

**THE STUDY OF EFFECTIVE FACTORS ON ELECTRICITY DEMAND BY FOCUSING ON
TARGETED-SUBSIDIES (CASE STUDY OF ARDABIL PROVINCE
HOUSEHOLD SUBSCRIBERS)**

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ABSTRACT

The efficiency of energy consumption has taken into consideration because of its important and beneficial outcomes where the main ones are as controlling the consumption of electrical and fossil energies, the reduction in investment costs and the healthy environment. Therefore, the current research comes to study the effective factors on electricity demand by focusing on targeted-subsidies. The sample of the study was the household subscribers of Ardabil province Electricity Company which 150 participants were selected randomly. For hypothesis test the Pearson Correlation Coefficient and Multi Regression were used. The results showed that the targeted-subsidies, cheapness of power electricity price, people's attitude and belief, informing and culturalization, low consumption devices, rewarding and punishing policies create the conditions to reduce the subscribers' consumption. The families' income had no role in consumption. Targeted-subsidies and culturalization and using the low consumption electricity devices were the main effective factors in electricity consumption respectively.

KEY WORDS: Ardabil Province Electricity, electricity power demand, electricity subscribers, targeted-subsidies Company.

INTRODUCTION

The Industrial Revolution began in England in 1915 and following it the use of mechanical machines that were built by using of electrical energy widespread in all over the world, little by little the electrical energy increasingly permeated in everyday-life of people and brought it in its dominance. In a way that without electricity the urban life is inconceivable in the modern world. In other aspect the nature and essence of electrical energy is in a way that it can be converted simply and easily, it hasn't the capability of storage, these factors made it as a unique energy which every kind of policy flexibility in communities plays a crucial role in their development (Saidpour and porali, 2012).

Some economics scholars believe that by application of some policies such as improving the price of the energies (electricity, water, gas,.....), the consumers can be leaded to the optimal use of these energies, and in contrast there are other group of economists that believe, although the price reform of the energies is essential case in our country but it is necessary that before the implementation of price policies on the energies, the necessary conditions toward the efficient consumption of these energies should be prepared (Razini and Sabouri, 2010). Therefore, one of the governments' policies and plans for efficient and optimal consumption of energies is the targeted-subsidizing of the energies. In our country also the energy is an essential commodity and is subsidized, due to the IAEA (International Association of Energy Agency) report because of the low-price of the energies, its rate and level of consumption in comparison with other countries was severely increased where based on the Agency report the average of energy subsidies in China is 10/89 percent, in Russia 32/52 percent, on Indonesia 27/51 percent and in Iran it is 80/42 percent (Ghaderi *et al.*, 2006).

Although the targeted-subsidies is not a new solution in developing countries but it is one of the main pillars of accessing to sustainable development as performing it in an efficient way to measure its efficiency and reinforcement of its positive and useful points by solving the implementation obstacles and problems and by controlling its negative aspects. So, the current study is to investigate the level of effective factors in electricity consumption rate of families by focusing on targeted-subsidies in the course of considering the effects of price increasing on electrical energy which is called the electricity energy price elasticity index, we try to determine the effective factors role such as the effect of family income, culturalization, low-consumption devices.

Definition of subsidy

Subsidy means any kind of transferring payment, from the government treasury and from anything that can be

deposited to government treasury which awarded to families and producers of goods and services whether in cash and or in articles, to support the low-income people and to improve the income distribution.

The subsidy payment methods:

Direct cash subsidy: the subsidy which is paid in cash for increasing of targeted families' revenue.

Direct valued subsidy: the subsidy which is paid as specific valuable coupon for specific consumption to targeted families.

Indirect subsidy: the subsidy which is paid in price determination of articles and services less than its real cost where all the public people use it.

