An Analysis of the Effect of Energy Subsidies Decrease and Transfer Payments to Households on Social Welfare in Iran

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Abstract
This article aims at analyzing the possible effects of the increase in energy prices on the social welfare of Iranian households and comparing the consequences with the condition in which in concurrence with increase in energy prices, the government undertakes transfer payments to Iranian households in order to protect their social welfare status. A mathematical model, therefore, has been devised on basis of the current economical situation in Iran and within the framework of this model the effects of increase in energy price on social welfare is discussed. Decrease in energy subsidies and a shift towards market prices will result in a lower budget deficit for the government and powerfully harness one of the main causes of inflation. Therefore freeing market prices can be a positive element in the country’s economic potential especially in the consumption sector. However, if the elimination of subsidies be accompanied by transfer payments to households, the result is increase in the government budget deficit which in its turn will enhance inflation thus very negatively affecting social welfare. Since transfer payments result in an increase in social welfare directly, the overall situation will be determined by the outcome of the mutual engagement of these two factors. The results show that although on a short term basis an increase in prices can condition an increase in well-being, a long-term trend in energy price increase will most probably end in lower social welfare. In order to hinder such a process, the government should gradually eliminate its transfer payments to the public. In addition, the negative effects of government transfer payment to the people on social welfare will be less in comparison with a non-payment policy on condition that the decrease in well-being resulting form the inflation provoked by increase in the public budget deficit be less than the increase in well-being ensuing from government transfer payment. This may be, in itself, highly controversial.

Keywords: Analysis ; Effect ;Energy Subsidies Decrease ;Transfer Payments ;Households ; Social Welfare in Iran

Introduction
After the “targeted subsidies” law was passed by the legislative body in Iran, the Islamic Republic of Iran began gradually releasing control on market prices in 2010. One case with a long history of subsidization is that of energy careers. For years the Iranian economy had been negatively influenced by the consequences of subsidization in various sectors, including budget deficit and inflation, markets distortion, deficit of balance of payment, high energy use, bio-environmental hazards and inappropriate consumer patterns among Iranian households. Subsidizing was justifiable in that it helped the lower-income classes of society but in practice it gave more ease to the wealthy in that they used energy careers more than others. In reality,
energy subsidizing provoked an increase in the government’s budget deficit and in inflation, adding wealth to the already wealthy and increasing the poverty of the already poor, thus negatively affecting social welfare and income distribution.

A consequence of subsidization of energy careers by the government, was the irresponsible overuse of these careers and the forming of negative consumer patterns among the general public. The roots of such inappropriate habits were to be found in discordant market prices. The case was, in fact, that the government was creating inconsistency in market performance by keeping energy career prices low through subsidization. This in turn fueled the consumer’s ignorance of the relative scarcity of energy careers, and considering their low price, provoked his inattentive overuse of these careers. As a result, bad habits of consumerism formed over time causing unnecessary waste in energy consumption. A comparison of energy intensity in Iran with that of OECD and MENA countries indicates that energy intensity in Iran before performance of Iranian Targeted Subsidy Plan was not only far beyond international standards but also more than the regional countries who also subsidized energy careers. For example in 2002/2003 petroleum consumption in Iran equaled that of Spain whereas Spain’s GDP equaled six times that of Iran (Mehrara, 2007; Jafari and Baratimalayeri, 2008; Sobhiyan and Kashtiban, 2008; Bhattacharyya and Blake, 2009).

Graph1: Comparison of energy intensity-energy consumption per every GDP dollar in some selected countries (BTU per annum based on U.S dollar in 2005 in the stock exchange market)

Source: U.S Energy Information Administration
As can be seen the prices of energy careers in Iran including petroleum have a big difference with international prices which is the reason for the inflated energy consumption in the country. Generally, over the past decades, domestic fuel prices in Iran have merely constituted a small percentage of opportunity cost and have been among the lowest among the MENA countries (Bhattacharyya and Blake, 2009).

