



Policy implications of the purchasing intentions towards energy-efficient appliances among China's urban residents: Do subsidies work?



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ABSTRACT

Incentive policies are always used to sway purchase, retail stocking, and production decisions toward energy-efficient products by many countries or regions. So the effectiveness of such subsidies has been of much concern to scholars. This research focused on whether, or not, subsidy policies have guided people's intentions and behaviours. We investigated 436 urban residents from 22 provinces in China, covering the seven major geographic regions, and made an empirical analysis of the factors influencing Chinese urban residents' purchasing intentions towards energy-efficient appliances based on the structural equation model. On theoretical aspect, we developed the theory of planned behaviour. Our results show that the variable "POLICY" is insignificant which indicates that policy environment and media propaganda in China do not have significant effect on Chinese residents' willingness to pay for energy-efficient appliances. While, the residents' environmental awareness, past purchasing experiences, social relationships, age, and level of education all exert a significant influence on Chinese residents' purchasing intentions. Finally, based on the above research results, the corresponding policy suggestions which mainly focus on the time of subsidy, the object of subsidy and the method of subsidy are offered for policy makers.

1. Introduction

Since the 1990s, with the constant and rapid development of China's economy, and continuously rising national income, the uses, amounts, and types of household appliances in China are increasing and spreading rapidly. According to the statistics, the total number of household appliances and other energy-consuming products has doubled in the last 20 years (National Bureau of Statistics of the People's Republic of China, 2013). Accordingly, the domestic electricity consumption in China increased by 43% between 2008 and 2012, causing significant effects on the energy-saving and carbon emission reduction targets of China (Barr et al., 2005; Steg, 2008; Dietz et al., 2009; Yu et al., 2013). In fact, household appliances have become the main source of household energy consumption: 70% of family carbon dioxide emissions come from household appliances, and air-conditioners; refrigerators and TVs are the main components, accounting for 50% of household emissions (Xu, 2010). Therefore, cultivating consumer purchasing intentions towards energy-efficient household appliances (referred to as energy-efficient appliances) and promoting the use of energy-efficient appliances is crucial for China to achieve her

energy saving and emission reduction goals.

The Chinese Government pays much attention to energy conservation problems. Since 2004, the government proposed the establishment of a conservation-minded society, and published a series of policies and regulations pertaining to energy saving. In August 2004, the Central Government issued an administrative measure – the China Energy Label – and began to implement an energy efficiency labelling system in September 2005. Furthermore, the Government passed the Energy Conservation Law of the People's Republic of China in 2007. Since 2009, to contribute to the expansion of domestic demand, especially consumer demand, and to improve the energy efficiency of terminal products, the Chinese Government launched a major project entitled "The public-benefit project for energy-efficient products" promoting the application of ten energy-efficient products, such as: air conditioners, refrigerators, flat-screen computer monitors, washing machines, televisions, *et al.*, whose energy efficiency grade is level 1 or level 2, through financial subsidies thereof. In particular, in June 2012, during implementation of this public-benefit project, the Government published detailed rules to promote five types of energy-efficient appliances (air-conditioners, flat-screen televisions, refrigerators,

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Table 1
Policies, laws and regulations on energy saving in China.

Time node	Policies, laws and regulations
2004.8.	Issued the administrative measures of China Energy Label.
2005.9.	Implemented energy efficiency labelling system.
2007.10.	Enacted the Energy Conservation Law of the People's Republic of China.
2009.5.	Launched a big project named "People-Benefit Project for Energy-efficient Products".
2012.6.	Particularly published relevant detailed rules to promote five types of energy-efficient appliances (air-conditioners, flat-screen televisions, refrigerators, washing machines and water heaters) by the way of subsidy.
2013.5.31.	A year of national subsidy for energy-efficient appliances ended.

washing machines, and water heaters) by way of subsidy, with a tentative promotion period of one year. It is shown in Table 1.

Before China's "Public-benefit project for energy-efficient products", the United States provided financial aid to energy-star products, such as subsidies for energy-saving washing machines in California at \$75/set, a refrigerator subsidy at \$75/set to \$125/set; South Korea and Australia have also used financial subsidies to promote energy-efficient products. In 2008, a subsidy worth ¥280 million was used for promoting energy-saving lamps in China. As a result, 62 million energy-saving lamps were sold which directly stimulated social consumption worth ¥650 million and saved electricity in the amount of 3.2 TW in that year. Both domestic and foreign experience shows that government subsidy plays an important role. It can not only accelerate the promotion of energy-efficient products, but also eliminate market obstacles to their uptake.

