

Impacts of China's Energy Efficient Appliance Subsidy Program on Consumer Behavior

November 2013

Yang Yu Yang Yu, CLASP
All China Marketing Research (ACMR)



ABSTRACT

In June 2012, China launched the energy-efficient appliances subsidy program. This study investigated the program's impact by surveying 2,630 consumers in ten cities with different socioeconomic conditions. The results showed that Chinese consumers were very conscious about electricity savings and they considered energy-saving an important factor when selecting appliances. The study found that 62% of interviewed consumers were aware of the subsidy program but that consumers lacked in-depth understanding of the program. A greater focus on, and increased budget for, program marketing and outreach could potentially improve public awareness of energy-efficient appliances and facilitate market transformation in the long run. Only 13% of consumers claimed that the subsidy was the primary reason for them to purchase an energy-efficient appliance, and most Chinese consumers interviewed were willing to pay less than 10% more for energy-efficient appliances. Consumers' expectations of subsidy size varied between cities, but on average, they would become very likely to purchase energy-efficient appliances when the subsidy size was between 20% and 30%. Based on these findings, CLASP recommended that in the future only Tier 1 appliances (the most efficient) should be subsidized and the size of the subsidy should be increased so that it would meet the consumers' expectations.

Key words: Appliance efficiency, subsidy program, incentive policy, consumer survey, consumer behavior.

INTRODUCTION

The burgeoning Chinese economy of the past decades has resulted in significant acceleration of urbanization and notable increases in Chinese citizens' disposal income. Along with rapid economic development, China's energy consumption has increased at an extraordinary rate, and China surpassed the United States to become the world's largest energy consumer in 2010 (International Energy Agency, 2010).

The residential sector was soon recognized as one of the major contributors to overall energy consumption. Following reforms that opened up China's economy, living standards of Chinese citizens improved dramatically and the ownership of household appliances increased. Residential electricity consumption increased exponentially in turn. In 2010, electricity consumption in the residential sector was 512.5 TWH, accounting for approximately 12% of the total electricity consumption in China (National Bureau of Statistics of China, 2012). The energy saving potential for the residential sector was also significant. Murata et al. estimated that improving the efficiencies of end-use appliances would lead to a 28% reduction in electricity consumption by 2020 (Murata, Kondou, Hailin, & Weisheng, 2008).

Chinese policymakers recognized the importance of promoting high energy efficiency household appliances and has repeatedly highlighted it in government plans, including the “Comprehensive Working Plan of Energy Conservation and Carbon Reduction in the 12th Five Year Plan”. Policymakers designed and implemented a series of measures that aimed to improve the efficiency of household appliances and facilitate a market transformation toward energy efficiency. Since the 1980s, China has implemented 48 Minimum Efficiency Performance Standards (MEPS) for energy-using products. In 2005, China introduced the China Energy Label (Figure 1), a categorical mandatory energy information label, adapted from the EU categorical energy label (Zhou, 2008). The label categorizes appliances into five tiers (or three tiers), with Tier 1 being the most efficient and Tier 5 (or Tier 3) being the least efficient. Tier 5 (or Tier 3) was also the minimum energy efficiency required for products to enter the Chinese market. China Energy Labels now appear on 29 types of products, covering all major household appliances.



Figure 1 China Energy Label

To complement the MEPS and China Energy Labels, and to facilitate market transformation, the Chinese government also launched a series of incentive programs. Such programs included the *Appliances to the Rural Areas Program* in 2008, the *Promoting Energy-Efficient Appliance for the Benefit of People Program* in 2009, and *Appliances Trade-in Program* in 2009 (China National Institute of Standardization, 2012). In the executive meeting chaired by Premier Wen Jiabao on May 16, 2012, the State Council decided to commit 26.5 billion RMB (\$4.26 billion) to the newest phase of the *Promoting Energy-Efficient Appliance for the Benefit of People Program*

(referred to as "the subsidy program" hereinafter). This subsidy program, launched on June 1, 2012 and scheduled to end on May 31, 2013, offered consumers incentives for the purchase of energy-efficient appliances (Tier 1 and/or Tier 2 appliances). It covered six categories of household appliances, including air conditioners, televisions, refrigerators, clothes washers, water heaters and desktop computers.

The subsidy program was the latest, and by far the largest, incentive program implemented by the government that seeks to promote the use of energy efficient products and improve the energy efficiencies of end-use electric products. However, no studies had been conducted to assess the effectiveness of this program or similar programs from the consumers' perspective. This study aimed to fill this gap by conducting a consumer survey in 10 cities across different socioeconomic strata in China.

The primary objectives of this study were 1) to investigate consumers' behavioral characteristics when purchasing energy-efficient appliances; 2) to study consumers' level of awareness about the subsidy program; and 3) to investigate the relationship between the size of the subsidy and consumers' expectations under different purchase scenarios. Based on the results of this study, we attempted to formulate a set of practical policy recommendations for future policy designs and implementations.

METHODOLOGY

This study was comprised of two phases. Phase I was a qualitative study to gain basic understanding of consumer behavior when purchasing household appliances, their level of awareness of the subsidy program, their experiences with and feedback on the subsidy program, and their attitude towards the current subsidy size. Phase I of the study was carried out in five cities: Beijing, Chengdu, Changsha, Wuxi and Jiangmen. The selection of cities was based on both their socioeconomic make-up and location. The cities were classified into four tiers, with first tier being most socioeconomically advanced cities, such as Beijing, and fourth tier being smaller cities, such as Jiangmen (Table 1). Two focus group meetings (FGM), each with eight participants, were conducted in each city. Each FGM consisted of four male and four female participants, from both high income and low income groups. Among the eight participants, six of them had purchased household appliances and claimed the subsidy in the past six months, and two of them were planning to purchase new household appliances in the next three months. Additionally, the participants had to satisfy the following requirements: 1) had resided in their city for at least one year; 2) were able to make purchase decisions; 3) had not participated in any market surveys of the subsidy program for the past two years; and 4) do not work in advertising, media and market research or other related sectors.

