Energy Price Reform and Household Welfare: The Case of Turkey

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With energy security and climate change becoming growing concerns, policy makers have increasingly come to realize that energy prices will have to rise in order to reflect the full cost of consumption. In developing countries, this often involves removing subsidies to bring energy prices closer to market rates; in the developed world, the goal is to internalize environmental costs in energy prices. At the same time, however, there is concern that higher energy prices will create economic distress, particularly for poor households.

Recent reforms in Turkey illustrate these issues. The country's residential electricity tariffs remained constant during 2002–07 even though fuel costs increased. In 2008 the government approved a cost-based pricing mechanism that led to an increase in the retail electricity tariff of more than 50 percent over the course of one year. Price reform is a key part of the electricity market reform launched in Turkey in 2001. It is considered essential for encouraging energy efficiency, attracting private investment, and improving the financial position of the state-owned electricity utilities. Nonetheless, the magnitude of the price increase was unprecedented. Its potential effect on household consumption and welfare has prompted policy debate.

This paper presents a partial equilibrium analysis of the welfare impact of the tariff reform (through an increase in electricity expenditures and a decrease in electricity consumption) in Turkey. The indirect impact of higher electricity prices, channeled through higher prices of other energy-intensive commodities, is not analyzed. It should also be noted that while electricity reform may result in price increases, it also provides opportunities that would not otherwise exist to improve quality and reliability and to redirect public resources more transparently to the poor. Analyzing the broader impact of electricity pricing reform is beyond the scope of the paper.

To assess the distributional consequences of rising electricity prices, the analysis estimates a short-run demand function that allows income-based heterogeneity in household price sensitivities. The model is estimated using disaggregated consumption data for a representative sample of 8,572 Turkish households from the 2008 Household Budget Survey of the Turkish Statistical Institute. The data set provides rich detail on appliance ownership, dwelling features, income, and demographic characteristics. The large number of observations combined with the substantial rate changes under the price reform helps in identifying both price and nonprice segments of the demand function.

A common issue in using survey data for statistical analysis is that it results in only selective observation of those who choose to report. In the Turkish Household Budget Survey, about 20 percent of households with access to electricity did not report electricity expenditure. To address potential sample selection bias, the analysis applies Heckman's selection model. But it finds no find evidence of selection on unobservables, which suggests that sample selection bias is not a concern in this study. To lend credence to the specification and results, I also conduct out-of-sample tests of the model, which show that the model predicts consumption responses to new price changes in 2009 fairly satisfactorily.

By allowing price elasticities to vary with household income, the model reveals a highly differentiated distribution of demand elasticities in the population: all else being equal, the wealthiest households are three times as responsive in adjusting consumption to price changes as the poorest households are. Specifically, a 10 percent increase in the electricity price will cause households in the bottom income quintile to reduce electricity consumption by 1.6 percent on average, and those in the top income quintile to reduce it by 5.6 percent, all else being equal. Poor households are less flexible in adjusting electricity consumption because they use electricity for basic needs and are close to their minimum consumption levels. By contrast, wealthier households are more likely to own price-elastic appliances (such as air conditioners and dishwashers) and exhibit greater responsiveness to rising electricity prices.

Not surprisingly, lower-income households experienced a greater welfare loss as a percentage of income. The welfare loss from the 2008 price increase, approximated by the change in consumer surplus, is on average about 164 Turkish lira, or 2.16 percent of household disposable income, for a household in the bottom income quintile, compared with 330 Turkish lira, or 0.75 percent of income, for a household in the top quintile. These results are robust to alternative model specifications and modeling techniques.

The results suggest that when there is a positive relationship between electricity price elasticity (in absolute terms) and households' income, a uniform increase in the price of electricity can be quite regressive. Moreover, from the point of view of energy efficiency policy, removing subsidies to poor households will be less effective in reducing energy use than imposing a tax on high-income households, because wealthier households are more sensitive to price changes. Finally, given the relatively large financial burden of electricity expenses for the

poorest households, there is a strong case for carefully crafting social protection policies to ensure that stringent energy pricing policies do not impose undue hardship on this group.

The work presented in this paper also illustrates the advantages of using a rich micro data set to analyze the energy demand of the household sector. Many developing countries are implementing similar energy price reforms. The availability of household survey data would allow similar analyses in settings where differentiated price elasticity estimates are needed to evaluate the distributional impact of price increases.