_i + e_i \qquad i = 1, \ldots, G \qquad P'X'y_i = P'X'Y_i\gamma_i + P'X'X_i\delta_i + P'X'e_i \qquad (2)$$

In compliance with equation 2, vector p determined in a manner that we have: $P'(X'X)P = I$

In general reduced form of system specified as follows:

$w=W\beta+r$ (3)

$w_i=P'X'y_i \quad , W_i = (P'X'Y_i, P'X'X_i)$

Matrix form of above relation summarized in the following format:

$$w' = [w_1 \quad \cdots \quad w_G]; \qquad \beta_i = \begin{bmatrix}\gamma_i \\ \delta_i\end{bmatrix};, \; r_i = P'X'e_i, \qquad (4)$$

$$W = \begin{bmatrix} W_1 & 0 & \cdots & 0 \\ 0 & W_2 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & W_G \end{bmatrix}, \beta = \begin{bmatrix}\beta_1 \\ \beta_2 \\ \vdots \\ \beta_G\end{bmatrix}, r = \begin{bmatrix} r_1 \\ r_2 \\ \vdots \\ r_G \end{bmatrix}$$

But r=F.vec(E) where $F=I_G\otimes P'X'$ and E[vec(E)]=0 . Meanwhile under the hypothesis, it should be written that: $\Sigma\otimes I_t = Var(vec(E))$ as well as according to the X clause, we can mention that:

E(r) =0.

$$\begin{aligned} Var(r) &= F(\Sigma \otimes I_T)F' \\ &= I_G \otimes P'X'(\Sigma \otimes I_T)XP \otimes I_G \\ &= \Sigma \otimes P'X'XP = \Sigma \otimes I_K \end{aligned} \qquad (5)$$

Hence because the converted system has variance-covariance matrix along with the Contemporaneous Correlation problem, it guides us to use Generalized Least Squares method which its estimator specified as follows:

$$\tilde{\beta} = (W'\Phi^{-1}W)^{-1}W'\Phi^{-1}w \qquad (6)$$

Where $\Phi=\boldsymbol{\Sigma}\otimes I_K$

So, now the feasible Least Squares estimators for B gained such like:

$$\tilde{\tilde{\beta}} = (W'\hat{\Phi}^{-1}W)^{-1}W'\hat{\Phi}^{-1}w \qquad (7)$$

Where $\hat{\Phi} = \hat{\Sigma}\otimes I_K$

As well, there is a consistent estimator for **Σ**, so that it could be made from the residuals of 2SLS method. The 3SLS method of estimating all coefficients of the simultaneous system comprises following stages:

Stage1: Purifying explanatory variables from endogenous form through conversion.
Stage2: Making a consistent estimator for **Σ**.
Stage3: Acquiring respective estimators by using Generalized Feasible Least Squares method (Johnston et al, 2000).

3- 2-Model specification

This study in order to examine the effects of energy subsidies of the Iranian industry sector on employment and production variables tries to prepare proper Simultaneous Equations system. Thus, we have modeled a four-equation pattern which presented as follows:

The effective variables on labor force demand which characterized through minimum costs approach included: production (value added of industry sector), real wage rate, trend rate and interest rate (rent cost of each unit of capital). Amini's paper (2009) used per capita capital stock as a proxy in his study, so we also apply this index in our research.

First Equation: in this production equation of industry sector, energy considered as a production input in logarithmic form of Cobb-Douglas production function as follows:

$$LnVAD=LnA+\alpha_1 LnL+\alpha_2 LnK+\alpha_3 LnE+u_1 \quad (3\text{-}2\text{-}1)$$

Where L represents the employment in industry sector, K is capital stock in industry sector, E is a representative of energy input in industry, VAD shows the value added of industry sector under the fixed prices of 1997 and finally U_1 indicates residual term.

Second equation: Under this equation, we consider the demand equation of energy input as a function of real value added variable of industry sector and total energy subsidies (Mehnatfar, 2007). Meanwhile the trend term entered into the model as a former period's effect of demand on current demand.

$$LnE=\beta_0+\beta_1 LnVAD+\beta_2 LnSUB+u_2 \quad (3\text{-}2\text{-}2)$$

LnE is the logarithm of energy demand, LnVAD represents the logarithmic form of real value added of industry sector, Lnsub indicates the logarithm of energy subsidy in the industry sector of Iran and eventually U_2 residual term of the model.

Third Equation: This equation characterizes the production cost as a function of value added of industry sector and per capita subsidy (per each unit of energy).

Fourth Equation: In this equation the demand for labor force indicated as a function of logarithmic form of real wage level, the logarithm of value added in industry sector and logarithm of capital in labor force ratio:

$$Lne=f(ln(wage/cpi)\ ,\ lnVad\ ,\ lnk/l\ ) \quad (3\text{-}2\text{-}3)$$

Where LnEis logarithm of industry sector, Ln(Wage/cpi) shows logarithm of real paying wage of industry sector under the fixed prices of 1997, LnVAD indicates logarithmic form of value added in the industry sector under fixed prices of 1997, and LnK/L states logarithm of capital in labor force ratio.

