

Available online at www.sciencedirect.com ScienceDirect

Energy Procedia 5 (2011) 229–234

Energy
Procedia

IACEED2010

Empirical Research of Social Norms Affecting Urban Residents Low Carbon Energy Consumption Behavior

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Abstract

Firstly, this paper defined urban residents low carbonization energy consumption behavior as two aspects: the purchasing and choosing behavior and daily using behavior, and then based on the literature researches, this paper developed the conceptual model of social norms affecting urban residents low carbon energy consumption behavior. Taking Xuzhou as an example, through 280 valid sample, using LISREL 8.7, this paper verified and corrected the conceptual model. The results showed that the stronger the social norms of low carbon energy-saving orientation, the stronger the residents low carbon behavior intention; The stronger the residents low carbon behavior intention, the more positive the low carbonization energy consumption behavior; Social norms cannot directly play a role in residents' energy consumption behavior, can only have indirectly and positive effect on residents behavior via behavior intention.

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Selection and peer-review under responsibility of RIUDS

Keywords: social norm; low carbonization; energy consumption behavior;

1. Introduction

With the strong propulsion of energy-saving and emission reduction measures in Chinese industrial field, the edge effect of industrial energy-saving decreases and the difficulties increases. While as the consumption subject of life energy and the terminal consumer of industrial products, the potential of energy-saving and emission reduction contained in urban residents' energy consumption behavior in daily life becomes a field that needs highly attention and in-depth excavation.

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The urban residents energy consumption behavior is low carbon or not, and it not only directly affect the structure、 scale and increment speed of residents energy consumption, but also indirectly influenced the consumption value judgement and choice on industrial products. As residents low carbonization energy consumption behavior forming a stronger social norms, it inevitably has a positive impact on low carbon development in the field of production and circulation. And then from the angle of demand management, it promotes that the goal of Chinese energy-saving and emission reduction smoothly realizes.

The study of Chen et al (2004) [1] showed that one of the key characteristics of Chinese culture is high standard orientation, and the attention on social norms is far more than the attention on own attitude for Chinese people. They saw themselves as part of the group, so they were easily influenced by social norms. Therefore, to study the influences of social norms for residents low carbonization energy consumption behavior in Chinese culture background, and to clarify the path of social norms acting on residents low carbonization energy consumption behavior through empirical study, can provide more specific reference and basis for the choice and formulate on the guiding policy of energy-saving and emission reduction in residents living fields.

2. Literature Review and Hypotheses Proposed

2.1. Low carbonization energy conservation behavior

In the existing literatures, there are crosses in the concepts in residential energy consumption behavior, household energy use, residents energy conservation behavior; Van Raaij and Verhallen (1983) [2] defined residential energy use as energy consumption behavior related to purchasing, maintaining and using; Van Diepen (2000) [3] defined household energy use as home energy use and transport energy use; In the study of Linden , Carlsson-Kayama and Eriksson (2006) [4], they expressed residents energy behavior as using behavior of heating and lighting, cleaning, catering and entertainment use behavior; Chen Lishun (2009) [5] divided urban residents energy consumption behavior into selective energy consumption behavior and habitual energy consumption behavior.

Since the classification and the definition of resident's energy behavior above, this paper defines "urban residents low carbonization energy consumption behavior" as "the purchasing and choosing behavior of urban residents for energy-saving facilities and green energy and the using and the management behavior of the quantity and way of energy in daily life ".

2.2. Social Norm

R.Gwin & P.Norton (1993) [6] thought social norms was the common behavior rules and standards of social members, and it can be internalization individual consciousness, so it would be followed without rewards, it could also have function because of the external positive ruling or reverse ruling. R. Corsin (1994) [7] thought social norms was a kind of social behavior rules, and it was various cultural value standard of acceptable or unacceptable behavior of social group members. Zheng Xiaoming (1997) [8] defined social norms as "the behavior standard, rules and regulations, manners and customs, moral laws and regulations, the value standard that the whole society and each group and their members should have ". This paper adopts the definition of Zheng Xiaoming for social norms.

For the influence that social norms affected the behavior of residents energy-using behavior, the study of British scholar Black, etc. (1985) [9] found: the family put the retrofit measures as a duty which rooted in certain social rules and personal ethics, and when a part of people adopted energy-saving behavior and obtained benefit for others, it would form incentive and stress to others, thereby it also changed their behavior. The research of Scott, etc. (2000) [10] which studied Canada residents found: although factors

affecting different types of residents energy-using behavior were significantly different, the residents personal circle (families, friends and colleagues, etc.) is really an important factor affecting residents energy-using behavior. The study of Garling, etc. (2003) [11] also found that: the pressure produced by social norms significantly influenced residents energy-using behavior.

According to the literature researches above, we proposed the hypothesis as follows:

H1: Social norms have positive influence on urban residents low carbonization energy behavior of choice and purchasing, and it can directly affect low carbonization energy-purchasing behavior.

