An evaluation of the welfare effects of reducing energy subsides in Iran

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HIGHLIGHTS

► Reform of energy prices is an important element of the "Economic Reform Plan" for 2010–2014 for Iran.
► The implementation of this plan has affected both households' welfare and firms' profitability.
► Higher energy prices decrease energy consumption by Iranian households.
► Iranian household welfare will increase with a 100% or 200% rise in energy prices.
► Iranian household welfare will decrease with a 400% or 500% rise in energy prices.

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ABSTRACT

Energy prices in Iran have traditionally been heavily subsidized by the Government, and as a result, energy consumption per capita in Iran is close to the European Union level. The welfare effects of efforts to raise energy prices closer to world levels are examined in this paper. Reform of energy prices is an important element of the "Economic Reform Plan" (2010–2014) for Iran. We first analyze the relationship between energy consumption, energy and non-energy prices by estimating the household expenditure function. The results show that a higher energy prices will decrease energy consumption by Iranian households. Second, we evaluate the impact of a rise of energy prices on the household welfare by measuring the compensating variation (CV) in five steps with a compensating payment. The results show that Iranian household welfare will increase with a 100% or 200% rise in energy prices, if the government pays 20%, 30% or 50% of the $20 billion income resulting from removing energy subsides. While, in contrast, Iranian household welfare will decrease with a 400% and 500% rise in energy prices, if the government payment is 20% or 30% of $20 billion income.

1. Introduction

The Iranian government has made a lot of efforts to reform the energy pricing mechanism and has tried to establish a market-oriented one. But the energy pricing mechanism in Iran is still not in line with international prices, because subsidies are paid by the government for energy consumption and energy prices have been completely controlled by the government since 1980. Therefore, Iranian energy prices are generally lower than international standard levels. These lower energy prices could not fully reflect the relationship between energy consumption and energy demand. Distortions in energy prices have caused serious challenges to the Iranian households' energy consumption and economic welfare as well as the government budget. Nowadays, the government is attempting to reform energy pricing through reducing energy subsides. Therefore, the relationship between energy prices, energy consumption and household economic welfare in Iran should be studied before reforming the energy pricing mechanism.

2. Literature review

International institutions and researchers have done a series of studies on energy subsides reform and analyzed its impacts on economy variables such as production, consumption, welfare and others.

A joint report of IEA, OPEC, OECD, and World Bank (2010) reviewed some case studies of subsidy reform in OECD and non-OECD countries. The case studies of consumer subsidy reforms in Poland, Indonesia, Malaysia, and the US show that they have all led to a decrease in inflation, an increase in household disposable income and a decrease in demand for energy. The case studies of product subsidy reform of coal mining in Germany (1995), in Poland (1990s), in the UK (1980s), in Spain (1995), and in France (2000) led to an increase in unemployment in coal mining, a

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decrease in production, and improvement in the economic situation of some the coal mining.

The results of other case studies of the impact of removing energy subsidies on the poor and on welfare such as ESMAP (2004); Oktaviani et al. (2007); and Aboulleinein et al. (2009), showed that the removal of energy subsidies induced a decrease in welfare for all income classes, an increase in poverty, the decline of household incomes, a reduction in inequality and average annual GDP growth.

Many researchers have studied the relationship between energy subsidies and economic welfare. Uri and Boyd (1997) examined the impact of an increase in prices of gasoline and electricity on the Mexican economy using a general equilibrium model. The results indicated that an increase in the prices of gasoline and electricity would result in a decrease in output, a fall in the consumption of goods and services, a reduction in total utility and higher government revenues. Templet (2000) showed that the States with large energy price disparities between sectors have statistically higher poverty, lower incomes, more pollution and use more energy but with less efficiency. Risschel and Smestad (2003) analyzed California's electricity market deregulation process from a subsidy viewpoint. Their results showed that regulated retail energy prices combined with deregulated wholesale energy prices have caused high energy demand, skyrocketing wholesale prices, and electricity shortages. Areno et al. (2008) showed that deregulation in gas industry of US had a positive impact on both demand and supply in the industry, and had a negative and significant effect on the deadweight loss in the market. Walawalkar et al. (2008) analyzed the economic properties of the economic demand-response program in PJM electricity in

the US and compared the social welfare gains with subsidies paid to price-responsive load using load and price data for 2006. The results showed that the social welfare gains exceed the distortions introduced by the subsidies. In Lin and Jiang (2011) study, a CGE model was used to analyze the economic impacts of energy subsidy reforms. The results showed that removing energy subsidies will result in a significant fall in energy demand and emissions, but will have negative impacts on macroeconomic variables.

