Governmental factors for household energy savings: Adding the theory of planned behavior

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ABSTRACT

This study aims to investigate the relationship between household energy savings behaviors and governmental factors by implementing the theory of planned behavior (TPB). This cross-sectional study used a unique dataset compiled by Statistics Indonesia: Village Potential Statistics (VPS) Year 2011 and Environmental Care Behaviour Survey (ECBS) Year 2013. Variables connected to HES were decided by applying a logistic regression model with multivariable. Manual backward stepwise regression was performed. In the model, all variables of the planned behavior theory and its addition were significantly correlated with HES besides Intention (Very sincere: OR = 1.08, 95% CI: 0.99, 1.16). After examining the extension of five government-based variables, results of this study showed that intention, perceived behavioral control, attitude, and subjective norm might become the explanation of household energy savings

INTISARI

Penelitian ini bertujuan mengetahui kaitan perilaku hemat energi rumah tangga melalui penerapan teori perilaku terencana dengan memperhitungkan variable pemerintah. Studi ini menggunakan data *cross-sectional* yang dikumpulkan oleh Badan Pusat Statistik, yaitu: Pendataan Potensi Desa (Podes) Tahun 2011 dan Survei Perilaku Peduli Lingkungan Hidup (SPPLH) Tahun 2013. Variabel yang berhubungan dengan perilaku hemat energi dianalisis menggunakan model regresi logistik melalui *manual backward stepwise regression*. Dalam model, semua variabel teori perilaku terencana dan penambahannya berkorelasi secara signifikan dengan perilaku hemat energi selain variabel niat (pada kategori sangat tulus: OR = 1,08, 95% CI: 0,99, 1,16). Hasil penelitian ini menunjukkan bahwa variabel niat, kontrol perilaku yang dirasakan, sikap, dan norma subjektif dapat menjelaskan perilaku hemat energi di rumah tangga setelah memperhitungkan lima variabel berbasis pemerintah.

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1. Introduction

Recent work by historians has established that energy savings policy discourses have concentrated progressively on increasing the efficiency with which the economy purposes energy to bring uses such as cooking, cooling, refrigeration and transport. This target on energy proficiency is actuated by a aspiration to decrease emissions of carbon dioxide (CO₂) and other contaminants, growth the safety of energy source, and decrease the absence for new energy provision infrastructure, such as difficult-to-site power supply and transmission lines. On the micro side, the demand for household energy needs to be saved. Data from Indonesia energy outlook (2016) have shown that the highest final energy consumption in period 2000-2014 occurred in industrial sector (48%), followed by transportation (35%), household (11%), commercial (4%), and other sector as the lowest. That is, if household energy consumption is reduced it will help significant savings. Batih and Sorapipatana (2016) shows that refrigerators, air conditioning units, lamps, and television sets are devices that have the greatest possible for electrical energy preserving.

Economic variables have well-known a lot of immersion in the literature with energy savings. But energy savings is not only related to economic issues. Previous research has established that, particularly when it comes to elevating the selection of proficient technologies, subsidy programs could be persuasive, as we continually find that profit plays a significant function in the households' opinion to choose efficient contraptions. Energy savings can explain by theory of planned behavior (TPB). According to Mei-Fang Chen (2016) the extended theory of planned behavior model could describe a person's motive to perform energy savings better. Surveys such as that conducted by Tan et al (2017) have shown that attitude, perceived behavioral control and moral norm were positively significant with purchase intention for energy-efficient household appliances. An objective of this study was to investigate governmental factors for household energy savings in Indonesia with adding the theory of planned behavior.

2. Theory

Theory of planned behavior is developed to predict behavior by understanding the drives or motivations that come from outside or volition itself. This theory uses a frame of mind to look at attitudes toward behavior. Based on the theoretical framework of this theory, the main determinant of individual behavior is intention. Intention is the form or expression of caring.

Ajzen (2005) describes that individual intention when behaving is a combination of attitude with subjective norm and perception of perceived behavioral control. The theory of planned behavior is developed on the assumption that human beings are rational beings. As rational beings, individuals will behave on the basis of information they possess. Information is arranged systematically before being used as a consideration when it will behave. Thus, an action or behavior will be based on intention by taking into account social attitudes, norms and controls.

