

Decomposing Electricity Demand Elasticity in Iran

Computable General Equilibrium Approach

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Abstract:

Aggregate price elasticity provides helpful information about how price change affects aggregate demand, but there is a black box about adjustment mechanisms of price changes. In other words, aggregate price elasticity sheds no light on the empirical importance of the different kinds of adjustments within firms and households generating the aggregate response. The reliability of the aggregate elasticity would increase if it can be presented as the weighted sum of related items in different level of aggregation.

The aim of this study is to discuss and show how a general equilibrium analysis can be used to decompose demand elasticity in electricity market. In this model, we separate the contributions from various mechanisms to the price sensitivity of aggregate electricity demand. The contribution of households and activities demand is separated in first step and then the contribution of activities are decomposed to three components: substitution effects, scale effects and re-allocation effects. Briefly, in this context substitution effect is the relative change in the average electricity intensity of the sector attributable to changes in the industrial electricity intensities. Scale effect shows the relative change in the total aggregate input and reallocation effect is defined as the relative change in the average electricity intensity attributable to changes in the allocation of aggregate input between industries with different electricity intensities (Holmøy, 2005).

Our general equilibrium model consists of 9 production sectors and households, assuming Iran as a small and open economy. Our results shows that 100% increase in electricity price leads to 8.78% decrease in electricity demand, out of which 0.32% is related to households and 8.46% is related to sectors. The results indicate that electricity demand of households and activities decrease by 1.5% and 10.8% respectively. According to their electricity shares from

total electricity demand, the contribution of households in total decrease is 0.32%. Due to the higher electricity share in the demand and higher response to price changes, activities contribution reaches 8.46%.

In second layer, substitution effects with 5.9% have more important role with respect to other effects. Substitution effects are sensitive to the choice of the value of “elasticity of substitution between electricity and fossil fuels”, while scale effects and re-allocation effects are robust. Also "wholesale and retail" and "metal ores and other minerals" sectors have highest response to electricity price changes which contribute 2.27% and 1.84% respectively, in total 5.63% substitution effects.

Keywords: Electricity, Demand, Computable General Equilibrium, Elasticity, Iran.

JEL: D21, D22, D58, L94, Q41.

References:

- Ang, B. W. (1995). Decomposition Methodology in Industrial Energy Demand Analysis. *Energy*, Volume 20, Issue 11, 1081-1095.
- Bentzen, J. and T. Engsted (1993): Short- and long-run elasticities in energy demand: A cointegration approach. *Energy Economics* 15, 9-16.
- Holmøy, Erling. (2005). The Anatomy of Electricity Demand: A CGE Decomposition for Norway. Discussion Papers 426, Research Department of Statistics Norway.
- Longva, S., Ø. Olsen and S. Strøm (1988): Total elasticities of energy demand analysed within a general equilibrium model. *Energy Economics* 10, 4, 298-308.
- Madlener R. (1996). Econometric Analysis of Residential Energy Demand: A Survey. *Journal of Energy Literature*, II (2) (December): 3-32.
- Shahmoradi, Asghar and Honarvar, Afshin (2008). Gasoline subsidy and consumer surplus in the Islamic Republic of Iran, *OPEC Energy Review*, Volume 32, Issue 3 , Pages232 – 245.
- Steenho, Paul A. (2006). Decomposition of Electricity Demand in China's Industrial Sector. *Energy Economics*, Volume 28, Issue 3, 370-384.