For Iran, Shafie Pour Motlagh and Fariabi (2007) estimated the trend of total energy subsidies from 2003, running a model for analysis of changes at the level of social welfare that resulted from price reform policy. The results of their model running under two scenarios showed that reducing energy subsidies for each energy form is extremely beneficial. Further, an increase in prices can be a basis for redistribution of income within poor households and increase the government revenue and economic growth in long-term. Manzor et al. (2009) using a CGE/MPSGE model showed that removing energy subsidies results in shrinking output and the reductions in urban and rural welfare, respectively, by 13% and 12% as well as hyperinflation. Table 1 gives a summary of these studies.

These studies show some important viewpoints: (1) the economic output and energy prices affect energy consumption; (2) the removal of energy subsidies affects energy consumption, household income, and household welfare; (3) the relation between energy prices can reflect energy substitutions.

In this paper we will mainly study the impact of energy prices change on energy consumption, household income and household welfare in Iran.

Table 1
The reform of energy subsidies and its effects according to reviewed studies.

Authors	Approach/method	Location/area	Results
Joint report: IEA, OPEC, OECD, and World Bank (2010)	Review some case studies of consumer subsidy reform	Poland (reform of the VAT rate for energy products in 1990s) Indonesia (reform of direct subsidies for petroleum in 2005 and the electricity price subsidy in 2008) Malaysia (reform of price gaps on prices of electricity and petroleum product in 2008) US (reform of the consumer price subsidy for natural gas in 1978)	Decrease in inflation, increase in household disposable income and decrease in demand for energy
	Review some case studies of product subsidy reform of coal mining	Germany (1995), Poland (1990s), UK (1980s), and France (2000)	Increase in unemployment in coal mining, decrease in production, and improvement in the economic situation of some of the coal mining
Aboulleinein et al. (2009)	Input–Output and CGE model	Egypt	Decrease in total private consumption, increase in GDP, affect the welfare levels of all quintiles, the budget turns to a surplus
ESMAP (2004)	Dynamic Computable General Equilibrium	Mexico	Decrease in welfare, increase in poverty, and reduction in inequality
Oktaviani et al. (2007)	Dynamic Computable General Equilibrium	Indonesia	Increase in employment, decrees in output, decrease in households income, decrease in welfare
Uri and Boyd (1997)	General Equilibrium model	Mexico	An increase in gasoline and electricity price would result in a decrease in output, consumption of goods and services, reduction in utility and increase in government revenues
Templet (2000)	Cross-sectional simple linear regressions	50 states of USA	The states with large energy price disparities between sectors have higher poverty, lower incomes, more pollution and use more energy.
Risschel and Smestad (2003)	Analysis of market deregulation process	California's electricity market, USA	High energy demand, skyrocketing wholesale prices and electricity shortages
Areno et al. (2008)	Disequilibrium model of supply and demand	US natural gas industry	Positive impact of both demand and supply, and had a negative effect on the deadweight loss in market
Walawalkar et al. (2008)	Economic model of demand response market	PJM electricity market of USA	Social welfare exceed the distortions introduced by the subsidies
Lin and Jiang (2010)	CGE Model	China	Fall in energy demand and emissions, and negative effects on macroeconomic variables
Shafie Pour Motlagh and Fariabi (2007)	Environmental Cost-Benefit Analysis Model: (ECBA Model)	Iran	Increase in government revenue and economic growth in long-term
Manzor et al. (2009)	CGE/MPSGE model	Iran	Shrinking output, reduction in urban, rural welfare, and hyperinflation