Increase in energy careers price reduces energy intensity. An example in this regard is China where the release of control on energy market and energy prices in the years ranging from 1985 through 2004 resulted in energy intensity decrease (Zhao, 2001; Hang and Tu, 2007). In the same manner in transition economies, after the release of energy prices in the 90’s, the level of energy use fell (Cornillie and Frankhauser, 2004). With higher energy prices another consequence is the inclination of the consumer towards goods and services which necessitate lower energy consumption. As an example it can predicted that increase in the price of petroleum will have a substitution effect (lesser use of public transportation) as well as an income effect (less traffic) (IMF, 2010). Therefore it can be expected that as a result of decrease in energy subsidies and increase in energy prices, in addition to less energy consumption, household tendency will turn towards the utilization of lesser-energy-consuming goods and the amount of energy intensity in Iran will fall significantly.

Considering the negative effects of subsidization by the government, a well managed process of lowering and ultimately eliminating this practice will result in a better and more efficient economic status for the country. However, what actually occurs in the Islamic Republic of Iran is decreased energy subsidization that is compensated for in the form of transfer payment by the government to the people, in order to ensure no less in their utility subsequent to increase in prices following the elimination of subsidies. What the effect of such transfer payment on a long-term basis will be is considerable. It deems highly probable that some households will use this payment as a means of acquiring the level of utility prior to the Iranian Targeted Subsidy Plan, or in other ways that will provoke increase in aggregate demand, thus stimulating rise in inflation.

Rise in energy price will have deep effects on Iranian households and firms and whether implemented gradually or in a single step will affect all consumers on the one hand, and on the other, provoke increase in the production costs of all other goods. In addition it will, through the
substitution and income effects of demand, change the pattern of demand for domestically produced and imported goods (IMF, 2010).

**Literature Review**

In a study entitled "The effect of Increase in Petroleum Price on the Welfare of Various Income Groups" Davoodi and Salem (2007) estimated two well-being measures i.e "Compensating Variation" and "Equivalent Variation" and using pooled data of the period ranging between 1375 and 1382 calculated the direct and indirect effects of inflation resulting from a 30% increase in the price of petroleum on welfare of various income group. The two authors believe that increase in petroleum price can potentially cause increase in the price of other goods. Therefore in order to determine the extent of price increase in various goods resulting from rise in petroleum price, they worked on the basis of a study carried out by the Ministry of Commerce and finally within the framework of a AIDS model, and after estimating its parameters, calculated CV and EV of each income group.

Conrad, K., and Schroder (1991) evaluated the effects of petroleum tax on the welfare of high, medium and low income households. They specified a demand system and elicited EV within its framework in order to analyze the effects of paying higher petroleum taxes on the disposable income of the household. The researchers, on the basis of annual data for 1965-1987 in Germany, estimated their model parameters and reached the conclusion that an increase in energy tax has various effects on the welfare of different groups, i.e. households with varying income levels are affected heterogeneously. As a result of their study, EV for low-income households was determined at 105 marks while for medium-income households at 581 and for high-income households at 815 marks. This shows two significant effects; the first is that petroleum tax lowers the welfare of all households regardless of their income, and the second that decrease in welfare for high-income households is more than that of medium-income households, and likewise, welfare decrease in medium-income households is more significant than it is in the case of low-income households. This indicates that petroleum is a luxurious product in Germany since decrease in households income is accompanied by decrease in petroleum consumption.

Saboohi (2001) devised a quantitative model in order to determine the instantaneous effects of reducing energy subsidies and its consequences for the Iranian economy. This model encompasses four modules; the first module estimates the amount of rise in price of goods and services. The second considers the change in the cost of living due to change in energy price. The third is concerned with the effect of improvement in government budget on the status of inflation. Finally, the fourth estimates the effects, per se, of energy price change on living costs. The results show that if a gradual social security policy were implemented, supported by the financial gain of eliminating subsidies, just distribution of income and support for the poor would be feasible.

