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Consumer preference for labels in the purchase decisions of air conditioners in India

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ABSTRACT

Appliance labels provide consumers with information on energy usage of appliances and mandatory labeling is an important policy tool for promoting the adoption of efficient appliances. Following global practice, standards and labeling programs have been adopted in India for various appliances since 2006. This paper provides empirical support for this approach, by estimating the value placed by consumers in India on energy labels. The estimates of willingness to pay (WTP) for energy labels and higher efficiency as indicated on labels are obtained using a discrete choice experiment in purchase decisions of air conditioners. A mixed logit model is specified to estimate the parameters for chosen attributes of air conditioners. The results show that consumers place a positive value on the presence of labels. The preference for star rating levels is heterogeneous in the sample. The WTP for higher star rating is estimated which is a useful input in designing other energy efficiency programs in conjunction with the labeling program.

Introduction

As a part of the international negotiations on climate change, India has submitted to reduce the emission intensity of its gross domestic product by 33–35% from 2005 levels by 2030 (UNFCCC, 2015). India's net greenhouse gases emissions were 1884 million tonnes of CO_2 equivalent in 2010. The emissions from electricity generation was 38.3% of the total emissions (MoEF, 2015). The total electricity consumption of India has grown from 317 billion kWh in 2000–2001 to 874 billion kWh in 2013–2014. The industry sector accounts for the largest share (44%), followed by domestic (22%), agriculture (18%) and commercial sector (9%) (MOSPI, 2016). Enhancing energy efficiency in different sectors of the economy has been identified as an important mitigation strategy in India's efforts to reduce the emission intensity. The electricity consuming appliances are used in all these sectors and improvement in the efficiency of appliances can contribute in reducing the energy intensity of the economy.

The research on end-use efficiency began post-oil crisis in the 1970s in the developed economies. Consumer purchase and utilization decisions have been studied using qualitative choice models that estimate the trade-off between capital and operating costs implied from consumer decisions (Hausman, 1979; Train, 1985). Techno-economic studies have also been carried out to calculate cost effectiveness of efficient technologies using retail prices, energy costs and other assumptions (Gately, 1980; Koomey and Sanstad, 1994; Wada et al., 2012). These studies show the presence of market barriers to penetration of energy-efficient technologies and provide justification for policy intervention. Various policy interventions have been made and the impact of these programs are being studied. The three most used policy interventions in developing countries are information programs, regulations and financial incentives (Kelly, 2012). Information programs such as appliance labeling address the barrier of inadequate information to consumers, regulation such as efficiency standards on appliances limits consumer choices and financial incentives aim to lower the high capital cost of efficient technology and push the market towards higher efficiency. The incentive programs are sometimes implemented in conjunction with standards and labels (Mahlia, 2004).

Appliance labeling is a widely adopted policy instrument to improve efficiency in appliances. As per Harrington and Damnics (2014), a total of 81 countries have implemented standards and

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labeling program by 2013. Most of the countries have adopted endorsement labels or comparative labels on different electrical and electronic appliances. While the content of the label or the manner of presentation may differ across countries, the common objective is to facilitate comparison of products on energy efficiency. Most of these labels are based on a graphic concept such as linear scale, bars, and dials to show the relative energy efficiency of a product. For example, the ENERGY STAR label launched in 1992 in the US is an endorsement label. The US and Canadian Energy Guide labels are comparative labels on a continuous linear scale. The European Union energy label and China energy efficiency label are comparative labels based on categories using bars. The label design adopted in Australia, Japan, Thailand, South Korea, and India are comparative labels based on categories using dials with stars indicating relative energy efficiency (Wiel et al., 2006; Rohling and Schubert, 2013).

The impacts of the appliance labeling have been studied on the market transformation and the associated economic, energy and environment benefits (Webber et al., 2000; Tao and Yu, 2011). The impact of labels on consumer decisions has been studied using different methods. Qualitative assessment has been done using questionnaire-based studies (Murray and Mills, 2011; Zeng et al., 2014; Dhingra et al., 2016). Hedonic models and econometric models of consumer decision making have been used to quantify consumer preference for labels (Sammer and Wüstenhagen, 2006; Shen and Saijo, 2009; Ward et al., 2011; Galarraga et al., 2011). These studies found that consumers place a positive value on the labels. However, the comparison of value placed on labels as compared to other attributes to provide a benchmark for comparison has not been done. The studies estimating the quantitative value placed on labels is limited in developing countries. Also, there is limited research on quantifying consumer willingness to pay (WTP) for higher efficiency indicated on comparative labels based on categories. Incentive programs are designed for consumers to promote energy-efficient technologies in conjunction with labeling programs. The incentives to be offered should be determined based on consumer WTP for efficient products as indicated on labels in the absence of any incentives. If the incentives offered are more than the difference between the incremental cost and consumer WTP, the program may increase the fiscal burden and even increase electricity consumption due to increase in sales of appliances and rebound effect.