The impact of subsidies

Subsidy is one of the instrumental policies of governments to apply their social, economic and environmental purposes which are run globally in several different sectors including agriculture, fisheries and energy. In general the subsidies as the government contribution firstly, allow the consumers to buy the goods and services lower than the market prices and secondly promote the manufacturers revenues in comparison with non-intervention conditions (or reduce the production costs). Based on this definition, subsidies include the cases that the government as the producer of goods and services, sells its production at prices that do not cover the production costs or may be compensate the loss of the goods that produced by private sector (Parmeh, 2005).

Based on the theory, subsidy is an important economic instrument that the governments interfere in the market with it. Subsidy affects the economy by changing relative prices and by price distortion it prevents the efficient allocation of resources and so reduces the economic growth. On the other hand, by creating the budget deficit, and increasing social costs, it makes serious impact on national economy. Although in some countries, the consumers apparently benefit from these subsidies (because they pay lower prices for subsidized goods), but indirectly they will be damaged. Because the payment of subsidies causes, the increasing of public costs, the reduction in economic growth and the deficit in the government budget (Bazri *et al.*, 2012).

Review of the literature

Salehi *et al* (2012) in a study as "the study of social and cultural factors effects on targeted-subsidy of energies and on the per capita of energy consumption" got this result that there is a significant relationship between the environmental valued variables, public and specific environmental knowledge and people's attitude toward the targeting subsidies. Also there is a significant relationship between people's attitude in the field of targeted-subsidy and consumption rate of the electricity.

Darbany *et al* (2012) in a research as "the necessity of targeted-subsidies execution to improve the relative advantage indices of agricultural crops (wheat)" declares that if the targeting-subsidies as one of the seven aspects of Economic evolution Program can be fulfilled efficiently, it implicitly can improve the relative advantage indices.

Mirfardi *et al* (2012) in a study as " the effect of the targeting-subsidies on sustainable development of energy resources (by emphasize on non-reusable energy sources) concluded that targeting-subsidies has a tangible effect on energy consumption.

Hope and Singh (1995) have experienced the price increasing of petroleum products and electricity in six studies. Their research results show that in most countries the energy consumption pattern has changed to fuel substitution and particularly in Malaysia, Indonesia and Turkey, the increasing of household energy prices caused the substitution in electricity.

Dube (2003) in his study on the effect of subsidies on energy consumption and energy supplying in Zimbabwe by focusing on electricity energy concludes that the energy subsidies in Zimbabwe caused the increasing of energy consumption and the reducing of energy supplying profit by the private sector.

Park and kwon (2011) by referring to the other aspects of the evolution in energy subsidies system and by using the coupon-subsidy based on the census data of 2007 year in South Korea concluded that such a change in the energy distribution system improves the conditions toward the clean energies and provides the sustainable development.

Miller (2001) by applying the consolidated econometric methods studied the long-term electricity demand for 48 States of America during the period of 1990 to 1999 and concluded that the electricity consumption is the function of an average price of electricity, the mean of real revenue of families, the average price of natural gas, price index, population, urbanization percent, household and time aspects.

The study of theoretical basis and the review of the literature show that targeted-subsidies affect the electricity power

energy consumption rate; however the consumption process is a complex phenomenon and is influenced by different factors. Therefore, in this study paying special attention to the targeted-subsidies issue we try to identify the role of different effective factors in electricity energy consumption. These factors can be shown in the following conceptual model.