ESMAP (2004) uses a CGE model in order to simulate the effects of eliminating electricity subsidization in Mexico in the period ranging from 2000 through 2015. Results show that macro effects are not prominent causing only minor decrease in GDP, exports and employment. The Welfare of all income groups decreases but with the more impact on the poor since electricity subsidies are more valuable for them than for others.

Oktaviani et al, (2007) use a CGE model to analyze the effects of eliminating fuel subsidies in Indonesia which occurred in three stages during 2000-2005. In Indonesia, prices in the years 2000, 2001 and 2005 rose 12%, 30% and 29% respectively. They conclude that after the elimination of subsidies, progression from a short-term to mid-term basis results in lower
performance since households income decreases while prices rise. In addition, they maintain that poverty shows increase from 8.9% to 12.9% of the population, a condition which is far from severe in rural areas. On the other hand the researchers assert that there occurred little difference in the distribution of income, the decrease in income being almost heterogeneous among various income groups. Ultimately they conclude that the government should compensate the households for the effects of terminating subsidization.

Abouleinein et al, (2009), used a CGE model to evaluate the gradual elimination of subsidies of petroleum energy products over a five-year period in Egypt. They show that elimination of subsidy without any compensating policies lowered the annual growth of GDP during this period with an average of 1.4% causing the fall of welfare for all income groups. In addition the unjust distribution of income also decreased and the comfort of the rich reached lower levels.

**Model**

Decrease in or elimination of, energy subsidies affects the social well-being in two ways over a short-term period: direct and indirect. Increase in energy careers prices not only lowers household welfare directly but also due to its effects on production costs and increase in the price of other goods, indirectly affects social welfare. If the decrease in or elimination of energy subsidies be accompanied by transfer payment to the people by the government, this payment being financed through the gain in subsidy elimination, social welfare will be affected over a mid-term or long-term period due to a continued budget deficit and probable inflation. A model based on these factors and taking economic variables in Iranian economy into account is here devised for an analysis of the effects of increase in energy career prices and transfer payment to Iranian households, on their social welfare.

Premise 1) a part of government income gain from decrease in or elimination of energy subsidies and is then used for transfer payment to the people. There is a balance between the government's other incomes and expenditures.

Premise 2) The rate of inflation in Iran is a function of energy price, the price of non-energy products and the government's budget deficit.

Premise 3) With increase in energy careers price the cost of production rises and this leads to increase in the price of goods other than energy.

Premise 4) The government will increase transfer payment to the people in order to compensate people's probable welfare reduction and ensure the stability of their purchase power parallel to increase in energy career prices.

Two scenarios are possible:

1- Transfer payments by the government to the people in order to compensate for decline in welfare and purchase power, after energy price increase.

2- The omission of transfer payment to the households after increase in energy careers prices

The First scenario) Transfer payments by the government to the people in order to compensate for decline in welfare and purchase power, after energy price increase

In explicating the traditional social welfare function, economists consider a number of basic assumptions one of which is individualism. It asserts that the social welfare function is a function only of the individuals utility. This premise can be questioned for two reasons. Although some individuals may accept the intrusion of others' utility in their own social welfare function but this is not the case for a large majority. Obviously when there exists conflict between benefits of various social groups, the benefits of some will be sacrificed to that of others. In addition,
although social welfare is not unrelated to individual utilities, this variable, similar to other macroeconomic variables has independent attributes itself on the macro level. This is why A.sen(1985) believe that measures based on individual preferences should be totally disregarded and other more authentic measures of welfare taken into account.

