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Artículo de Revisión

EFFECT OF CONDITIONAL COOPERATION ON ENERGY SAVING: A MINI-REVIEW

EFECTO DE LA COOPERACIÓN CONDICIONAL SOBRE EL AHORRO DE ENERGÍA: MINI-REVISIÓN

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ABSTRACT

Introduction:
Social norms have influence on the human behaviour. This concept has been used in programs that provide regulatory information and expect changes in behaviour, mainly in the reduction of consumption.

Objective:
To critically review the theoretical approaches to social norms and their impact on energy saving, focussing on the Cuban context. The perspective for the application of social norms in other sceneries was also considered.

Materials and Methods:
In this section themes of interest as: energy conservation programs, boomerang effect, OPOWER program, as well as comparison of OPOWER in Europe and Latin America and the Caribbean scenarios were analysed. In energy-efficient context, there are evidences that if comparisons are made between neighbours about the contribution that each one makes to save energy, it can induce energy efficiency in the neighbourhood. Also the use of the conditional cooperation concept in other scenarios could be attractive.

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Conclusions:
Programs based on the social norms can be an attractive option to use in greater number of public services because can induce changes in the behavior, based only on motivational cooperation without need to be related to the price. Energy sector in Cuba could incorporate social comparison module to household energy report and expect the reduction of energy consumption.

Keywords: behaviour; consumption; social norms; energy-efficient.

RESUMEN

Introducción:
Las normas sociales tienen influencia en el comportamiento humano. Este concepto ha sido utilizado en programas que brindan información regulatoria y esperan cambios en el comportamiento, principalmente en la reducción del consumo.
Objetivo:
Revisar críticamente los enfoques teóricos de las normas sociales y su impacto en el ahorro de energía, enfocados al contexto cubano. También fueron contempladas perspectivas para la aplicación de las normas sociales en otros escenarios.
Materiales y Métodos:
En esta sección fueron recopilados aspectos de interés tales como: programas de conservación de energía, efecto bumerang, el programa OPOWER, así como la comparación de OPOWER en escenarios de Europa y América Latina y el Caribe. En el contexto de la eficiencia energética, existe evidencia que, si se hacen comparaciones entre vecinos sobre la contribución que hace cada cual al ahorro de energía, se puede inducir a un uso eficiente de la misma en el vecindario.- También el uso del concepto de la cooperación condicional aplicada a otros escenarios podría ser atractivo.
Conclusiones:
Programas basados en el concepto de las normas sociales pueden ser una atractiva opción para usar en mayor número de servicios públicos porque estos pueden inducir cambios en el comportamiento, basados únicamente en la cooperación motivacional sin necesidad de estar relacionados con el precio. El sector energético en Cuba podría incorporar un módulo de comparación social a los reportes de energía al hogar y esperar una reducción en el consumo de electricidad.

Palabras clave: comportamiento; consumo; normas sociales; eficiencia energética.

1. INTRODUCTION

Climate change is a subject to which great importance is considered nowadays. The greenhouse gases (GHG) emissions to atmosphere, from which the burning of fossil fuels is the main source of emission, are the climate change cause (Mandan, 2009). To achieve sustainable development, a balance must be struck between the three dimensions - economic, social and environmental - simultaneously. This goal is pursued by natural resource policies, where the most important strategy has been to increase energy and material efficiency to prevent economic growth from continuing to have

negative impacts on the environment (United Nations Environment Programme, 2012). Energy efficiency plays a key role in public policy agenda, especially in the most developed countries. This policy pursues the industries competitiveness and energy security to reduce carbon dioxide emissions into atmosphere and reduce environmental impacts (Patterson, 1996).

Conditional cooperation is a phenomenon that results from contemporary theories about pro-social behaviour. This stipulates that people contribute when they know that other people also contribute. Motivational reasons have a strong impact on this behaviour, among which are: social norms, and reprocessing or compliance (Frey & Meier, 2004). According to this theory, higher contribution rates are observed when information is provided and many others contribute. This prediction has a strong sense if people act according to pure altruism theories (Clotfelter, 1997).