3. Research Method

The study was conducted in the form of The Environmental Care Behavior Survey (2013), with data being gathered via Village Potential Census (2011). Both are organized by the Indonesian Central Bureau of Statistics. The range of the 2013 Environmental Care Behavior Survey is all province in Indonesia with a sample of 75,000 households with 271,019 household members. The types of data composed include: i) facts on household members, ii) housing estates, iii) practices of energy use, iv) behavior of containing, handling and using waste, v) pattern when exploiting and pleasuring water. In the meantime, village potential census facts has so far been the only thematic spatial information root to display the eventuality of village-level zone beyond Indonesia. Village potential census is arrangement depend on the context of December 2009, subsisting of 77,126 village-level areas cover 6,651 sub-districts in 497 districts.

The supreme result for this inquiry is house-hold energy savings behavior, defined as in the past year, did households save electricity? Depended on the study's theoretical framework (Figure 1), nine possible predictors of household energy savings collected in the ECBS 2013 and VPS 2011 were identified: attitude, subjective norm, perceived behavioral control, administration status, village representative board, education of the village head, education of village secretary, and village's own revenue. Factors that were issued among household that saved and did not save energy ($p < 0.05$ in the design-adjusted Chi-squared) were used in making the model. Collinearity was evaluated. Highly collinear ($r > = 0.8$, usage Pearson's correlation test) showed that the variables are related to household energy efficiency. Manual backward stepwise regression was then performed to expand a multivariable logistic regression model of forecaster of household energy savings in Indonesia. Significant determinants ($\alpha = 0.05$) were used in the definitive model. Odds ratio (ORs) and 95% confidence interval are disseminated.

4. Results and Discussion

4.1. Results

Of the 271,019 household member, 99,884 (36.85%) of them save energy. Among the 271,019 households who ordered, 53,911 households (44.8%, 95% CI:44.3, 45.2) are in *kelurahan* (urban) area (Table 1). Bivariate analysis was performed and results showed all factors were correlated with household energy savings: attitude ($p < 0.001$), intention ($p < 0.001$), subjective norm ($p < 0.001$), perceived behavioral control ($p < 0.001$), the administration status ($p < 0.001$), village representative board ($p < 0.001$), village's own revenue ($p < 0.001$), education of the village head ($p < 0.001$), and education of village secretary ($p < 0.001$).

Tabel 1 Bivariate correlated amid attribute household energy savings in Indonesia

Characteristics	N	%	[95% CI]	P-Value
Intention				<0.001
Not sincere	2,712	40.6	[38.8, 42.5]	
Less sincere	5,267	22.4	[21.3, 23.5]	
Sincere enough	33,180	27.7	[27.2, 28.2]	
Sincere	175,876	36.5	[36.3, 36.8]	
Very sincere	53,984	44.7	[44.3, 45.2]	
Attitude				<0.001
Not mature	24,885	45.6	[45.0, 46.3]	
Less mature	95,197	40.5	[40.2, 40.9]	
Mature enough	74,323	37.1	[36.8, 37.5]	
Mature	57,842	31.5	[31.1, 31.9]	
Very mature	18,772	21.9	[21.3, 22.5]	
Subjective Norm				<0.001
Not diverse	5,079	56.8	[55.5, 58.2]	
Less diverse	10,165	48.5	[47.6, 49.5]	
Diverse enough	34,923	42.8	[42.3, 43.3]	
Diverse	43,439	40.7	[40.3, 41.8]	
Very diverse	177,413	33.5	[33.3, 33.7]	
Perceived Behavioral Control				<0.001
Not precise	926	56.2	[52.9, 59.4]	
Less precise	4,110	47.7	[46.2, 49.2]	
Precise enough	139,199	38.7	[38.4, 38.9]	
Precise	123,236	34.0	[33.8, 34.3]	
Very precise	3,548	45.2	[43.5, 46.8]	
The administration status				<0.001
Kelurahan (urban)	53,911	44.8	[44.3, 45.2]	
Desa (rural)	217,108	34.9	[34.7, 35.1]	
Village Representative Board				<0.001
No	36,402	39.4	[38.9, 39.9]	

Yes	234,617	36.5	[36.3, 36.7]	
Education of the village head				<0.001
<= Senior High School	202,947	35.9	[35.7, 36.1]	
>= Under Graduate	68,072	39.6	[39.3, 40.0]	
Education of Village secretary				<0.001
<= Senior High School	189,491	35.9	[35.7, 36.2]	
>= Under Graduate	81,528	38.9	[38.6, 39.3]	
Village's Own Revenue				<0.001
No	79,458	78.4	[78.1, 78.7]	
Yes	191,561	75.3	[75.1, 75.5]	