With regard to the two above mentioned criticisms relating to the traditional social welfare function, the current economic situation in Iran is taken into consideration and the social welfare function below is proposed:

$$W = W(Q_E, Q_{NE}, TP, Inf)$$

Such that

$$\frac{\partial W}{\partial Q_E} > 0, \quad \frac{\partial W}{\partial Q_{NE}} > 0, \quad \frac{\partial W}{\partial TP} > 0, \quad \frac{\partial W}{\partial Inf} < 0$$

in which $Q_E$ is the quantity of energy demanded and consumed by society. $Q_{NE}$ is the quantity of non-energy commodities demanded and consumed in the society. $TP$ is the sum of all transfer payments from the government to the people, aimed at compensating welfare reduction resulting from increase in energy prices. $Inf$ is the rate of inflation.

The function of aggregate demand for energy can be written thus:

$$Q_E = Q_E(P_E, I, P_S, P_C, \ldots)$$

Such that

$$\frac{\partial Q_E}{\partial P_E} < 0, \quad \frac{\partial Q_E}{\partial I} > 0, \quad \frac{\partial Q_E}{\partial P_S} > 0, \quad \frac{\partial Q_E}{\partial P_C} < 0$$

The function of aggregate demand for non-energy goods can be written thus:

$$Q_{NE} = Q_{NE}(P_{NE}, I, P_S, P_C, \ldots)$$

Such that

$$\frac{\partial Q_{NE}}{\partial P_E} < 0, \quad \frac{\partial Q_{NE}}{\partial I} > 0, \quad \frac{\partial Q_{NE}}{\partial P_S} > 0, \quad \frac{\partial Q_{NE}}{\partial P_C} < 0$$

Low energy prices in Iran have encouraged the proliferation of energy intensive industries and provoked careless consumption of energy (Maruyama et al, 2009). Therefore increase in energy price affects the production of other goods which are generally energy intensive or at least their transportation involves energy consumption. Consequently increase in energy careers prices ends in increase in the price of non-energy goods. Determining the amount of this increase lies within the scope of empirical studies and econometrics. Considering these factors and taking the third premise into consideration we have:

$$\frac{\partial P_{NE}}{\partial P_E} > 0$$

Therefore

$$\frac{\partial Q_{NE}}{\partial P_E} - \frac{\partial Q_{NE}}{\partial P_{NE}} \frac{\partial P_{NE}}{\partial P_E} < 0$$

The inflation function appears thus

$$Inf = Inf(P_E, P_{NE}, BD)$$

such that

$$\frac{\partial Inf}{\partial P_E} > 0, \quad \frac{\partial Inf}{\partial P_{NE}} > 0, \quad \frac{\partial Inf}{\partial BD} > 0$$

$P_E$: is the aggregate price of energy careers;

---

4. Transportation of Commodities usually takes place by truck in Iran. Alternative modes of transportation have not been extended. So the sector of transportation in Iran is very sensitive to energy prices.
\( P_{NE} \): is the aggregate price of non-energy goods;

\( BD \): is the government's budget deficit.

In order to evaluate the effects of energy price increase, using the chain derivative rule, we calculate the derivative of social welfare function:

\[
\frac{\partial W}{\partial P} = \frac{\partial W}{\partial Q_{NE}} \frac{\partial Q_{NE}}{\partial P_{NE}} + \frac{\partial W}{\partial Q_{NE}} \frac{\partial Q_{NE}}{\partial P_{NE}} + \frac{\partial W}{\partial \inf} \frac{\partial \inf}{\partial P_{NE}} + \frac{\partial W}{\partial \inf} \frac{\partial \inf}{\partial P_{NE}} + \frac{\partial W}{\partial \inf} \frac{\partial \inf}{\partial P_{NE}} + \frac{\partial W}{\partial \inf} \frac{\partial \inf}{\partial P_{NE}}
\]