2. MATERIALS AND METHODS

2.1. Theoretical bases of social norms

Economic terms are related to an induced change in a social context. Most economics publications are about imitating exact sciences (for example, applied mathematics). However, there is another type of economy that has another point of view. It focuses on a "concept of man", or a "model of human behaviour" (Frey, 1999).

The social norms are cognitive representations of what the "reference group" would typically think, feel, or do in a given situation, which people use as reference points to guide and assess their own thoughts, feeling and behaviours (Turner, 1991). At present, social norms influence of behaviour is well-known. Previous research stipulates that rules can stimulate an action and can also direct it in a direct and relevant way (Cialdini et al., 1990).

Social norms can vary according to culture or social groups, there are regularly very powerful norms ~~on~~ about acceptability of certain behaviours and violations of these norms are intensified due to disapproval and social rejection. For instance, many unhealthy or risky behaviours, such as substance abuse, smoking, risky sexual practices, are associated with social disapproval (Holt-Lunstad, 2015). According to Frey & Meier (2004), the behaviour resulting from conditional cooperation can be based on several theories, such as: the desire of people to act in accordance with social norm (Messick, 1999); the feeling of reciprocity (Rabin, 1993); or the desire to contribute to public good (Vesterlund, 2003). In general, people tend to react negatively to those who disrupt common good, and positively to those who contribute to it (Horne & Kennedy, 2017).

2.2. Energy conservation programs

More than 50% of studies about behaviour change on social norms have been carried out from 2010 onwards, being alcoholism-related, health-related and pro-environmental-related (which include water and energy consumption and sustainable transport use) the most common topics. USA is the country with more application of social norms studies, followed by Europe, other countries represent only 12% (Yamin et al., 2019). Programs have been created under the concept of social power to induce changes in socially significant behaviours. These programs provide regulatory information and expect changes in behaviour applied to multiple scenarios, such as

voting (Gerber & Rogers, 2009), savings for retirement (Beshears et al., 2015) and charitable donations (Frey & Meier, 2004), even social norms can be used to prevent violence in childhood (Lilleston et al., 2017). More specifically, social norms can be applied in the energy sector. Some researchers found that comparisons between neighbours about each other's contribution to energy savings can induce energy efficiency in neighbourhood (Schultz et al., 2007); (Horne & Kennedy, 2017); (Acuner & Kayalica, 2018). Theory of conditional cooperation seeks to achieve energy savings through non-price related treatment. High contribution rates are observed when information is provided and many others contribute to energy efficiency (Allcott, 2011). However, consumers' disposition to save energy varies depending on population and the behavioural and situational dynamics in their households and societies (Acuner & Kayalica, 2018).

Energy conservation programs evaluation is a fundamental part of practical work in economics. Evaluations have great importance because based on them, political decisions are taken, such as whether the program is implemented or not. Depending on population of interest for the study size, analysis can be done with the entire population or by choosing a random subgroup (Allcott & Mullainathan, 2012). To choose the experimental data, randomization is the best option, since it is a reasonable predictor of effects distribution in other target sites. According to Rubin (1974), experimental study on a random sample gives better results when studying treatment effect on social norms, due to the great variability that are not assigned to particular causes. With random procedures between experimental and control units, an "unbiased" estimate of desired effect cause is achieved (Rubin, 1974).

Comparison between different energy conservation programs is generally based on program implementing cost per kilowatt-hour of electricity saved. Another way to estimate treatments effect, is to calculate energy price changes that would induce the same changes in demand, both short and long term (Allcott, 2011). This can be done by calibrating with estimated price elasticities (Allcott & Mullainathan, 2012).

2.3. Boomerang effect

Although social norms are considered old within social psychology, they have not been used enough to understand and predict social behaviour (Cialdini et al., 1990). "Boomerang effect of the descriptive norm", is result of conditional cooperation and social learning mechanisms. Environmental improvement actions often tend to have unintended consequences, causing a rebound effect that goes in opposite direction to what is desired and is generally linked to greater pollution. The rebound effect can lead to social and negative externalities, economic inequalities and other general unintended consequences in our society (Laurenti et al., 2016). In relation to energy, the boomerang effect describes unintended consequences that are opposed to save energy (Schultz et al., 2007); (Allcott, 2011); (Laurenti et al., 2016). Many models predict that "descriptive norm" component of the Household Energy Report treatment, in which the energy use of a household is compared with that of its neighbors, would cause households, that previously used more than the norm, to decrease use whereas households, that used less than normal, used more (Schultz et al., 2007). This is considered a negative change when it occurs with attitudes (Clee & Wicklund, 1980).