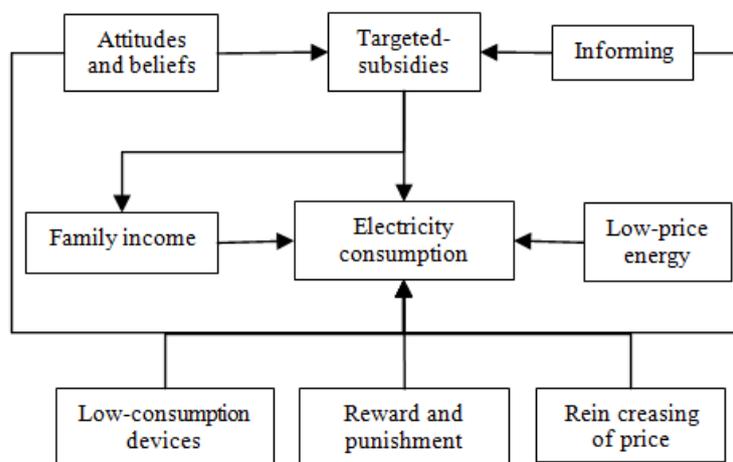


Fig.1. The conceptual model of research

Research hypothesis

1. It seems that by targeted-subsidies the consumption level of household subscribers in electricity amount has decreased.
2. The low-price of electricity energy causes the consumption increasing.
3. The attitude and belief of people cause the controlling and decreasing of household subscribers' consumption.
4. Cultural programs or the culturalization of consumption pattern improving cause the controlling and decreasing of household subscribers' consumption.
5. Low-consumption devices cause the decreasing of household subscribers' consumption.
6. A reward and punishment policy for consumers (reducing and promotion of price based on the rate and time of consumption) causes the decreasing of household subscribers' consumption.
7. Re-increasing of electricity energy price (execution of the second phase of targeted-subsidies) will reduce the electricity energy consumption.
8. The increasing of the household subscribers' income causes the increasing of household subscribers' consumption.

MATERIALS AND METHODS

The current study is descriptive and was conducted in the field form. The participants were the household electricity subscribers in Ardabil Province which based on the Cochran's Sampling Formula 163 subscribers were selected as the sample of the study. The data collection instrument was questionnaire where the correlation coefficient and multi regression test were used for hypothesis test. Also for questionnaire reliability the Cronbach's Alpha was used in a way that it was %82 where it shows that the applied instrument had suitable reliability.

RESULTS AND DISCUSSION

The participants were 127 male and 26 female. The education level of most of the subscribers was BS (about 33 percent). About 48 percent were employee and 31 percent were self-employed. In concern with the related questions to research main variables, the results show that most of the subscribers have positive view about the improving of consumption main variables. They assessed the cultural programs in relation with changing people's attitude toward energy consumption positively. However some of the subscribers believe that appropriate informing about the consequences of overusing of energy hasn't been done or they have no complete information about the calculation method of consumption rate. Although most of the subscribers have the positive view about the implementation of targeted-

subsidies and its impacts on consumption reduction, but about 90 percent of the subscribers are opposed to the increase of energy price and its negative results.

In the field of low-consumption devices about 60 percent of subscribers declare that when they want to buy electrical devices they pay attention to the energy labels, they believe that using these kinds of devices are significant in less consumption of electricity.

In subscribers' point of view, reward policy for low-consumer subscribers and punishing policy for high-consumers can be effective in consumption reduction, however about these policies much detailed information should be given to them.

Test of hypothesis

The research variables were measured by using of Likert scale and in respective level, by combination of each variable question, the index of variables was made where the created index is in an interval level. So in testing of research hypothesis, the Pearson Correlation Coefficient and Multi-variable regression were used with the following results.

Table 1. Correlation Coefficient among variables

Hyp. No.	Test statistic	Relation amount	Meaning level	Hyp. test
1	r	0/788	0/000	confirmed
2	r	0/450	0/000	confirmed
3	r	0/505	0/000	confirmed
4	r	0/540	0/000	confirmed
5	r	0/623	0/000	confirmed
6	r	0/467	0/000	confirmed
7	r	-0/385	0/000	confirmed
8	r	0/089	0/132	rejected

The correlation coefficient between targeted-subsidies and energy consumption reduction is 0/788 which shows there is a high and significant correlation between the targeted-subsidies execution and reduction in household subscribers. So the hypothesis is confirmed. The correlation coefficient between the low-price of electricity energy and the consumption increasing is 0/453. The correlation indicates a positive relationship between these two variables, i.e., the cheaper the price, the higher in energy consumption. The level of meaningful relationship is 99 percent which shows there is a significant correlation statistically, so the hypothesis is confirmed. There is a positive correlation between the attitude and belief of people in the field of energy consumption and its reduction consumption. It means that the subscribers who change their attitude and belief in energy consumption are low energy consumers. The correlation is 0/501 where with 99 percent surely it can be said that the above hypothesis is confirmed.