City Tiers	GDP(Billion RMB)	Population(Million)
1st	>450	Urban>7 and rural>5
2nd	>100	Urban>3 and rural>2
3rd	>50	Urban>0.8 and rural>0.5
4th	>20	Urban>0.5 and rural>0.3

Table 1 Classification of Cities

The results of the Phase I study were used to develop a detailed survey that was distributed to consumers in 10 cities for the Phase II study (Table 2). Phase II was a quantitative study designed to measure the impact of the subsidy on consumer behavior. The survey used in the Phase II study covered three major areas. The first component examined consumers' purchase behaviors – what factors the consumers considered the most when they purchase appliances; whether they purchased energy-efficient (EE) appliances (appliances with Tier 1 and/or Tier 2 energy efficiencies); and what the primary reasons were for consumers to choose (or not choose) EE appliances. The second component studied the level of awareness consumers had about the subsidy program. The consumers were asked whether they had heard of the program, whether they could name all six subsidized product categories, whether they knew the size of subsidy for those products, and what their general response to the subsidy program was. The third component investigated consumers' willingness to pay for efficient appliances and attempted to quantify the consumers' expectations for the size of the subsidy under different purchase scenarios.

Tier	Cities	2010 Population (million)	Sample size determination
1st	Beijing	19.61	450
	Shanghai	23.02	500
2nd	Shenyang	8.11	200
	Chengdu	14.05	330
	Xi'an	8.47	200
	Changsha	7.04	180
3rd	Wuxi	6.37	150
	Dongguan	8.22	200
4th	Luoyang	6.55	150
	Jiangmen	3.76	140
Total		105.2	2,500

Table 2 Surveyed cities and sample sizes

The number of survey participants required for an adequate sample size was 2500, which would ensure a 95% confidence interval. The number of participants in each city

was determined by its population, as shown in Table 2. In each city, four locations were selected for surveys and interviews: an appliance retail store, a high-end residential community, a middle-class residential community and a transportation hub. The total number of consumers interviewed was 15008, out of which 2630 completed the survey. Similar to the Phase I study, these consumers either purchased household appliances covered by the subsidy program in the past six months or planned to make a purchase in the next three months. These consumers also had to satisfy the additional requirements as described in the Phase I study. These 2630 respondents will be referred as "the successful sample" in the following discussion, and most of the analysis was performed based on the successful sample. The demographic information of the successful samples can be found in Table 3.

Age		Household size	
18-25	24.6%	One person	9.0%
26-35	26.6%	Two persons	12.8%
36-45	25.7%	Three persons	69.9%
46-55	23.2%	Four and above	8.3%
Gender		Education	
Male	50.0%	High School	36.8%
Female	50.0%	Diploma	38.2%
Income		Bachelor	23.3%
High	37.1%	Master	1.6%
Medium-Low	62.9%	Doctorate	0.1%

Table 3 Demographic information of the successful samples (N=2630)

RESULTS & DISCUSSION

Behavioral Characteristics of Consumers

A number of factors that could potentially influence a consumer's purchase decision about a particular type of appliance were investigated. For each type of appliance, the consumers were asked to select the most important factor they would consider when making a purchase.

The influence of each factor was found to vary depending on the type of appliance, as shown in Figure 2, but energy-saving was among the top three factors for all appliances except for desktop computers. For televisions and desktop computers (PCs), brand and price were the top considerations for most consumers, whereas for heavier energy consuming appliances, such as refrigerators and air-conditioners, large proportions of consumers would consider energy-saving as the most important factor. The results of this study were similar to those found by Ma et al., where brand, price and energy savings (consumption) were the top three factors weighed by consumers when

purchasing refrigerators, clothes washers and air-conditioners (2011). The considerations of Chinese consumers varied slightly from European consumers, whose top appliance purchase considerations included quality, cost vs. quality, and energy consumption (Gaspar & Antunes, 2011).