To the right of the above equation there are six terms. Considering these terms from left to right we see that: the first term is negative due to the negative substitution effect of energy demand; the second term, considering the direct relationship between the price of non-energy goods and energy and also the negative substitution effect of demand for non-energy goods, is negative. The third term, considering premise 4 that is, the fact that with increase in the price of energy, the government compensates in the form of increasing transfer payment to the public, is positive. The fourth term, considering the direct relationship between energy price and inflation, and the negative effect of inflation on social welfare is negative. The fifth term, considering the direct relationship between energy careers prices and the price of non-energy goods and the direct link between the price of other goods and inflation with its negative effects on social welfare, is negative. However the sixth term is neither positive nor negative since the effect of increase in energy careers prices on the government's budget deficit is unknown. On the basis of the first premise the government's budget deficit is defined as follows:

\[
BD = TP - P_{E}Q_{E}
\]

In order to determine the effect of increase in energy careers prices on the budget deficit we calculate the derivative function of the above equation:

\[
\frac{\partial BD}{\partial P_{E}} = \frac{\partial TP}{\partial P_{E}} - \left( Q_{E} + P_{E} \frac{\partial Q_{E}}{\partial P_{E}} \right) = \frac{\partial TP}{\partial P_{E}} - Q_{E} \left( 1 + \frac{P_{E} \frac{\partial Q_{E}}{\partial P_{E}}}{Q_{E} \frac{\partial P_{E}}{\partial P_{E}}} \right)
\]

As can be seen increase in energy careers prices will initiate decrease in the governments' budget deficit if on the one hand the government reduces its transfer payment to the public and on the other hand the price elasticity of energy careers aggregate demand is less than one; in other words if energy careers aggregate demand has low elasticity. The condition for decrease in the government budget deficit as a result of increase in energy careers aggregate price is calculated as follows:

\[
\frac{\partial TP}{\partial P_{E}} - Q_{E}(1 - |e_{P}|) < 0
\]

Thereby, the upper bound for the rate of government transfer payment in order for budget deficit reduction and stemming from a higher reduction in social welfare reduction is calculated as follows:

\[
\frac{\partial TP}{\partial P_{E}} < Q_{E}(1 - |e_{P}|)
\]

If we have the above condition, considering the direct relation between the governments' budget deficit and inflation, the sixth term will be positive. From this term, the highest level of transfer payment by the government to the people related to the first scenario for the purpose of decreasing the budget deficit after the rise in energy careers prices can be calculated thus:

\[
TP = \int Q_{E}(1 - |e_{P}|) dP_{E}
\]

The above expression has significant implications. Since the amount of the government's transfer payment is equal to the area under the curve of the equation \( y(P_{E}) = Q_{E}(P_{E})(1 - |e_{P}|) \) it is obvious that with increase in the dependent variable of this equation, the amount of the above
integral and consequently government transfer payment will increase. Since with the progression from a short-term period to a mid-term and long-term period the price elasticity of energy careers will increase (Bhattacharyya and Blake 2009), the government, in order to lower the budget deficit and inflation and raise social welfare must, over time gradually decrease its transfer payment.

Considering that the government's transfer payment aimed at sustaining the households' purchase power are implemented after the rise in energy careers prices, the third term can be, with a little tolerance, supposed equal to the first and second term. Thus it follows that:

\[
\frac{\partial w}{\partial p_E} = \frac{\partial w}{\partial \text{Inf}} + \frac{\partial w}{\partial \text{NE}} \frac{\partial p_{\text{NE}}}{\partial p_E} + \frac{\partial w}{\partial \text{Inf}} \frac{\partial p_{\text{NE}}}{\partial p_E} + \frac{\partial w}{\partial \text{Inf}} \frac{\partial \text{BD}}{\partial p_E}
\]

The above equation will be positive only on condition that the third term of the right hand side be positive and in addition its amount be more than the sum of the first and second terms of the right hand side of the equation.