The correlation coefficient between the two consumption pattern improvement and its consumption reduction is 0/540. So with 99 percent surely and with 1 percent probability of error, it can be said that the observed correlation coefficient is meaningful statistically. Therefore, the cultural program and consumption pattern improving cause the reduction in electricity consumption.

The Pearson Correlation Coefficient between using low-consumption electrical devices and the decreasing of consumption shows the significant relationship between the variables. The correlation between two variables is 0/632 which shows that using the low-consumption devices affect the reduction of electricity consumption positively, so the above hypothesis is confirmed statistically. The correlation coefficient between the application of reward and punishment policies and the consumption reduction of 0/476 shows the positive and meaningful correlation between two variables. It means that applying the reward and punishment policies can be effective in reduction of electricity consumption.

The correlation coefficient between Re-increasing of the energy price and reduction in consumption is - 0/385. The correlation is negative which indicates the negative effect of energy price increasing on consumption reduction.

The results show that the correlation coefficient between the families income and energy consumption reduction is 0/89. Due to the high significance of error, so the test statistic will be H0, then the H1 is rejected while H0 is confirmed. So the research hypothesis is rejected and there is no significant relationship between families income and energy consumption reduction.

Multiple regressions

Using Pearson Correlation coefficient, the direction and intensity of relationship between dependent and independent variables were studied. In the rest of the study by using the multiple regressions the changes of dependent variable will be predicted by independent variables.

In regression equation for determining the determination coefficient (R2) and the weight of each variable (Beta), the set of independent variables enter in the equation. It should be noted that, in order to determine the role of each variable in the field of consumption decreasing of subscribers, multiple regression, (enter) method was applied. In this method all the independent variables simultaneously analyzed and their effects on dependent variable will be determined.

Table2. Summary of multiple regression results

Estimated standard error	Adjusted R ²	R ²	R	F	Significant level
0/9672	0/800	0/810	0/822	42/748	0/000

According to multiple regression results, multiple correlation coefficient for consumption reducing variable is R²= 0/822, it means that all the above variables are correlated by consumption reducing with 0/822. The determination coefficient (variance) is R=0/810 and its adjusted coefficient equals R^{2 Adj}=0/800, so the above variables explain 80 percent of consumption reducing total variance. F-value is equal to 42/58 and with 99 percent confidence it can be said that the effect of all the above variables in explaining the dependent variable is meaningful.

Table 3. Standardized beta Coefficient

Dependent variables	standardized coefficient	T	Significant level
	Beta		
Constant coefficient	--	12/874	0/000
Targeted-subsidies	0/634	14/65	0/000
Informing and Culturalization	0/522	10/897	0/004
Low-consumption devices	0/423	9/781	0/008
Changes in attitude	0/356	6/585	0/000
Reward policies	0/244	3/43	0/012
Low-price energy	0/201	2/87	0/04
Re-increasing of energy	-0/314	4/584	0/000
Families income	0/089	0/87	0/237

Based on the above table data results, among all the studied variables, the targeted-subsidies with 0/634 beta is the most effective variable in families' consumption reduction. So this variable is the most powerful in explaining. Then informing and culturalization variable with 0/522 beta value; using the low-consumption devices with 0/423 beta have the most effect on consumption reduction. The effect of price re-increasing of energies with -0/314 is negative, while the families' income variable has no effect on consumption reduction.

CONCLUSION

It seems that the targeted-subsidies program is an appropriate method for achieving sustainable of renewable energy sources (Mirfardi and Daneshpazir, 2012). The results showed that there is a significant difference in average use of electricity consumption after the execution of targeted-subsidies program over the previous year (Salehi *et al.*, 2012) By establishing an appropriate policy in the process of targeted-subsidies payment, we can avoid in losing of national sources and capital and take positive and certain step toward the economic globalization (Mohammad Nejadi *et al.*,

2012) By accepting this that the targeted-subsidies has the high effect on reducing the electricity consumption, this study in line with other researchers admits this kind of political, economic, social and cultural behavior.

