An Empirical Analysis of Households Electricity Demand in Ampara District in Sri Lanka

A. L. Mohamed Aslam[1], John Nigel [2] and S. M. Ahamed Lebbe[3]

[1]*Ministry of Finance and Planning, Colombo, Sri Lanka*
[2]*Department of Economics & Statistics, University of Peradeniya, Sri Lanka*
[3]*Department of Social Sciences, South Eastern University of Sri Lanka*

Introduction

Electricity plays a crucial role in the socio economic development of a country (Beenstock et. al., 1999). Sri Lanka is one of the nations which produces electricity from a mixture of sources such as hydro power, thermal power, wind power and bio energy (Public Utility Commission for Sri Lanka, 2012). Hydro power is the primary source of electricity in Sri Lanka and generates electricity in ten large and one small power station in the Laxapana, the Mahaweli, and the Samanala complexes. In 2013, the electricity generated by hydro power was 6,918 GWh. The thermal power is the second source of electricity in Sri Lanka which produces 4,772 GWh and the generation of power through Non-Conventional Renewable Energy (NCRE) sources, including mini-hydro generation was 1,171 GWh in 2013. Bio energy is another source of power in Sri Lanka to supplement the electricity to Ampara and Monaragala districts which is made by using paddy husk. The electricity generated by bio energy was 260 GWh in 2013 (Central Bank report, 2013).

In Sri Lanka, electricity is mainly used for residential, religious, general, industrial, and hotel purposes. Numbers of consumers of the above categories have continuously increased in the past. The number of domestic consumers are 88% of the total number of electricity consumers in 2011.The largest share of 40% of the total electricity units has been sold

to domestic users in 2011 (Public Utilities Commission of Sri Lanka, 2013).

Electricity demand has been analyzed theoretically and empirically using different approaches (Beenstock et. al., 1999; Athukorala et al., 2007; Abosedra et al., 2009). These studies have considered different factors that influence the household electricity demand patterns according to the context and have analyzed the household electricity demand both at micro and macro levels. Complementing the existing studies, the present study will investigate the empirical realities of the households electricity demand in Ampara District in Sri Lanka. Hence, this study attempts to fill the research gap on household electricity demand through empirical test in the selected District. As there is a lack of research on this important issue, this empirical study is aimed to address this gap and this study was conducted in Ampara District of the Eastern Province of Sri Lanka.

Objectives

The general objective of the study is to estimate household electricity demand in Ampara district in Sri Lanka. The specific objectives of this study are to identify the factors that determine the household electricity demand in Ampara district, and to test the factors' significance in the developed model.

Methodology

Nine of the 20 Divisional Secretarial (DS) Divisions in Ampara District were randomly selected for the study (Addalaichenai, Akkaripattu, Kalmunai, Sainthamaruthu, Sammanthurai, Damana, Karithivu, Ampara, and Lahugal). On the basis of the household distribution a total of 250 households were selected as a sample. Usage of electricity by households in Ampara district has been continuously increasing. This study is investigated some of the selected determinant factors such as household income, price of electricity, quality of houses, numbers of

rooms of the households, usage of electrical appliances and family size as policy variables to identify household electricity demand in Ampara district.

The data were gathered through questionnaire and interviews in 2014 for the study. The questionnaire was pre tested with a few households to ensure the accuracy of the questions. In most of the literature surveyed, the constant elasticity model was used through OLS. Hence, this study also used the constant elasticity model. The functional form used and its extended model is as follows:

$$Qd \quad = f(RI, PPr, Qh, Nr, Mf) \dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

$$\ln Qd = \delta_0 + \delta_1 lnRI + \delta_2 lnPPr + \delta_3 lnQh + \delta_4 lnNr + \delta_5 lnMf + \dots + \epsilon_i \quad \dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Where,

Qd   - Household electricity demand;
RI   - Real income of households;
PP   - Weighted average price of electricity;
Qh   - Quality of house (0 – Normal, 1 – Upstairs);
Nr   - Number of rooms;
Mf   - Members of families.

Results and Discussion

This study identified that real household income, price of electricity, quality of the house, number of rooms, and members of the families are the key determinants of the households electricity demand. The estimated household electricity demand function is as follows:

Qd   = -1.17 + 0.0413RI - 0.914PPr + 0.0781Mf + 0.106Nr + 0.248Qh

P-Value (0.00)   (0.30)   (0.00)   (0.09)   (0.12)   (0.00)

Where:

        Qd   - Log (Qd (K/wh),
        RI   - Log (RI),
        PPr - Log (PPr),
        Mf   - Log (Mf),
        Nr   - Log (Nr),
        Qh   - Qh

The R^2 for this model is 0.89 and 'F' value of this model is 389.79. The estimated demand equation explained 89% of the variation in households electricity demand in the study area. The estimated coefficients of the price of electricity, members of families, and quality of the houses are statistically significant. Among these, the price of electricity was negatively related with households electricity demand and other two positively related.

Conclusions and Policy Recommendation

The demand model fitted the data considered for the analysis satisfactorily. The model explained a reasonable proportion of the variation in the dependent variable. This analysis clearly demonstrates that the households' electricity demand of study area was positively determined by the real income of the households, quality of the houses, number of rooms, and members of the families; and negatively related with the price of electricity. Even though the real income of households and number of rooms are positively related, statistically they are insignificant. According to the estimated result, a change in price, quality of house, or a change in the size of families has important policy implications because of their sizable influence on electricity demand in the study area.

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