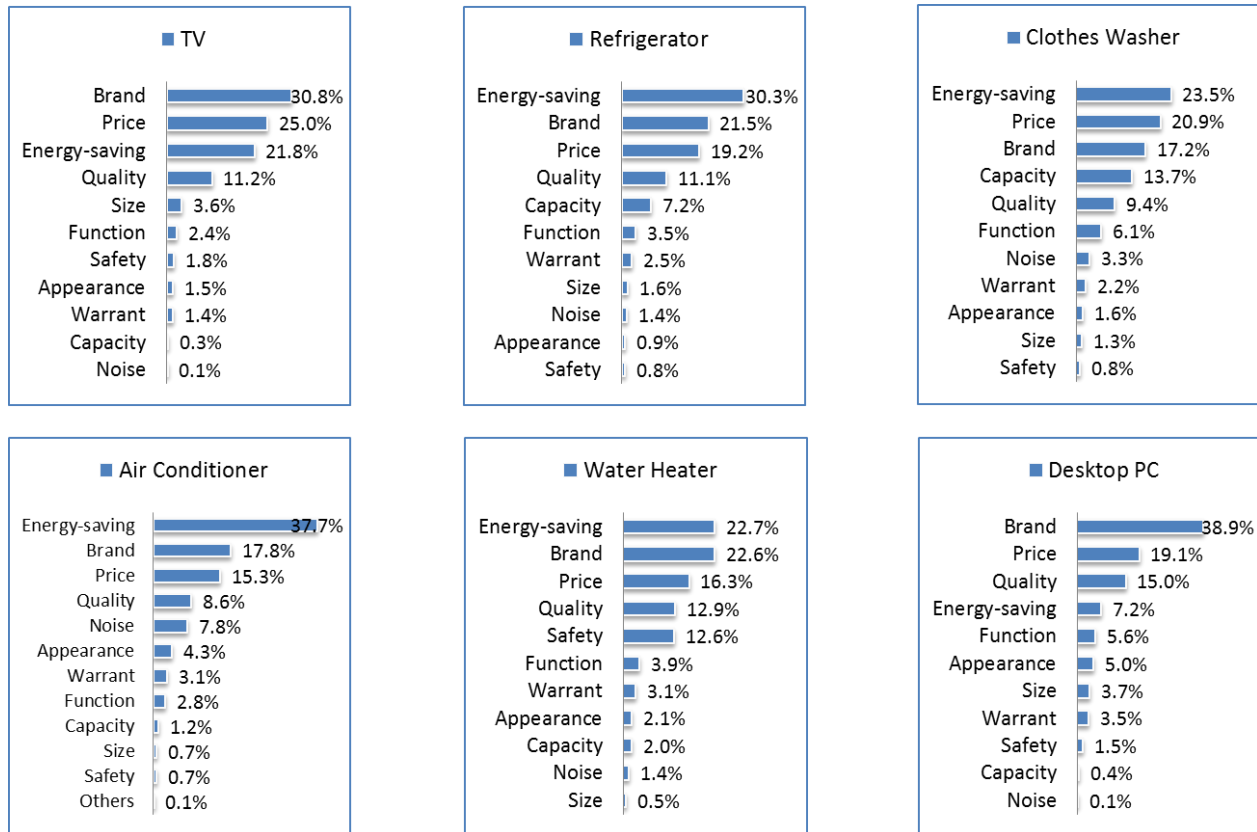


Figure 2 Factors influencing consumers' purchasing decisions (% of consumers, N=2630)

75% of the interviewed consumers had purchased appliances in the past six months, while 25% planned to purchase a new appliance in the next three months, as illustrated in Figure 3. Among those who had purchased appliances, 87% of consumers chose energy-efficient appliances (appliances with Tier 1 or Tier 2 energy efficiency grades). The high percentage of energy-efficient appliance purchases may be explained by the small price gap between certain types of efficient appliances and non-efficient appliances (appliances with Tier 3-5 energy efficiency grades). For example, the price of flat-panel televisions was more closely related to their screen size than to their energy efficiency tiers; for the same screen sizes, price differences between efficient and non-efficient televisions were not significant (CLASP & Top10 China, 2013). Moreover, for some appliances, the market was already saturated with efficient models, leaving consumers very few choices in terms of energy efficiency tiers. For instance, more than 95% of the refrigerator models in the Chinese market were Tier 1 and Tier 2 products (CLASP & Top10 China, 2013). This uniformity suggests that a new set of energy

efficiency classification standards was needed for those appliances, but further investigation was beyond the scope of this study.

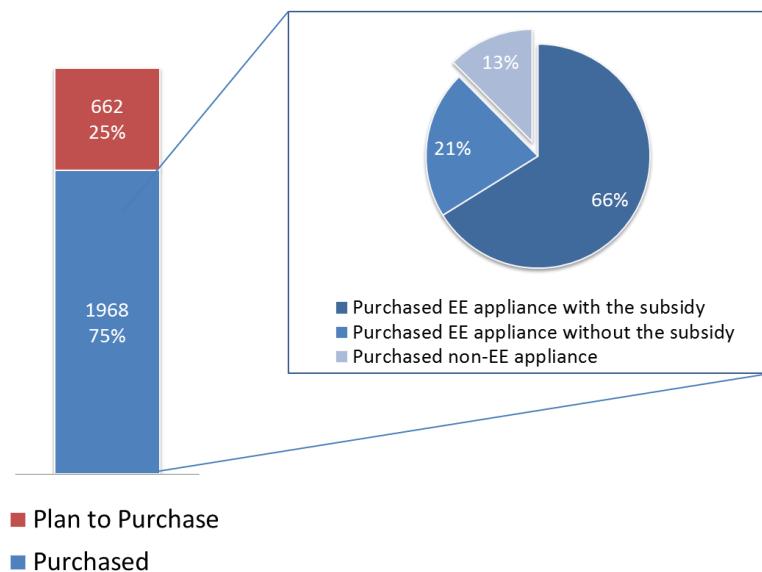


Figure 3 Appliance purchase status among consumers (N=2630)

66% of consumers interviewed had participated in the subsidy program and claimed their subsidies when purchasing energy-efficient appliances. However, 21% of consumers did not participate in the program even though they purchased energy-efficient products. It should be noted that not all energy-efficient appliances were covered by the subsidy program.

For consumers who had purchased energy-efficient appliances in the past six months, 53% considered electricity savings the primary influence when making the purchase, whereas 26% of consumers purchased energy-efficient appliances because these consumers considered themselves as having environmental and energy conservation awareness (Figure 4). These results were similar to findings from a previous U.S. study by Zhao et al., that approximately 76% of 437 survey respondents considered savings the major factor in their decision-making on home energy efficiency improvement (2012). Similarly, Shen & Saijo found that energy labels indicating electricity savings had significant effect on Shanghai consumers' preference for energy-efficient air conditioners and refrigerators (2009). The results from these studies all indicate that consumers are highly conscious of their electricity bills.

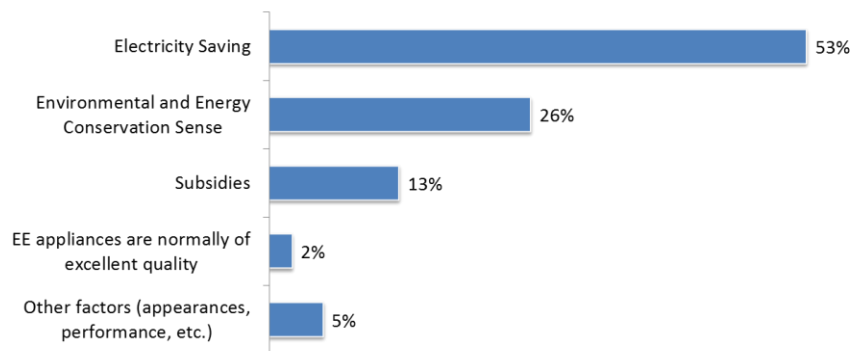


Figure 4 Primary reason for consumers to choose EE appliance (% of consumers, N=1723)

Research has also shown that consumers' propensity to purchase energy-efficient products is closely related to electricity price (Mills & Schleich, 2010; Reiss & White, 2008). China's average electricity price increased continuously from 0.262 RMB/kwh in 1996 to 0.51 RMB/kwh in 2007 (Huang, 2009). This continual increase in China's electricity prices may be one reason electricity saving was a top consideration for many Chinese consumers purchasing energy-efficient appliances.