Table 2 displays of the full and reduced (sole involving variables recognized as significant operation the backwards stepwise regression) models. In intact model, all factors that make up the Theory of Planned Behavior were connected with household energy savings except factor of intention: less sincere (OR = 0.62, 95% CI: 0.56, 0.69) or sincere enough (OR = 0.68, 95% CI:0.63, 0.74) or sincere (OR = 0.88, 95% CI: 0.81, 0.95) or very sincere (OR = 1.08, 95% CI: 0.99, 1.16) versus not sincere. Different variables from all governmental basis were associated with household energy savings: having village representative board (OR = 1.35, 95% CI: 1.31, 1.40) versus no; owning village's own revenue (OR = 1.10, 95% CI: 1.08, 1.12) versus no; enjoying the administration status is *desa* (OR = 0.59, 95% CI: 0.57, 0.60) versus *kelurahan* (urban); accepting education of the village head is under graduate (OR = 0.89, 95% CI: 0.87, 0.91) versus senior high school and holding education of village secretary is under graduate (OR = 0.95, 95% CI: 0.93, 0.97) versus senior high school.

4.2. Discussions

The theory of planned behavior (TPB) provides a useful insight of how the main antecedent of an individual's address; and in turn an individual's behavioral intention is established by attitude, subjective norm and perceived behavioral control (Greaves et al. 2013). In this prior research of the 2011 VPS and 2013 ECBS, we construct that more than one-thirds (36.85 %) of the household do energy savings. Attitude, subjective norm and perceived behavioral control were correlated with the probability of the household energy savings. Meanwhile, intention was not linked with the probability of the household energy savings. Significant used TPB for deconstruct environmental portent have been considered in other countries. It is now well showed from a variety of research that TPB mediates the relation between environmental concern and green products purchase

intention in India (Paul et al. 2016). Mei-Fang Chen (2015) revealed the extended theory of planned behavior model could describe a person's motive to perform energy savings better compared to original one. In other research, Oztekin et al. (2017) contributes advocacy for the applicability of the TPB as a model of behavioral forecast and agree with other studies analyzing the practicality of the TPB in the context of recycling. In 2013, Mei and Pei examined social and behavioral factors for promoting an added Theory of Planned Behavior model to presume the intention of customers in visiting green hotels. The result obtained from this empirical study verify that the expanded TPB model has a good analytical power. For this study, some variables including attitude, subjective norm, perceived behavioral control, the administration status, village representative board, village's own revenue, education of the village head, education of village secretary were significant ($p < 0.05$) in reduced model.

In our investigation, except the variable intention, the other three variables of TPB, namely attitude, subjective norm and perceived behavioral control were correlated in high significance to household energy savings. Meantime, for the governmental factors as the existence of the administration status, village representative board, village's own revenue, and education of the village head and secretary were significantly associated with the household energy savings. The minority of household in this study: 34,9% located in rural; 36.5% have village representative board; 75.3% have no village's own revenue; 39.6% education of the village head is under graduate; and 38,9% education of village secretary is under graduate, a finding that is in accordance to other studies. Relatively few studies have examined the association governmental factors with household energy savings. Apparently, household energy savings can improved by increasing the awareness related to government support.

Remarkably, this analysis did not use intention variable as risk factor that will relate to household energy savings. With this, we distinguish this study from other recent research that noted negligible a connection between pro-environmental behavior (such as household energy savings) and perceived behavioral control. Prior to the work of Halder et al. (2016), whereas noted behavioral control had a significant effect on intention to utility bioenergy. Surveys such as that organized by Yazdanpanah, M., & Forouzani, M. (2015) have shown that perceived behavioral control is not significant in predicting the intention to gain organic food in Iran.

We awaited that household energy savings behavior would be lower because in Indonesia, energy savings is less relevant. In Indonesia electrical power is attached to the household there are 5 levels. The lowest level is 450 watts. The next are 900, 1300, 2200 and above 2200 watts. The government has a policy that households with house's installment of 900 watt electric capacity has the right to get the power subsidies. In this prior research of the 2011 VPS

and 2013 ECBS (table 3), we assemble that more than two-thirds (75.61%) are recorded as subsidy recipients. But if taking into account households that do not have a meter of 11.81%, then the discussion on energy savings is only relevant to 12.58% of respondents. However, it does not necessarily mean that lower-class consumer groups do not need to be frugal. Economic factors are crucial as energy-saving reasons.