Total cost: total cost is gained from sum of fix and variable costs during the production process (Abounoori, 2009). But here the total cost calculated under the sum of energy value of consumption and value added of industry sector (cristopholos, 2000).

Table2: The Gained Outputs of Eviews S

Parameter	Coefficient	Standard deviation	t –Statistic	P-value
C(1)	7.941310	0.478001	16.61359	0.0000
C(2)	-0.031795	0.027150	-1.171074	0.2526
C(3)	1.046373	0.017018	61.48564	0.0000
C(4)	-0.064896	0.017989	-3.607499	0.0013
C(5)	45.67284	8.307015	5.498104	0.0000
C(6)	-1.697476	0.470662	-3.606571	0.0014
C(7)	0.056506	0.025001	2.260137	0.0328
C(8)	0.247494	0.051293	4.825085	0.0001
C(9)	0.587051	0.783372	0.749390	0.4606
C(10)	2.095578	0.043394	48.29173	0.0000
C(11)	-5.543976	0.155884	-35.56467	0.0000
C(12)	0.920518	0.008809	104.5033	0.0000
C(13)	-0.021515	0.004833	-4.451978	0.0002
C(14)	-1.011624	0.011717	-86.33854	0.0000
C(15)	0.010955	0.001629	6.724956	0.0000

Equation1: production function of industry sector

LOG(VAD)=C(1)+C(2)*LOG(L)+C(3)*LOG(K)+C(4)*LOG(E) $R^2 = 0.99$ $D.W = 2.28$

Equation 2: Energy Demand Function of industry sector:

LOG(E)=C(5)+C(6)*LOG(VAD)+C(7)*LOG(SUB)+C(8)*@TREND

Equation 3: Total Cost Function

LOG(TC)=C(9)+C(10)*LOG(VAD)

Equation 4: Employment Function of industry sector:

LOG(L)=C(11)+C(12)*LOG(VAD)+C(13)*LOG(WAGE/CPI)+C(14)*LOG(K/L)+C(15)*@TREND

Source: Authors' findings .

4- Estimating and analyzing results

With respect to the above table gained from the respective simultaneous equation system, there is a positive relationship between the energy subsidies and demand for energy as expected theoretically. In compliance with the first equation (production function of industry sector), clearly there is a negative relation between energy input and industry production which shows low and decreasing productivity of energy in the industry sector. So as a result, any decreasing energy subsidy accompanies a decrease in the demand for inputs and finally caused to increase energy productivity. Under the equation number 4, increasing production leaded to incline employment in industry sector. Therefore, where energy subsidy 1 percent increases leaded to decline the demand for it near to 0.05 percent on average as well it ups energy productivity about 0.003 percent on average provided the production function be constant so that, that increase in productivity accompanies an increase in employment of industry sector closed to 0.002 percent on average.

4-1- Conclusion and recommendations

Energy is known as an effective and strategic input in the consumption and production process. The price of this input could be an influential element on the quantity of energy demand for economic agents. The devoted energy subsidies of the industry sector in Iran at the aim of helping to that sector have not been successful to enhance production; rather it has caused increase in energy demand as well increasing in the environmental pollutants. Allocating subsidies appropriately and directing the county prices toward the regional and global prices could improve energy productivity through decreasing demand for energies in industries.

When energy productivity raises caused to finally promote employment and production levels. At all, considering the following recommendations can help our economy over the sustainable development:

1- Improving the physical technology in industries which are energy intensive could increase productivity.

2- Although Iran enjoys extensive fossil reserves, but using renewable, solar and wind as well as nuclear energies can decrease its dependency on fossil fuels and their polluting traits so that these subsidy reforms can help Iranian economy to attain key achievements.

3-Given this truth that electricity and oil are two main elements to economic growth for industries, the government should apply their policies in a manner that no happen negative impact on the sustainable development process.

4- Confidence building and culture building among the people and especially investors are two necessary factors which needed to be on the top priority of government agenda before and after the reforms implementation**.**

5- Allocating the gained financial resources from reducing energy subsidies for importing new technologies as capital stock is one of the appropriate solutions at the aim of optimal allocation of resources.

References

Abounoori, A., 2009,"Microeconomics", TextBook, Azad University press, Vol (1).

Anderson, K., McKibbin, W.J., 1997. "Reducing coal subsidies and trade barriers: their

contribution to greenhouse gas abatement". Seminar Paper 97-07, University of Adelaide, Center for International Economic Studies (CIES).

Amini, GH., 2009. "Estimation of Labor Demand patterns in Iran's economy, barnameh-budjehmagazine, 33-34, Tehran, Iran.