Expected appliance lifespan may have been another reason consumers considered electricity savings when purchasing energy-efficient appliances. Most of the appliances covered by the subsidy program were major household appliances with relatively long lifespan, in the range of 10 to 15 years. One previous study estimated that the average lifespan for refrigerators and clothes washers were 16 years and 12 years, respectively (Canadian Appliance Manufacturers Association, 2005). For appliances like these that are purchased infrequently, it was reported that consumers would consider not only the cost of the appliances, but also long-term properties, such as energy-saving benefits in the long run (Young, 2008).

The subsidy program did not appear to be a major factor in Chinese consumers' decision on whether to purchase energy-efficient products, as only 13% of consumers reported that they were motivated by the subsidy (Figure 4). However, this result does not necessarily mean that the subsidy program was ineffective. Firstly, although the subsidy was not the primary reason that most consumers purchased energy-efficient appliances, the subsidy program still had significant influence on consumers' decisions, as indicated in Table 4. In this way, the subsidy could act as a catalyst for energy-efficient appliance purchases and hasten a planned purchase. Secondly, the non-monetary effects of the subsidy could also contribute to the consumers' choice of energy-efficient appliances. Previous study has demonstrated that the mere existence of a rebate made consumers more willing to choose high efficiency products because customers could feel more comfortable about the promised energy efficiency when a rebate was offered (Train & Atherton, 1995).

	# of appliances purchased with subsidy	Influence of subsidy (1 being lowest and 5 being highest)
TV	725	4.1
Refrigerator	397	3.9
Clothes Washers	271	3.9
Air-Conditioner	330	4.0
Water Heater	212	3.7
Desktop PC	102	3.9

Table 4 Influence of subsidy on consumers' purchase decisions

For those who did not purchase energy-efficient appliances, high price was one of the key barriers, as indicated in Figure 5. 39% of consumers also expressed the concern that high energy efficiency of an appliance would sacrifice quality. 26% of consumers reported that the complexity of the subsidy claiming process was the reason that they did not choose energy-efficient appliances.

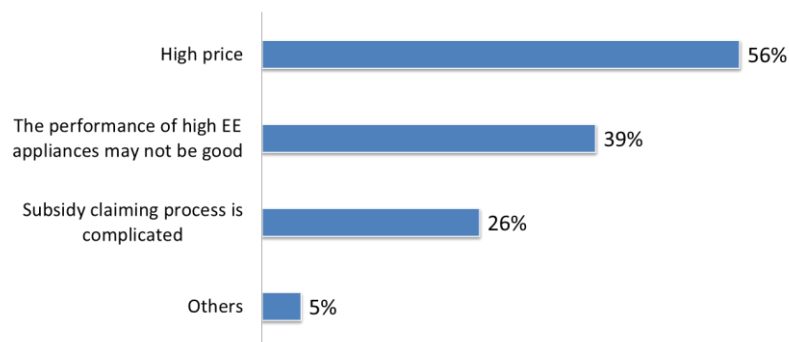


Figure 5 Reasons for consumers not to choose EE appliance (% of consumers, N=245)

Program Recognition and Awareness among Consumers

Among the 15008 total consumers interviewed, 62% had heard of the subsidy program (Figure 6). As shown in Figure 7, among those who completed the survey, 58% had seen the subsidy program label depicted in Figure 8. However, most of the consumers lacked in-depth knowledge of the subsidy program. Only 10% of consumers were able to name all six types of appliances covered by the program while most of the consumers knew the subsidy size for only one type of appliance or did not know the subsidy sizes at all, as shown in Figure 9 and Figure 10. So while there was a considerable level of awareness among consumers that the subsidy program was available, most did not have detailed knowledge of it.

It should be noted that raising awareness of energy efficiency programs is typically a gradual process. For instance, in 2000, only 40% of consumers were aware of the U.S.

Energy Star program, but consumer awareness increased to 60% of the population by 2005 and exceeded 80% in 2011 (U.S. Environmental Protection Agency, 2001; U.S. Environmental Protection Agency, 2006; U.S. Environmental Protection Agency, 2012). Based on the progress of the Energy Star program, current consumer awareness of the Chinese subsidy program is satisfactory, but there is room for improvement.

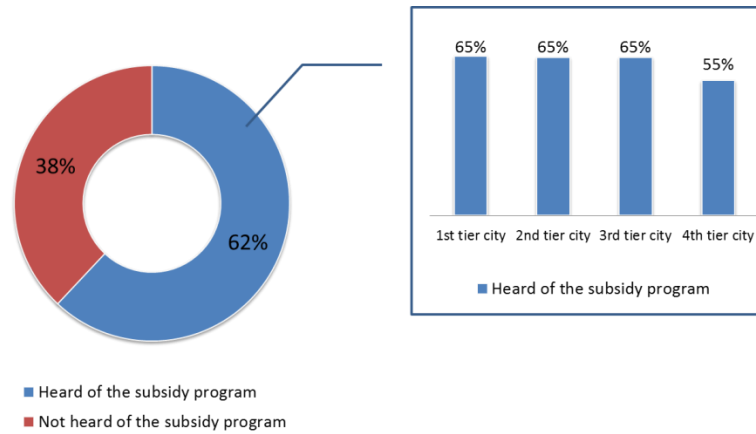


Figure 6 Aware of the existence of the subsidy program (% of consumers, N=15008)

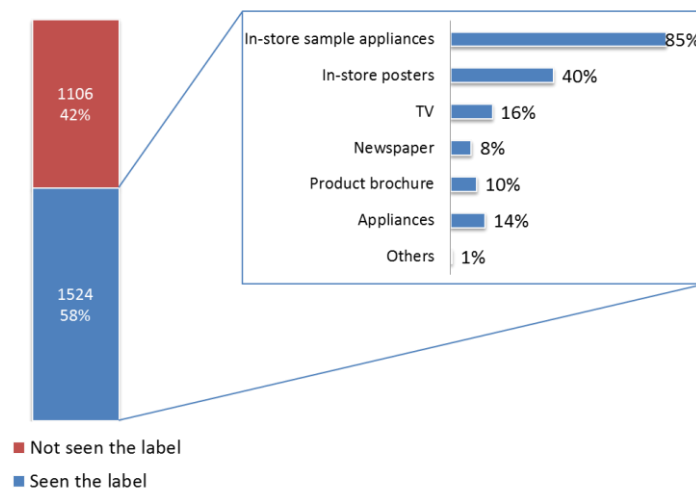


Figure 7 Aware of the subsidy program label (% of consumers, N=2630)