The Second scenario) The omission of transfer payment to the households after increase in energy careers prices

The social welfare function is defined as follows:

\[
W = W(Q_E, Q_{\text{NE}}, \text{Inf})
\]

The inflation function can be written as before thus:

\[
\text{Inf} = \text{Inf}(P_E, P_{\text{NE}}, \text{BD})
\]

Obviously, with the omission of government transfer payment to the people, considering the first premise of the model, the government will be faced with a budget surplus and the budget deficit can be written as follows:

\[
\text{BD} = -P_E Q_E
\]

In order to evaluate the effects of increase in energy careers aggregate price on social welfare we calculate the derivative function of the social welfare function:

\[
\frac{\partial w}{\partial p_E} = \frac{\partial w}{\partial Q_E} \frac{\partial Q_E}{\partial p_E} + \frac{\partial w}{\partial Q_{\text{NE}}} \frac{\partial Q_{\text{NE}}}{\partial p_E} + \frac{\partial w}{\partial \text{Inf}} \frac{\partial p_{\text{NE}}}{\partial p_E} + \frac{\partial w}{\partial \text{Inf}} \frac{\partial \text{NE}}{\partial p_E} + \frac{\partial w}{\partial \text{Inf}} \frac{\partial \text{BD}}{\partial p_E}
\]

Again, as in the previous case, from left to right on the right hand side of the equation if the terms be considered, the first through fourth terms are negative but in the case of the fifth, its being positive or negative is unknown since the effect of increase in energy careers price on the budget deficit is unknown. Therefore in order to determine this effect we determine its derivative function:

\[
\frac{\partial BD}{\partial p_E} = -\left( Q_E + P_E \frac{\partial Q_E}{\partial p_E} \right) = -Q_E \left( 1 + P_E \frac{\partial Q_E}{\partial p_E} \right) = -Q_E (1 - |e_p|)
\]

As can be seen in the above equation, in a short-time period since energy careers aggregate demand is not elastic (suppose that elasticity of aggregate demand is low because disaggregate demands are not elastic), with increase in the energy careers aggregate price the government's budget deficit decreases and the amount of this decrease is more in comparison with the first scenario. On a long-term basis also, with increase in the price elasticity of energy careers aggregate demand over time, and in parallel to increase in prices of energy careers, the budget deficit will decrease as long as the elasticity is less than one.

Conclusion

Bhattacharyya and Blake (2009) estimated the price elasticity of demand for gasoline, diesel, kerosene and fuel oil in Iran and a number of other Middle-Eastern and North-African oil
exporting countries on a short and long term basis. Their results for Iran are shown in the table below:

Table 1: Estimated price elasticity of demand for some energy careers in Iran

<table>
<thead>
<tr>
<th>energy career</th>
<th>Short-term</th>
<th>long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>gasoline</td>
<td>-0.124</td>
<td>-0.494</td>
</tr>
<tr>
<td>diesel</td>
<td>-0.055</td>
<td>-0.129</td>
</tr>
<tr>
<td>kerosene</td>
<td>-0.064</td>
<td>-0.149</td>
</tr>
</tbody>
</table>

Source: Bhattacharyya and Blake (2009).

They showed that although on a short-term basis the price elasticity of demand is a small amount, with progression from a mid-term to long-run basis, it increases. Hypothetically even when elasticity is low on a short-term basis, if energy prices rise to international standards, demands will still probably show decrease. Davoudpour et al (2006) and Narayan et al (2007) have reached similar results.

Analysis of The First Scenario

In the case where the price elasticity of demand on a short-term basis is small and the transfer-payment of the government to the people does not increase or even decreases after rise in energy careers aggregate price, it can be expected that the government's budget deficit will decrease and result in lower inflation rate and, consequently, higher social welfare (on condition that the amount of decrease in inflation is more than the increase in inflation resulting from the direct and indirect effects of increase in prices).

However, moving from a short-term basis to a mid and thereafter long-term basis, with increase in the price elasticity of energy careers aggregate demand, if this elasticity rises to a level above one, within the framework of this model increase in energy careers prices will result in decrease in social welfare. This is because with rise in the prices, there will result increase in the budget deficit and provoke higher inflation due to the direct and indirect effects of increase in energy careers prices. On a mid-term and long-term basis, however, if the price elasticity of energy careers aggregate demand be less than one, it can still be hopefully anticipated that with control over the government's transfer payment, the budget deficit will be reduced, and decrease in social welfare resulting from the rise in inflation rate due to direct and indirect effects of energy careers price increase will be avoided. In any case what seems most significant in this case is the cease of government transfer payment to the households.