Since the previous system of subsidies would disturb the economic balance in society, for this the investments and the consumption with low-price energy was oriented in a wrong way and its consequence is, consuming it in non-economic justification which requires constant support of government. Also the major part of the subsidies were paid to the manufacturing sector, which instead of investing in productive sectors and empowering the production and promoting the economic efficiency and effect, it moved to consumption and made the consumerism (Mohammad Nejadi *et al.*, 2012). Based on studies, the production in Iran is depended to cheap energy production (Sadidpour and Porali, 2012). In this study the considered hypothesis was confirmed, it was in line with review of the literature where realized that low-price of electricity is one of the main reasons in phenomenon of consumerism.

Investigating the effective social, cultural correlations on the participants attitude about targeted-subsidies and the type of their attitudes in relation with this program, showed that they who had positive and high attitudes about the mentioned program, have much commitment in observing the ethical principles of consumption (Sadidpour and Porali, 2012). The results of collected data confirmed the related hypothesis about the attitude and belief of people and stated that people's attitude and belief cause the controlling of consumerism phenomenon, where it is in line with the review of literature of this study and confirms it.

According to studies, targeted-subsidies, based on the informing of the subscribers about the massive utilization of electrical energy, is an effective movement in making the certain and static electricity energy and in the establishment of balance between the production and supply of electrical energy to meet the developing industry (Bazri *et al.*, 2012). By analyzing the results of this study and by confirming its hypothesis about the informing and cultural programs cause the consumption reduction we can claim that the results of this study with above background is in one direction. The relationship between electricity demand and family income is direct. When the family income increases, the family electricity consumption increases too. Most of the empirical studies reflect this fact that the reaction of electricity demand level to income is weak; in a study in Ethiopia the reaction of electricity demand in some areas of the country was challenging (Tavakoli and Bahrani, 1998). By studying the results of the data collection in the effect of income on the level of electricity demand based on its results, there is no relationship between the levels of electricity consumption and so the considered hypothesis is rejected.

Suggestions

Based on the obtained results and the discussions to reduce the consumption of electricity energy the following suggestions can be given.

1. Targeted-subsidies is the main factor in changing the consumption patterns and guides them toward those changed consumerism, where for improving the effects of targeted subsidies, a committee should be formed in electricity distribution company to investigate and control the negative impacts of this program to compensate the defect of the targeted-subsidies law such as payment by installments of the consumption electricity cost for low- or efficient-consumers, more support of low-income groups and having free or cheap services to poor but efficient consumers.
2. Paying attention to the significant effect of people's attitude and belief in controlling of subscribers' consumption, implementing educational plans and making social arrangement can control the electricity consumption where accordance with it, the most accessible and applicable groups are the employees of electricity distribution company and other government offices or organizations. With respect to the holding of annual approved training courses for raising the information of people about electricity and also holding annual exhibitions about the affiliated products of companies to electricity industry will facilitate this action.
3. Noticing the effects of culturalization and informing people about the rate of consumption, by continuing the educational programs using mass media and also by planning specific time of showing specific programs about modifying consumption, publishing magazines for different ages about improvement of consumption pattern and free distribution in schools, offices and meetings and also sending short messages on monthly bills, it can be enforced.
4. Since the low-consumption devices after the execution of targeted-subsidies, are the main factor for saving, by establishing of noticing to energy labels on brands and also by holding the low consumption devices exhibitions and showing them to the public people we can spread using them.
5. According to the satisfaction of people about the rewarding and punishing policies (tariff-classification in electricity cost), by more incentive policies such as free rate of part of tariffs (consumption) and also the capability in continuing these rewards for low and less use of electricity in loaded times (peak time) for other circular bills, the subscribers can be encouraged to reduce the consumption

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