Figure 8 “Promoting Energy-Efficient Appliance for the Benefit of People” subsidy program label

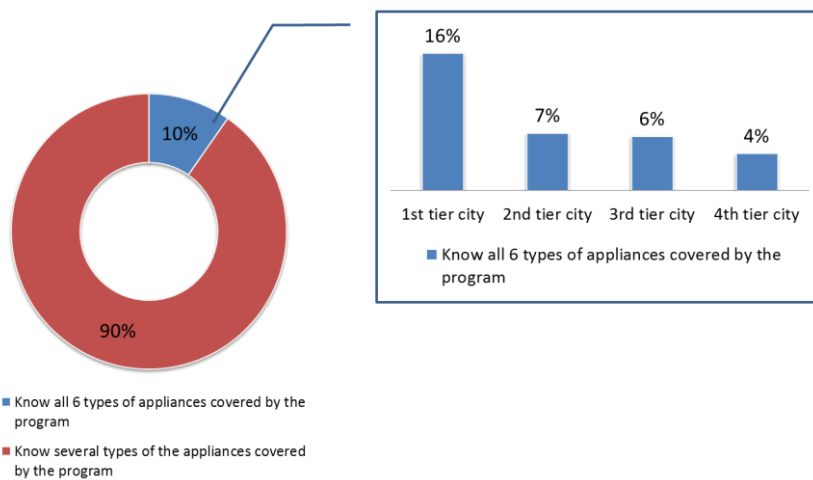


Figure 9 Knowing the types of appliances covered by the subsidy program (% of consumers, N=2630)

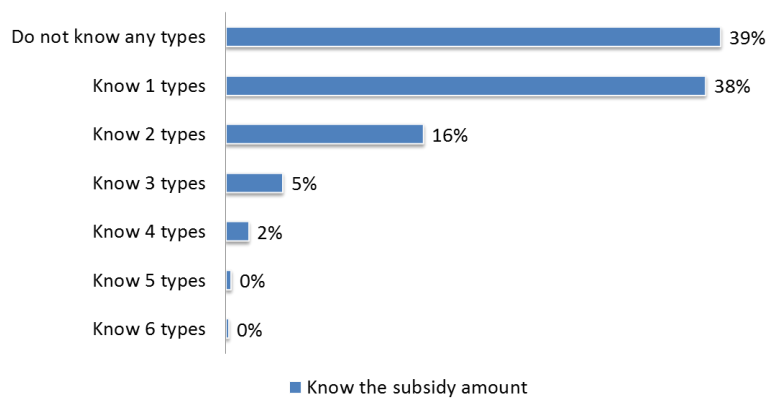


Figure 10 Understanding the size of the subsidy (% of consumers, N=2630)

Figure 6 and Figure 9 illustrate that consumer awareness in fourth tier cities was lower compared to other cities, indicating that regional and socioeconomic status may also affect consumer awareness. Similarly, a previous study found that certain areas in the

United States have markedly higher residential energy efficiency than other regions, and greater propensities to purchase Energy Star labeled appliances, suggesting that regional norms played a significant role in purchase behavior (Murray & Mills, 2011). In China's case, these findings suggest that policymakers have an opportunity in fourth tier cities to enhance the promotion of energy efficiency programs, and perhaps to raise awareness of energy conservation in general.

A majority of consumers learned about the subsidy program from information in retail stores and/or referrals from friends or relatives (Figure 11). Retail store dissemination included program posters, signage, advertisement, pamphlets and introduction by sales staff. Although online shopping has increased in recent years in China, consumers still chose to visit retail stores to shop for appliances. Therefore, further enhancing program promotion and dissemination in retail stores could improve program effectiveness.

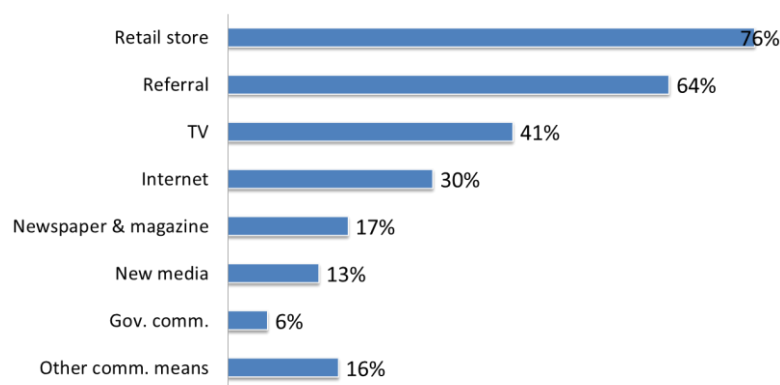


Figure 11 Communication channels for the subsidy program (% of consumers, N=2630)

Participation of sales staff was a major component in retail store dissemination of program information. Previous research found that sales staff was a primary source of information for consumers (35.8% of surveyed consumers), and that consumers held positive attitudes towards sales staff and valued their opinions (Gaspar & Antunes, 2011). Therefore, policymakers should consider providing training for sales staff that would enable them to supply accurate information about the subsidy program and energy-efficient appliances to consumers. Further, incentives for sales staff (such as commissions) could motivate them to push consumers toward energy-efficient appliances.

Referral or recommendation of the subsidy program through personal relationships (family, friends, or co-workers) was also an important communication channel, as 64% of consumers learned about the program that way. People are more likely to trust the information they learn from family, friends or co-workers, and encouragement from these personal relationships appeared to be more effective than outside pressure in the adoption of home energy-efficient and renewable energy products (Zhao et al., 2012).

As such, it is strongly suggested that policymakers take advantage of booming social media networks such as Weibo (Chinese version of Twitter) or Wechat (a smartphone-based text and voice messaging application that reportedly has over 300 million users in China) to reach out to consumers to promote the subsidy program.