H2: Social norms have positive influence on urban residents low carbonization energy-using behavior, and it can directly affect low carbonization energy-using behavior.

2.3. *The Relationship between Behavior Intention and Behavior*

Behavior intention refers to the ideological tendencies and action motives before individual acting. It is an important variable proposed in Ajzen's (1991) [12] "the theory of planned behavior". Ajzen found: the produce of behavior directly depends on behavior intention. Attitude, subjective norms indirectly affect on behavior - via behavioral intentions.

Since then, many researches on different questions of many scholars using the theory of planned behavior all supported the direct and significant positive correlativity between behavior intention and behavior. Florian (1999) [13] put behavior intention as the predictor variable of ecology behavior, and he investigated 3000 samples in Swiss, and the result proved there was a strong correlation between behavior intention and ecology behavior; Michele T, etc. (2004) [14] conducted a survey on 258 households in Northampton shire in central England using the theory of planned behavior, and he investigated influencing factors of the waste behavior. The result also proved behavior intention was the antecedents directly impacting the waste behavior. The research of Satoshi F (2006) [15] on pro-environment behavior conducted a survey on 341 households in Tokyo, he found the behavior intention all intuitively reflect the behavior.

Chinese scholars Qu Ying (2007) [16], Sun Yan (2007) [17], Chen Lishun (2009) [5] all proved there was a significant and direct positive relationship between behavior intention and behavior through empirical researches on residents living garbage classification behavior, residents environmental behaviors, residents energy consumption behavior. Meanwhile, Chen Lishun (2009) also proved social norms could either act on behavior – via behavior intention, or could directly affect residents energy consumption behavior.

According to the literatures analysis above, this paper proposes the hypothesis as follows:

H3: Social norms have direct and positive influence on urban residents low-carbon behavior intention.

H4: Low-carbon behavior intention has direct and positive influence on energy-purchasing behavior.

H5: Low-carbon behavior intention has direct and positive influence on energy-using behavior.

H6: Social norms have indirect influence on energy-purchasing behavior – via low-carbon behavior intention.

H7: Social norms have indirect influence on energy-using behavior – via low-carbon behavior intention.

2.4. *The Concept Model*

According to the literature review and analysis above, outstanding the influence of social norms for residents low carbonization energy consumption behavior, this paper builds up the conceptual model as Fig.1.

3. Research Design and Data Quality Inspection

3.1. Scale Development

This study adopts Likert scale, based on the mature scale, we develop our own design. The questionnaire contains 32 items. The respondents of this survey are residents of Xuzhou, Jiangsu province. This advance surveys issue 260 copies according to the scale, and withdraw valid questionnaires 212 copies. We use SPSS 17.0 to test the reliability and reliability. Results show that when we delete U1、U6 and SN3, Cronbach's alpha coefficients of four scales are more than 0.6, which explains that the scale has a good reliability. We examine the structural validity of each scale by “Item-to-total” (more than 0.3) and “Alpha” of each factor (more than 0.6). Every factor can meet the requirements. During the formal investigation, the total questionnaires are 400 copies, and the valid questionnaires are 280 copies.

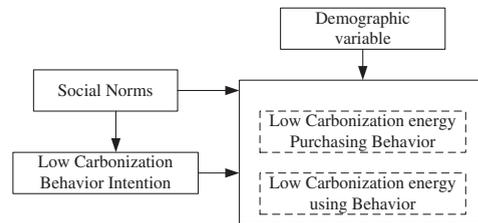


Fig.1. The concept model of social norms affecting residents low carbonization energy consumption behavior

3.2. Validity and Reliability Analysis

(1) Validity Analysis

SPSS 17.0 is used to do EFA. Results show that the load of every item in their respective factors is more than 0.5 and the load of every item in other factors are less than 0.5. Analysis results shown in table2, the scale has good convergent validity and discriminant validity. Then we use LISREL 8.70 and adopt fixed load method to make confirmatory factor analysis. The result indicates that the model fitting is good.

We choose the correlation coefficient inspection of Anderson and Gerbing (1988) to test discriminant validity. The results show that correlation coefficient adding and subtracting S.D. twice of two Latent variables does not contain 1, so each latent variable has a good discriminant validity.

(2) Reliability Analysis

Wortzel (1971) proposed Cronbach's alpha coefficient to test the reliability, the higher is the value, the better is this scale. Through the analysis result of SPSS 17.0, Cronbach's alpha coefficients of three scales are more than 0.7, which explains that scale has a good reliability.