Burniaux, J.M., Martin, J.P., Oliveira-Martins, J., 1992."The effects of existing distortions in energy markets on the costs of policies to reduce CO2 emissions: evidence from GREEN. OECD Economic Studies 19, 142–164.

Burniaux, J.M., Chanteau, J., Dellink, R., Duval, R., Jamet, S., 2009. "The economics of climate change mitigation: how to build the necessary global action in a cost-effectivemanner". Economics Department Working Papers No. 701.

Chattopadhyay, P., 2004. "Cross-subsidy in electricity tariffs: evidence from India". Energy Policy 32 (5), 673–684.

Chattopadhyay, P., 2007. "Testing viability of cross subsidy using time-variant price elasticities of industrial demand for electricity: Indian experience". Energy Policy 35 (1), 487–496.

christopoulose, D. K., 2000. "The Demand For Energy in Greek Manufacturing", Energy Economic, 22, p, 569-586.

DEO, 1999.United States Department of Energy (DOE)/Energy Information Administration (EIA, 1999. Federal Energy Market Interventions: Primary Energy). Washington D.C.

De Moor, A., 2001. "Towards a grand deal on subsidies and climate change". Natural

Resources Forum 25 (2), 167–176.

Deputy for Power & Energy Affairs-Power & Energy Planning Department, 2008, "Iran and World Energy Facts and Figures".

Deutsche GesellschaftfürTechnischeZusammenarbeit (GTZ, 2007."International FuelPrices 2007".Federal Energy Ministry for Economic Cooperation and Development.

European Environment Agency (EEA), 2004. "Energy Subsidies in the European Union: A Brief Overview". EEA, Copenhagen.

Global Subsidies Initiative, 2009."Achieving the G-20 Call to Phase out Subsidies to Fossil Fuels".International Institute for Sustainable Development, Geneva.

Greenpeace International, 1997."Energy Subsidies in Europe".

International Energy Agency (IEA), 1999. "World Energy Outlook Insights, Looking at

Energy Subsidies: Getting the Prices Right". OECD, Paris.

IEA, 2002.Coal Information. OECD, Paris.

IEA, 2006."World Energy Outlook". OECD, Paris.

IEA, 2008."World Energy Outlook". OECD, Paris.

Green,W., (2001),"Econometrics Analysis", New York University,Fifth Edition.

Zellner,A., and Theil,H., 1962. "Three simultaneous estimation of simultaneous equations",Econometrica,30,63-68.

Johnston, J. and Dinardo, J., 2000. "Econometrics Method, Mcgraw_Hill,4th . edition.

Kiyavar, M. and Nahidy, F., 2010."investigation the relation between energy price and energy consumption in industry sector", oil, gas and energy monthly, 5, p.41.

Lin, B.Q., Jiang, Z.J., Lin, J., 2009. "The analysis and design of China's residential electricity tariff subsidies (in Chinese)". Financial Research Journal 11, 48–58.

Moradi Poor,T.,2009. "Investigating the Policies Decreasing Energy Subsidy using Dyna- mic System"Tehran University, Iran.

Meh Abadi,M.,1994. "Investigating The Effects Imposing and Removing Subsidy Policy of Stabilization Oil Products Prices",Tehran University,Iran.

MehnatFar,Y., AsnaAshari, A., JafariSamimi, A., Karimi, S., 2007. "Investigating the Economic Impact of Gasoline Subsidy On Main Macroeconomic Variable in Iran:An Empirical Analysis(1971-2003)",University of Mazandaran,Iran.

Myers, N., Kent, J., 2001. "Perverse Subsidies: How Tax Dollars can undercut the Environment and the Economy", Island Press, International Institute for Sustainable Development.

Morgan, T., 2007."Energy subsidies: their magnitude, how they affect energy Investment and greenhouse gas emissions, and prospects for reform", UNFCCC Secretariat Financial and Technical Support Program.

OECD, 2000. "Environmental Effects of Liberalizing Fossil Fuels Trade: Results from the OECD Green Model". OECD, Paris.

Riedy, C., Diesendorf, M.O., 2003. "Financial subsidies to the Australian fossil fuel Industry". Energy Policy 31 (2), 125–137.

Saunders, M., Schneider, K., 2000."Removing energy subsidies in developing and transition economics".ABARE Conference Paper.23rd Annual IAEE International Conference, International Association of Energy Economics, Sydney.

Stern, N., 2006. "The economics of climate change: the Stern review". Report to the Cabinet Office, HM Treasury. Cambridge University Press, Cambridge.

Von Moltke, A., Colin M. and T. Morgan (ed.)., 2004. "Energy Subsidies: Lessons Learned in Assessing their Impact and Designing Policy Reforms", UNEP.

World Bank, 1997."Expanding the Measure of Wealth: Indicators of Environmentally

Sustainable Development". Washington D.C.

Wooldridge, J. M., (2000), "Econometrics: A Modern Approach",1th edition Michigan State University.