Size of the subsidy and consumers' expectations

Energy-efficient appliances are typically more expensive than similar non-efficient appliances, and the purpose of incentives (in this case, subsidies) is to close the price gap and encourage consumers to choose efficient appliances. It is logical to assume that consumers would be more likely to purchase energy-efficient products as the size of the subsidy increases. The size of the subsidy should be sufficient enough to drive consumers to choose energy-efficient appliances, but not so large that the program's cost-effectiveness is reduced.

Research suggests, however, that the actual relationship between the size of incentive and consumers' response is more complicated. Aside from energy efficiencies, factors such as brand, function, quality and appearance also contribute to consumers' purchasing decisions. Some studies reported a direct proportionality between the size of the subsidy and consumers' participation rate, while others found the relationship unclear. In a small-scale experiment conducted by the New York State Electric and Gas Corporation, rebates were offered to households to purchase fluorescent bulbs to replace existing incandescent bulbs, and the response rate was found to increase steadily with the size of the incentive (Stern, Berry, & Hirst, 1985). In another study, it was reported that the relationship between the size of the incentive and the participation of consumers was inconclusive (Stern et al., 1986). Therefore, this study attempted to define that relationship more clearly, and to determine the subsidy amount that would induce Chinese consumers to go through with their purchase of an energy-efficient appliance.

Consumers' willingness to pay

In this study, the consumers were first asked whether they were willing to pay more for energy-efficient appliances and then asked about their expectation of the size of the subsidy. Compared to what they would pay for non-efficient appliances, 86% of Chinese consumers claimed that were willing to pay extra for energy-efficient appliances in various amounts. The extra cost that most consumers were willing to pay was below 10% (Figure 12). However, in actual practice, not all consumers who claimed to be willing to pay more for energy-efficient appliances would actually do so (Banerjee & Solomon, 2003). It is possible that the extra cost Chinese consumers were willing to pay was lower than they claimed, and willingness to pay among Chinese consumers was lower than it was for European consumers. For example, Swedish consumers were found to be willing to pay 30% premiums for Class A washing

machines compared to Class C (Sammer & Wüstenhagen, 2006). In a more recent study conducted by CLASP, European consumers were found willing to pay, on average, 44% and 50% more for higher efficiency refrigerators and televisions, respectively (2013). These comparisons suggest that a larger incentive would be needed to actually alter Chinese consumers' purchase decisions.

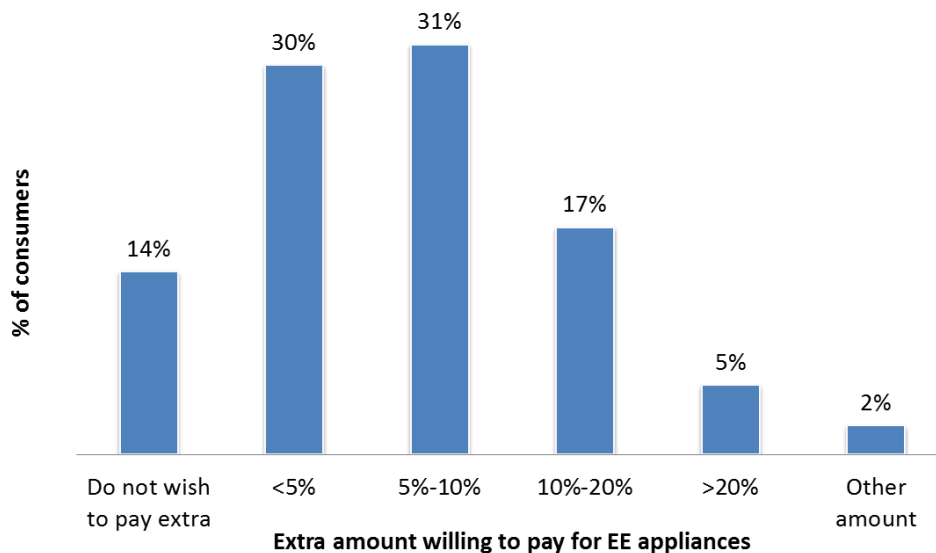


Figure 12 Consumers' willingness to pay for EE appliances (N=2630)

When asked about their expectations for subsidy size, all surveyed consumers were given two hypothetical scenarios. The first was inelastic demand, under which consumers needed to purchase new appliances, perhaps because their old appliances broke or they needed new ones for use in a new home. The second scenario was elastic demand, where consumers had the flexibility to choose whether or not to purchase new appliances, such as replacing a functioning older television or adding a secondary television.

The likelihood of consumers purchasing energy-efficient appliances was found to increase with the size of the subsidy under both scenarios, as illustrated in Figure 13, though consumers with elastic demands required more incentives than those with inelastic demands. On average, when the size of the subsidy reached 24.8%, consumers with inelastic demands would become very likely to buy energy-efficient appliances. In comparison, consumers with elastic demand expected a 31.3% subsidy. Strong regional effects were also observed: the expectations of consumers in smaller cities were much greater than those in larger cities.