Other than that the government can take an active role. Governments can play a role through policies such as policy on energy-saving movements. Lavergne's et al. (2010) comprehensive review completed that the direct and indirect effects attributable to respected government style and reason toward the environment clarified 21% of the variance in self report frequency of pro-environmental behavior. One potential reason that government style factors such as the administration status, village representative board, village's own revenue, education of the village head and education of village secretary are associated with household energy saving. Fang, et al (2014) revealed that government regulator and low carbon habits play a key role in eliminating energy-saving and emission-reduction (ESER) system and dismissing energy intensity. Fang, et al (2014) also revealed that the predominance of government authority on economic increase should be studied simultaneously and enhancing it for the sake of energy anxiety is a great importance as well.

Formally, government involvement to increase the popularity of household energy savings need to pay attention. Energy savings movement can synergize with community empowerment. This study is in accordance with results from other studies. The study by Mongkolnchaiarunya (2005) offers probably the most comprehensive empirical analysis of promoting an environmental movement such as energy savings and solid-waste management via community-based initiative in local government. Mongkolnchaiarunya (2005) also showed that governments are persuaded by community participation and empowerment. Bongsuk Sung and Woo-Yong Song (2014) examined the dynamic association between government policy as well as exports of renewable energy technologies (RETs) for three subsectors (solar energy technologies, biomass and wind). Their results showed that government policy dimension on exports depends on each subsector. This illustrates that the subsector level of the assay appears to be critical for delivering fit and more in depth interpretations of the association between government policy and other factors. Overall, after paying attention to the relationship with some variables such as attitude, subjective norm, and perceived behavioral control, there seems to be some evidence to indicate that when the governmental factors have been increased, there is also the increasing of dependency relationship to the energy savings.

Empowerment in the field of household and governmental factors such as the administration status, village representative board, and village's own revenue, education of the village head and education of village secretary will inspire various parties. Establishment of energy savings is an indicator of success of empowerment. Energy savings is a real activity to reduce the amount of energy use. Like any other activity, saving energy needs to be a habit. Behavior will become a habit if it begins with intention. That is, energy savings will become a habit when there is intention. Surveys such as that conducted by Donald et al (2014) have shown that car use was resolved by intention as well as habit, although perceived behavioral control was not found to affect this. On the other hand, public transport usage was affected by intention on.

There is significant implicit for energy savings in Indonesia. Tharakan (2015) shown, Indonesia's National Master Plan for Energy Conservation plans a target of reducing energy ardency by 1% annually until 2025. In order to reach this objective, energy savings possible have been distinguished as follows: commercial buildings – 25%, households – 10-30% and industry – 15-30%. More recently, Indonesia was a stalwart oil- producing country and financed petroleum products and electricity. Thus, research on household energy savings is highly relevant and important. There is an urgent need to address the energy savings behavior, both from the household side and from the governments.

There is numerous limitation to this analysis. First, by reason of this was a subsequent study of the 2011 VPS and 2013 ECBS, we did not have all the changeable presented in our theoretical frame. We could not study relationship between the details of energy savings at the household with several government-based factors in depth. In case, recall bias, in particular about intention may have pretended our derivative study. Additionally, the study included the basic forecasters of the inquiry outcome. Consequently, Manzi et al. (2014) pointed out that investigator in this field should examine if consequence of the risk factors will be based on strata of population. Additionally, the ECBS has definite data on perceptiveness and serviceable of household energy savings, which is a meaningful zone for further analysis. Finally, the ECBS did not consider consumption and food, even though, the largest household energy savings comes from cooking food.

5. Conclusion

The research examined predictors of household energy savings in Indonesia. We begin that several variables of governmental basis and theory of planned behavior were correlated with the household energy savings, so we suggest concrete mediation to promote these assistances. Increase village's own revenue and improve the condition of village representative board, education of the village head and village secretary which suggests a potential for

strategic solution to increase sustainable household energy savings. It is important to study the power of the community overreach programs to household energy savings and create value added for them. Feasibility of enhance electricity production and integration among other community-based interferences are important to be studied as well.

Several countries including Indonesia have popularized and advocacy of household energy savings with activity in the International Energy Agency. Indonesia has also combining innovation with energy savings and sustainability. We trust that these aggressiveness can elevate better energy savings and, collaborative with government activity could accelerate period and maximize gains in energy savings. Currently energy savings has not become common awareness. Energy savings are still for economic reasons. Energy savings due to sustainability awareness is still a minority. Need closer synergy between community and government. Household and community need to mature attitude, expand subjective norm, and even create new norms about energy savings and precise in perceived behavioral control.

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