Boomerang effect has been successfully neutralised by adding injunctive elements to messages, especially those emphasizing the desirable behaviours (Nolan et al., 2008). Due to the impact that such norms could have on human action Schultz et al., (2007), used "prudential norms" to combat boomerang effect. Specifically, they added a treatment condition to consumers who complied with the standard, which consisted in hand-drawing "smiling faces" in the feedback reports of the descriptive standard.

2.4. OPOWER program

Based on conditional cooperation concept, emerged in USA one of the most notable energy conservation programs without price, which is in charge of a company called OPOWER. This company sends letters from the Household Energy Report that compare a home energy consumption with that of similar neighbours and provide advice for energy conservation. On reports first page appears the Social Comparison Module that presents the "descriptive norm" and the "efficiency situation". The first is to compare the household with the mean and the 20th percentile of its comparison group. Household comparison group comprises approximately 100 households geographically close with similar characteristics, which include similar square feet and the same type of heating (gas versus electricity). The second "Efficiency situation" adds categories to the household as "Excellent", "Good" or "Below Average". Also part of the report is the action steps module. These suggestions are aimed at different households according to energy consumption historical patterns and demographic characteristics. For example, households with high energy consumption received these tips more frequently to reduce consumption.

The group "Excellent" receives two emoticons of "smiling faces", the group "Good" receives one, while the group of more consumption will be denoted "Below Average" and of course does not receive "smiley faces". Therefore, the possible boomerang effect of descriptive norm could be eliminated by energy conservation councils or by treatment with prudential norms that are assigned to different categories households (Allcott, 2011).

According to Allcott (2011), treatment could act through three main mechanisms: 1) The Action Steps advice allows consumer to act according to provided information in a way that can reduce electricity consumption; 2) There is evidence that through social comparisons, social learning about optimal energy use can be stimulated (Beshears et al., 2015); (Munshi & Myaux, 2006); 3) Another treatment effect could be using energy moral cost, which would increase in homes that use more energy than normal, while those that comply, would be fine. Household behaviour can be influenced by information about how much others contribute to a common good (Alpizar et al., 2008); (Frey & Meier, 2004).

Allcott´s paper (2011) showed clear evidence of non-price related treatment effectiveness, such as home energy reports made by OPOWER. results were in accordance with literature (Nolan et al., 2008); (Schultz et al., 2007) the latter being more controversial for population. In addition, home energy reports are more profitable and cheaper, taking into account that they are based on a simple letters sending.

3. RESULTS AND DISCUSSION

3.1. Comparison of OPOWER in terms of per capita electricity consumption per year in Europe and Latin America and the Caribbean scenarios

A study of Andor et al., (2020), reported that the maximum effectiveness of OPOWER is only achieved in USA or in countries with high electricity consumption levels and carbon intensities, because treatments have a greater effect. In particular, OPOWER would not be profitable in European countries, because consumption rates are much lower than in USA, and the article shows that treatments effects depend on the context.

The per capita electricity consumption per year for developing countries in Latin America and Caribbean is 1,893 kWh (Wilson, 2014), representing only 15% of USA consumption. Consequently, it could be presumed that OPOWER treatments would not be effective for this regions. In comparison with European countries that have lower indices also continue below, only this index is similar to Poland, which has the lowest consumption (1,935 kWh) (Andor et al., 2020). So the effects of OPOWER would not have the same impact as in USA and program's profitability would be compromised taking into account that they are a developing country, so raw material for manufacturing of Household Energy Report cost would be higher.