Analysis of The Second Scenario

On a short-term basis it is certain that since the price elasticity of demand is an small amount, increase in energy careers prices will result in a lower budget deficit. If the increase in social welfare resulting from lower inflation due to decrease in the government's budget deficit is higher than the sum of decrease in social welfare resulting from higher inflation due to the direct and indirect effects of rise in prices and decrease in social welfare resulting from less consumption of energy and non-energy goods, overall social welfare will increase. Otherwise it will definitely fall.

Since, in the second scenario, in comparison with the first, the government has no transfer payment to the people, there will result significant decrease in its budget deficit and form this perspective it can be said that the second scenario is preferable to the first.
Comparing the two scenarios

In order to compare the state of welfare in the two above scenarios, the evaluations of increase in energy careers prices for the two scenarios are now compared.

In the first scenario the change in social welfare due to change in energy careers aggregate price is as follows:

\[
\begin{align*}
\frac{\partial w}{\partial P_E} = \frac{\partial w}{\partial Q_E} \frac{\partial Q_E}{\partial P_E} + \frac{\partial w}{\partial Q_{NE}} \frac{\partial Q_{NE}}{\partial P_E} + \frac{\partial w}{\partial \inf} \frac{\partial \inf}{\partial P_E} + \frac{\partial w}{\partial TP} \frac{\partial TP}{\partial P_E} + \frac{\partial w}{\partial \inf TP} \frac{\partial \inf TP}{\partial P_E} + \frac{\partial w}{\partial \inf \inf} \frac{\partial \inf \inf}{\partial P_E}
\end{align*}
\]

And in the second scenario we have:

\[
\begin{align*}
\left( \frac{\partial w}{\partial P_E} \right)^2 = \frac{\partial w}{\partial Q_E} \frac{\partial Q_E}{\partial P_E} + \frac{\partial w}{\partial Q_{NE}} \frac{\partial Q_{NE}}{\partial P_E} + \frac{\partial w}{\partial \inf} \frac{\partial \inf}{\partial P_E} + \frac{\partial w}{\partial TP} \frac{\partial TP}{\partial P_E} + \frac{\partial w}{\partial \inf TP} \frac{\partial \inf TP}{\partial P_E} - \frac{\partial w}{\partial \inf \inf} \frac{\partial \inf \inf}{\partial P_E} Q_E (1 - e_P)
\end{align*}
\]

In order to compare the two scenarios we subtract the two sides of the equations one from another

\[
\begin{align*}
\left( \frac{\partial w}{\partial P_E} \right)^1 - \left( \frac{\partial w}{\partial P_E} \right)^2 = \frac{\partial w}{\partial TP} \frac{\partial TP}{\partial P_E} + \frac{\partial w}{\partial \inf \inf} \frac{\partial \inf \inf}{\partial P_E} Q_E (1 - e_P)
\end{align*}
\]

As can be seen the comparison of the two scenarios depends on determining whether the right-hand side of the above equation is positive or negative. Considering the fact that from left to right, the first term of the right hand side of the equation is positive and the second, negative, determining whether the expression is, overall, positive or negative depends on the interaction between decrease in social welfare resulting from rise in inflation rate due to increase in government budget deficit and rise in social welfare due to transfer payment.

What is certain is that the government can, by measurement of the two above elements over time, make improvements for its target income groups. In other words, if the increase in social welfare resulting from transfer payment to the people be less than the decrease in social welfare due to rise in inflation rate-stemming from a higher budget deficit- regardless of whether the aggregate demand for energy careers is elastic or not, decrease in transfer payment can cause increase in social welfare.
References
http://www.eia.gov/