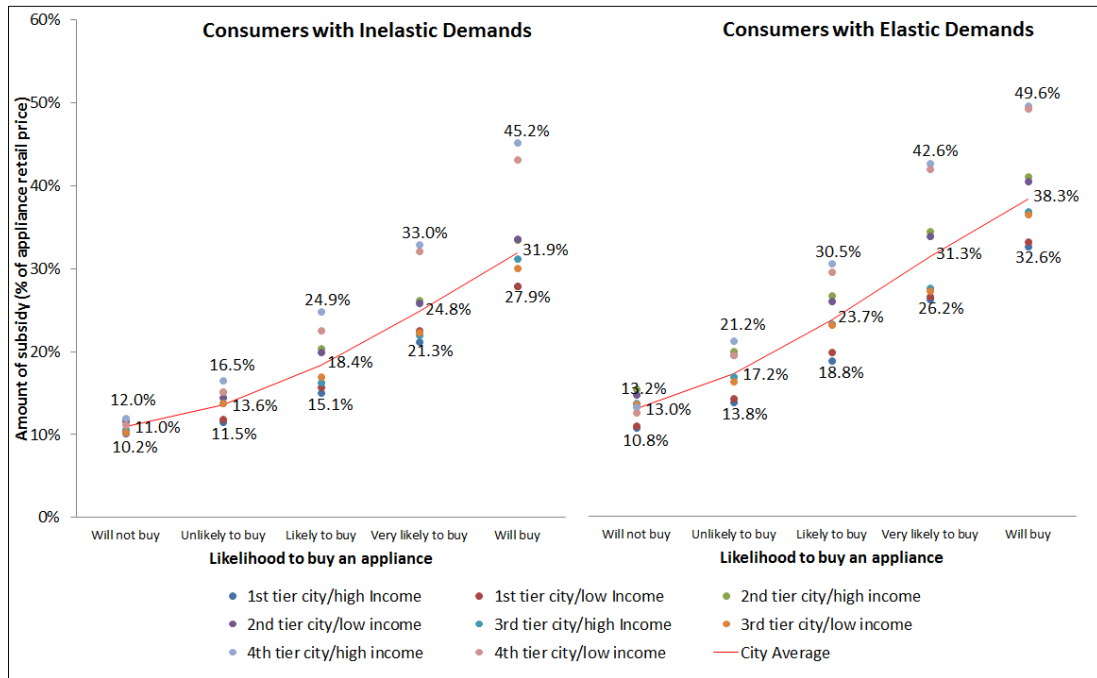


Figure 13 Likelihood for consumers to buy appliances under different scenarios with various subsidy sizes (N=2630)

Subsidy size weighed against appliance cost

For refrigerators, air conditioners and televisions, the size of the current subsidy ranged from 4% to 12% of the average prices for these three types of appliances, as shown in Table 5, Table 6 and Table 7. These subsidy sizes appear to be relatively small compared to Chinese consumers' expectations and other international practices. In a study conducted in June 2012, a 20% subsidy was recommended by Top 10 China (2012). An Austrian appliance turn-in program offered both initial investment rebates and payments for kWhs saved and the rebate was the greater value of either 20% of the initial electricity bill or 20% of the cost of the new appliance (Haas, 1996). It is therefore recommended that subsidy sizes be increased as a means of boosting program participation. More specifically, instead of subsidizing both Tier 1 and Tier 2 energy efficiency appliances, which were all deemed energy-efficient, it would be more cost-effective to subsidize only appliances with Tier 1 or higher energy efficiency and increase the size of the subsidy for those products. This adjustment would meet consumers' expectations even as the total program budget for incentives remains unchanged.

Total Storage Volume (TSV)	Energy Efficiency Requirement (η)	Subsidy Size (RMB)	Average Price(Subsidy:Price) RMB(%)
TSV \leq 240L	$\eta \leq 32\%$	260	2175(12%)
240L < TSV \leq 300L	$\eta \leq 32\%$	330	4011(8%)
TSV > 300L	$\eta \leq 40\%$	400	7776(5%)

Table 5 Average prices and the subsidy sizes for residential refrigerator, modified from (CLASP & Top10 China, 2013)

Cooling capacity (W)	Fixed speed air conditioner		Variable speed air conditioner	
	Subsidy Size Tier 1~Tier 2 (RMB)	Average Price (Subsidy:Price) RMB(%)	Subsidy Size Tier 1~Tier 2 (RMB)	Average Price(Subsidy:Price) RMB(%)
CC≤4500	180~240	2551(7%~9%)	240~300	3596(7%~8%)
4500<CC≤7100	200~280	5461(4%~5%)	280~350	6942(4%~5%)
CC>7100	250~330	6611(4%~5%)	330~400	8878(4%~5%)

Table 6 Average prices and subsidy sizes for fixed speed and variable speed air conditioners, modified from (CLASP & Top10 China, 2013)

Screen Size (inches)	Subsidy Size EEI≥1.7~EEI≥1.9 (RMB)	Average Price (Subsidy:Price) RMB(%)
19≤SC<32	100~150	1549(6%~10%)
32≤SC< 42	250~300	2748(9%~11%)
SC≥42	350~400	6339(~6%)

Table 7 Average prices and subsidy sizes for Liquid Crystal Display TVs, modified from (CLASP & Top10 China, 2013)

Further, the analysis showed that the ratio of subsidy to retail price was generally lower for appliances with higher capacities (Table 5, Table 6 and Table 7). For example, for variable speed air conditioners with cooling capacities greater than 7100W, the subsidy was only approximately 4% of the average retail price. It is suggested that ending subsidies for large capacity appliances makes sense for two reasons: 1) large capacity appliances with higher energy efficiency still consume large amounts of energy, and their purchase should be discouraged; and 2) the current subsidy size was insignificant compared to the high price of large capacity appliances, and would not likely influence consumers' purchasing decisions.

CONCLUSIONS & RECOMMENDATIONS

This program was by far the largest-scale subsidy program for energy-efficient appliances implemented by the Chinese government. A massive 26.5 billion RMB (~4.2 billion USD) was invested in the program, but its effectiveness remained unclear. This study investigated the value of the program from the consumers' perspective and attempted to provide practical recommendations to policymakers based on the results.

The results showed that most of consumers selected energy-efficient appliances because they could save money on their electricity bills, with continual increases in electricity

prices and the long life-span of appliances being two potential explanations. Only 13% of consumers claimed the subsidy was the primary influence when choosing a new energy efficient appliance, which was in line with the later findings that the current size of the subsidy was not sufficient to change consumers' decisions when purchasing energy-efficient appliances.

The study also found that the subsidy program enjoyed a moderate level of awareness among Chinese consumers, but that they lacked in-depth knowledge about the program. Whether the subsidy program included specific budget allocations for a public awareness campaign was unknown, but public outreach to raise awareness is essential for the success of an energy efficiency program. For example, the U.S. Energy Star program spent over US\$2.5 billion cumulatively on advertising through December 1999, reaching over 1 billion consumers (Egan & Brown, 2001). Chinese policymakers should consider enhancing marketing, advertising and outreach of the subsidy program by ensuring a sufficient budget. The program should also diversify its communication channels, expanding to include print media, television commercials, and especially retail promotions. Expanded outreach efforts would not only increase public awareness of the subsidy program, but also promote recognition and spur purchases of efficient appliances in general, which would contribute to the eventual transformation of the appliance market towards higher energy efficiency.