3.2 Cuban scenario

Per capita electricity consumption in Cuba is low (1,425kWh) (Panfil et al., 2017), representing a little more than 10% of USA consumption; probably because it is an island of approximately eleven million inhabitants and is a developing country. According to ONEI (2019) monthly consumption average per customer in Cuba, was 306.1kWh, in 2018, being household consumption 61.12%. However, better results could be achieved in Cuba with OPOWER program application, than in other countries with low consumption rates. Cuba is a country with education high level, the general people awareness related to energy saving and environmental protection is an advantage to use the behavioural science oriented to energy conservation. In addition, Cuba is a socialist country, energy policy is promoted by Cuban Government and directed by only one Ministry (Ministry of Energy and Mines) throughout the country. This means that household energy report could be send to every home and consequently be more effective in energy consumption reduction at national level. This strategy would be in accordance with ONEI (2019), whose bases are to achieve sustainable development in Cuba, as a new concept of economic advance. Economic blockade imposed by the USA for more than 50 years and intensified in 2019 by Helms-Burton Low, forces country Government to search for alternatives to alleviate the energy crisis, being of vital importance consumption reduction at household level.

Detailed analysis in smaller population group should be done first. By this way, the treatment effect of including social norms in Household Energy Report must be evaluated. A designed random field experiment could be performed comparing a small group of households receiving electrical report and a social comparison module with a group which will only receive the electrical report. The comparison between both groups could be based on program implementing cost per electricity kilowatt-hour saved. Hopefully the group under treatment will reduce their energy consumption. It is important to highlight that this type of design, is less invasive than price-related

strategies, because an increase in electricity price is not necessary to force people to save energy. The fact of including social norms in reports would be in agreement with social inclusion system in Cuba, which would take advantage of the high education level.

3.3. Perspectives for the use conditional cooperation concept in other scenarios

Evaluation of conditional cooperation effects on "Sharing Economy" could be attractive. According to Acquier et al., (2017), "Sharing Economy" is considered as an umbrella construct which have three foundational cores - (1) Access economy, (2) Platform economy, and (3) Community-based economy - These initiatives aim to increase efficiency and optimisation of underused resources in society. By this way, contributing to energy efficiency and reducing consumption, in order to achieve sustainable development. Climate change is considered a collective problem. Thus, people who work to reduce their emissions are adopting behaviour that benefits everyone (Horne & Kennedy, 2017).

Some of the Sharing Economy activities are: "recirculation of goods (e.g. ebay), increased durable assets utilization (e.g. car-/toolsharing), exchange of services, (e.g. timebanks, taskrabbit) and sharing of productive assets (e.g. co-working spaces)" (Schor, 2016). A report could be made with any of these activities and include the number of neighbours who practice it (social comparison module). This could lead to a greater number of neighbours joining the cause, in favour of reducing consumption and increasing energy efficiency. In this sense, social norms can also be used to stimulate renewable energy sources use, and therefore reduced grid carbon footprint (Horne & Kennedy, 2017).

Sharing Economy activities practice would be opportune in capitalist countries, which are characterized by having a high consumption index. In Cuban case, being a socialist country, it has a different dynamic than the rest of the world. Due to economic deficiencies and idiosyncrasy of the Cuban, people share their goods, which is very close to living in a Community-based economy.

4. CONCLUSIONS

1. Social norms insight can be used to evaluate the impact on environmental economics.
2. Several programs have been created on the concept of social power to induce changes in people's behaviour, based on motivational cooperation approach.
3. Energy sector in Cuba could incorporate a conditional cooperation module to household energy report (similar to the OPOWER program) and expect for energy consumption reduction, taking advantage of the high educational level and the social system in Cuba.
4. Programs based on social norms can allow beneficial effects in other context such as sharing economy as well to stimulate renewable energy resources use.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTIONS

- M.Sc. Leyanet Odales Bernal. She studied, analyzed the literature and wrote the paper.
- Ph.D. Ernesto Luis Barrera Cardoso. He made the methodological, scientific orientation and revision.
- Ph.D. Ralf Kiran Schoulz. He made the scientific orientation and was the consultor.
- Ph.D. Osvaldo Romero Romero. He made the scientific orientation and was the consultor.