To address the identified research gap, this study estimates the monetary value placed by consumers on labels and their WTP for higher efficiency in the purchase decisions of air conditioners in India. Air conditioning is one of the most intensive electricity end uses in households who own air conditioners. The increase in urbanization and disposable household income is resulting in increased penetration of air conditioners in Indian households (Phadke et al., 2014). The sales of room air conditioners in India has increased from a million units in 2003–2004 to 3.1 million units in 2010–2011 and is estimated to be 4.3 million in 2016–2017. The increase in the ambient temperature due to climate change is also expected to result in an increase in the sales of air conditioners (Gupta, 2014). Air conditioners were first covered in the voluntary scheme of the comparative energy label in 2006. In 2010 it was brought under mandatory labeling. The efficiency standards for room air conditioners have been increased two times in 2012 and 2014. The information on the star labels on air conditioners includes the number of stars, energy efficiency ratio (EER) and other model specific details. The EER is the ratio of the cooling capacity and the electrical power input. The number of stars displayed on the label is determined by the Star Rating Band which is a range of EER specified by BEE which has been periodically revised (Table 1). The star rating reiterates the EER information in a pictorial representation on a relative scale to facilitate comparison among different options. The star rating is shown more prominently than EER under the assumption that visual presentation will get greater consumer attention. The star rating can take 5 levels corresponding to 5 stars where the minimum number of stars is 1 and the maximum is 5. Under the mandatory labeling scheme, a model with EER lower than the minimum value of the range for 1 star is not allowed to be sold in the market. Fig. 1 shows the share of different star rating in the sales of efficient models since the launch of the program.

Table 1
Periodic revisions of star rating bands for air conditioners in India.

EER (W/W)			
Star rating	2010–2011	2012–2013	2014–
1 Star	2.30–2.49	2.50–2.69	2.70–2.89
2 Star	2.50–2.69	2.70–2.89	2.90–3.09
3 Star	2.70–2.89	2.90–3.09	3.10–3.29
4 Star	2.90–3.09	3.10–3.29	3.30–3.49
5 Star	3.10–3.29	3.30–3.49	3.50–

In this study, the value placed on the presence of the label on air conditioners is estimated and WTP for high star rating on labels is calculated. A mixed logit model is specified on data collected from a sample of 148 consumers through in-person interviews in a discrete choice experiment. This paper is divided into five sections. Method and data section presents the method including the model specification and experiment design. Analysis and results section presents the results from the model estimation and in Discussion section a discussion on cost benefit analysis of efficiency improvement in air conditioners is presented. In Conclusions section the main conclusions drawn from the study are summarized.

Method and data

In the market of consumer durable, different models of a product are differentiated based on their attributes. When a consumer is offered with a set of alternatives the final decision of choosing a product is the outcome of a decision-making process. Discrete choice models are used to describe decision makers choices among alternatives. The discrete choice models are based on the random utility theory and the theory of utility maximization. The experiments that model consumer choices using discrete choice models to understand consumer preferences for different attributes of products are known as discrete choice experiments.

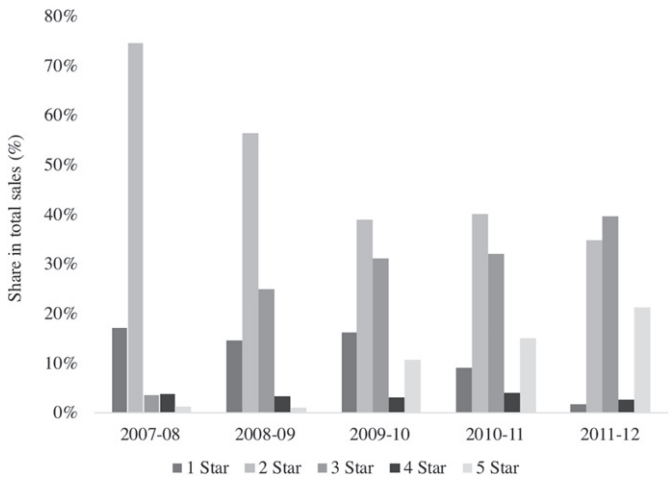

Fig. 1. Market share of different star rating appliances in air conditioners in India (MoEF, 2015).