It was found that Chinese consumers' willingness to pay extra for energy efficiency was low, and their expectations for subsidy size was high. Compared to those expectations, the size of the current subsidies offered was relatively small. Policymakers should consider subsidizing only appliances with Tier 1 or higher efficiencies and increasing the subsidy amount to meet consumers' expectations. In addition, the program should only subsidize appliances with normal or small capacities to discourage the purchase of large capacity appliances.

ACKNOWLEDGEMENT

This study was funded by Collaborative Labeling and Appliance Standards Program (CLASP). The authors wish to thank All China Market Research Co. Ltd. for carrying out the market research for this project.

REFERENCES

- Banerjee, A., & Solomon, B. D. (2003). Eco-labeling for energy efficiency and sustainability: A meta-evaluation of US programs. *Energy Policy*, 31(2), 109-123. doi: 10.1016/S0301-4215(02)00012-5
- Canadian Appliance Manufacturers Association. (2005). *Generation and diversion of White goods from residential sources in Canada*.
- China National Institute of Standardization. (2012). *White paper for the energy efficiency status of China energy-use products*. Beijing China: China Zhijian Publishing House.
- CLASP, & Top10 China. (2013). *Market analysis of China energy efficient products*. Unpublished manuscript.
- CLASP. (2013). *The new European energy label: Assessing consumer comprehension and effectiveness as a market transformation tool*.
- Egan, C., & Brown, E. (2001). *An analysis of public opinion and communication campaign research on energy efficiency and related topics*. (No. A013). Washington, DC.: American Council for an Energy-Efficient Economy.

- Gaspar, R., & Antunes, D. (2011). Energy efficiency and appliance purchases in Europe: Consumer profiles and choice determinants. *Energy Policy*, 39(11), 7335-7346. doi: 10.1016/j.enpol.2011.08.057
- Haas, R. (1996). Some empirical findings of an Austrian appliance turn-in program. *Energy*, 21(1), 55-60. doi: 10.1016/0360-5442(95)00085-2
- Huang, S. (2009). Review and outlook of china's electricity tariff reform - dedicated to the thirtieth anniversary of reform and opening-up. [中国电价改革回顾与展望——献给改革开放三十周年] *Price: Theory & Practice*, (5)
- International Energy Agency. (2010). China overtakes the united states to become world's largest energy consumer. Retrieved 05/22, 2013, from <http://www.iea.org/newsroomandevents/news/2010/july/name.19716.en.html>
- Ma, G., Andrews-Speed, P., & Zhang, J. D. (2011). Study on Chinese consumer attitudes on energy-saving household appliances and government policies: Based on a questionnaire survey of residents in Chongqing, china. *2010 International Conference on Energy, Environment and Development (Iceed2010)*, 5, 445-451. doi: 10.1016/j.egypro.2011.03.077
- Mills, B., & Schleich, J. (2010). What's driving energy efficient appliance label awareness and purchase propensity? *Energy Policy*, 38(2), 814-825. doi: 10.1016/j.enpol.2009.10.028

- Murata, A., Kondou, Y., Hailin, M., & Weisheng, Z. (2008). Electricity demand in the Chinese urban household-sector. *Applied Energy*, 85(12), 1113-1125. doi: 10.1016/j.apenergy.2007.05.008
- Murray, A. G., & Mills, B. F. (2011). Read the label! energy star appliance label awareness and uptake among U.S. consumers. *Energy Economics*, 33(6), 1103-1110. doi: 10.1016/j.eneco.2011.04.013
- National Bureau of Statistics of China. (2012). China statistical yearbook. Retrieved 05/22, 2013, from <http://www.stats.gov.cn/tjsj/ndsj/>
- Reiss, P. C., & White, M. W. (2008). What changes energy consumption? prices and public pressures. *The Rand Journal of Economics*, 39(3), 636-663.
- Sammer, K., & Wüstenhagen, R. (2006). The influence of eco-labelling on consumer behaviour – results of a discrete choice analysis for washing machines. *Business Strategy and the Environment*, 15(3), 185-199. doi: 10.1002/bse.522
- Shen, J., & Saijo, T. (2009). Does an energy efficiency label alter consumers' purchasing decisions? A latent class approach based on a stated choice experiment in shanghai. *Journal of Environmental Management*, 90(11), 3561-3573. doi: 10.1016/j.jenvman.2009.06.010

Stern, P. C., Aronson, E., Darley, J. M., Hill, D. H., Hirst, E., Kempton, W., & and

Wilbanks, T. J. (1986). The effectiveness of incentives for residential energy conservation. *Evaluation Review*, 10(2), 147-176. doi:

10.1177/0193841X8601000201

Stern, P. C., Berry, L. G., & Hirst, E. (1985). Residential conservation incentives.

Energy Policy, 13(2), 133-142. doi: 10.1016/0301-4215(85)90174-0

Top 10 China. (2012). Top 10's In-Depth Interpretation of 26.5 Billion Subsidy. [Top

10 深度解读 265 亿补贴]. <http://www.top10.cn/news/110/256/Top10-265.html>

Train, K. E., & Atherton, T. (1995). Rebates, loans, and customers choice of

appliance efficiency level - combining stated and revealed-preference data.

Energy Journal, 16(1), 55-69.

U.S. Environmental Protection Agency. (2001). *The power of partnerships: ENERGY*

STAR and other voluntary programs 2000 annual report.

U.S. Environmental Protection Agency. (2006). *ENERGY STAR and other climate*

protection partnerships 2005 annual report.

U.S. Environmental Protection Agency. (2012). *ENERGY STAR and other climate*

protection partnerships 2011 annual report.

Young, D. (2008). When do energy-efficient appliances generate energy savings?

some evidence from canada. *Energy Policy*, 36(1), 34-46. doi:

10.1016/j.enpol.2007.09.011

Zhao, T., Bell, L., Horner, M. W., Sulik, J., & Zhang, J. (2012). Consumer responses

towards home energy financial incentives: A survey-based study. *Energy Policy*,

47(0), 291-297. doi: 10.1016/j.enpol.2012.04.070

Zhou, N. (2008). *Status of china's energy efficiency standards and labels for*

appliances and international collaboration. (No. LBNL-251E). Berkeley,

California, USA: Lawrence Berkeley National Laboratory.