4. Test of Model and Hypothesis

4.1. The Choice of Model

According to the concept model proposed, we set initial structure equation model as M, as Fig.2. We use LISREL 8.7 for parameter estimation, and modify the model by T test. Normally, chi-square will be decreased when we increase the

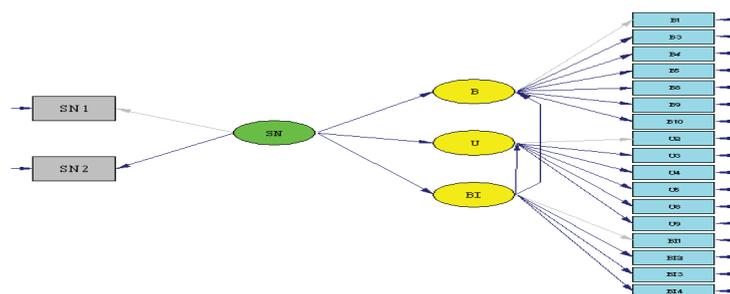


Fig. 2. Initial Model M

free parameter, and chi-square will be increased when we reduce the free parameter. After we increase the free parameter, the Chi-square reduces significantly, in that way, it makes clear that increasing free parameters is worthwhile. If the free parameters is decreased, the chi-square is not significant increased, so it shows that reducing free parameters is desirable.

The empirical results show that in the model M, the path of directly effect from SN to B is not significant, so we delete this path and modify model M to M1. The chi-square increased by 2.98(less than 6.63), so we support the modification of model M for model M1. Then we find the path of directly effect from SN to U is not significant, so we modify the model M1 for M2, and delete the path of SN to U. The chi-square increased by 5.61(less than 6.63), so we support the modification of model M1 for model M2. At the same time, according to the model and regression analysis, we find that BI plays a completely mediating role between SN and B, U., so H1 and H2 were not founded.

Therefore, the Hypothesis H1 and H2 were not founded. So we choose M2 for the final model. Standardized estimation results of model M2 are showed in Fig. 3.

4.2. The Empirical Results

We can see Standardized Path Coefficients are highly significant, and also we can see direct effect, indirect effect and the whole effect among variables.

According to the operation results of model M2, we test H3 to H7.

(1) Social norms may have direct and positive effect on low-carbon behavior intention, and the value of direct effect is 0.45, and the two variables are highly significant, so H3 is founded.

(2) Low carbon behavioral intention may have direct and positive effect on low carbonization energy choosing and purchasing behavior, and the value of direct effect is 0.33, and the two variables are highly significant, so H4 is founded.

(3) Low carbon behavioral intention may have direct and positive effect on low carbonization energy using behavior, and the value of direct effect is 0.40, and the two variables are highly significant, so H5 is founded.

(4) Social norms may have indirect and positive effect on low carbonization energy choosing and purchasing behavior, and the value of indirect effect is 0.15, so H6 is founded.

(5) Social norms may have indirect and positive effect on Low carbonization energy using behavior, and the value of indirect effect is 0.18, so H7 is founded.

5. Research Conclusions

Through this empirical study, we can get the following conclusions:

(1) Social norms attention to low-carbon and energy-saving has direct and positive effect on low-carbon behavior intention, and the direct effect is 0.58. We can stimulate residential low-carbon behavior intention through the power and pressure of social norms, which is very important to promote low carbonization energy consumption behavior for urban residents.

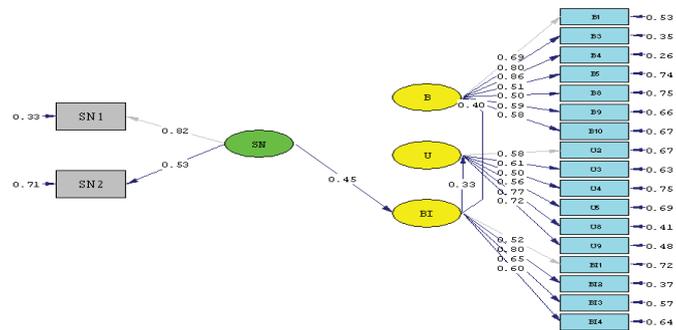


Fig. 3. Standardized Estimation Results of M2

(2) Residential low-carbon behavior intention has direct and positive effect on low carbonization energy choosing and purchasing behavior and low carbonization energy using behavior, and the direct effect is 0.36 and 0.40.

(3) Social norms have indirect and positive effect on low carbonization energy consumption behavior - via low-carbon behavior intention, but it can't directly affect low carbonization energy consumption behavior, the indirect effect is 0.15 and 0.18, which is disagree with the conclusion of Chen Lishun (2009). Taking Dalian residents as respondents. Chen Lishun's research shows that as control variables, social norms is not only the intermediary variable between behavior intention and behavior, but also can affects residential behavior.

(4) For demographic variables, there are significant differences of age, education level and profession for low carbonization energy using behavior, but there is no significant difference for low carbonization energy choosing and purchasing behavior. While the gender and income express indifference for both the behavior of choosing and purchasing and using.

This paper takes urban residents in Xuzhou as an example, due to the geographical limitations of the sample, the conclusions can only represent the third class cities in eastern in China.

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