On 31 May 2013, a year of national subsidy for energy-efficient appliances ended. The government achieved its policy targets almost perfectly from a macro point of view. According to survey data from a national survey of household appliances in China (China Market Monitor Co., Ltd), during the period of implementing this subsidy policy for energy-efficient appliances from June 2012 to May 2013, sales of colour TVs, refrigerators, washing machines, air-conditioners, an water heaters (the products winning the bidding) reached 50.13 million, 34.22 million, 33.17 million, 39.86 million, and 27.11 million units, respectively. Up to April 2013, the retail market shares of the five types of energy-efficient appliances (the products winning the bidding) increased significantly (as shown in Fig. 1). In addition, in 2014, national total electricity consumption reached 5.52 trillion kWh, with year-on-year growth of 3.8% and the growth rate falling by 3.8% points, which was the lowest level since 1998 (2.8%). In 2014, the growth in electricity consumption of urban and rural residents was 2.2% (year-on-year), a fall of 6.7% points.

Under such "wonderful" macro data, whether the Chinese residents' purchase intention and behaviour towards energy-efficient appliances really changed after the subsidy policies remains a key research question. Whether, or not, subsidy policies have an impact on Chinese residents' willingness to pay for the energy-efficient appliances, and what factors affect Chinese residents' purchasing behaviour of energy-efficient appliances also remain key questions. In this work, to solve the aforementioned problems, we investigated the behaviour of urban residents from 22 provinces in China, covering seven major geographic regions, and established a model based on the method of a structural equation model.

2. Literature review

Many scholars have researched the purchase of energy-saving appliances. In view of the research focus of this paper, we here examine the literature covering policy as a starting point, review it based on the theoretical models thereof, and hereby primarily

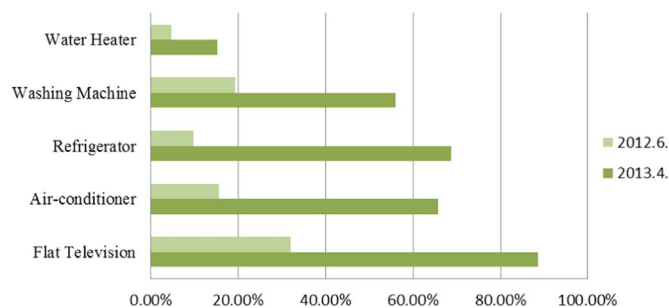


Fig. 1. Changes of the retail market shares of the five kinds of energy-efficient appliances which won the bidding because of the subsidy policy. Source: China Market Monitor Co., LTD¹

propose our research hypothesis.

2.1. Incentive policy

Galarraga et al. (2016) propose that the current academic research on energy efficiency are seriously out of line with the problem of policy making. To promote people's purchases of energy-efficient appliances, many countries have introduced a lot of incentives, such as subsidies, taxes, reward and punishment systems, etc. However, most current academic studies consider only the use of tools, rarely consider combining with the purpose of policy in the context of policy constraints. Therefore, studies combined with the country's policy implementation background are significant.

In terms of green consumption and energy consumption, Yao et al. (2014) use Quantile Regression and the Counterfactual Analysis to study the effect of subsidy policy and the inherent family property behaviour on *per capita* electricity consumption. They find that the subsidy policy has a positive effect on the electricity consumption of urban and rural residents in general, but residents at two ends of the power consumption distribution are not sensitive to the subsidy policy. They also find that the subsidy policy has a rebound effect on the total electricity consumption of residents, and leads to an increase in power consumption. Yang and Zhao (2015) study the effect of subsidy policy on high-, and low-income families and find that high-income families translate their attitudes to green consumption into green purchasing behaviour rather well.

The above facets are combined with the policy background, but those studies which combine relevant policies and energy-efficient appliance purchase behaviour are rare. In the context of the end of China's energy-efficient appliances subsidy policy, this research into residents' purchasing behaviour towards energy-efficient appliances, aimed to provide meaningful conclusions for policy-makers.

From the perspective of the object of an incentive policy, most people generally believe that the incentive policy is directly aimed at consumers. Actually, the incentive policy can also play other roles upstream of the entire product supply chain: for example, an incentive policy can encourage manufacturers to produce more energy-saving products (an "upstream incentive policy"), it can also encourage retailers to sell more energy-saving products (a "midstream incentive policy"). Similarly, incentive policies for consumers are called "downstream incentive policies". Upstream incentive policies include three types: technology procurement,² financial incentive, and subsidy. China's subsidy policy on energy-efficient appliances is an upstream

¹ <http://www.monitor.com.cn/>.

² Technology procurement is a means for the government to encourage manufacturers to carry out technological innovation. The specific method is that the government put forward a standard of a personality of a product, such as energy saving, environmental protection, low cost, etc, and then take some similar approaches to the tender. Manufacturers who are able to create products which can meet the government's standards will receive a corresponding incentive or subsidy.

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