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## Abstract

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## Abstract

In this paper, we aim to examine consumer behaviour concerning energy-efficient appliances in the context of a developing country. As a case study, we use the Philippines, one of the earliest countries in Southeast Asia to introduce appliance test standards. We conducted face-to-face surveys of potential purchasers of air conditioners (ACs) in Metropolitan Manila, where the percentage of AC owners has increased as a result of economic growth. The survey includes choice experiment questions to estimate preferences for AC attributes, including purchase price, additional functions, country of manufacturer and energy efficiency information. In addition, we examine the types of information on eco labels that encourage consumers to choose an energy-efficient AC, including the default option of an energy efficiency ratio, estimated cost per hour or an energy star rating. Our choice experiment analysis reveals that energy-efficient ACs made by domestic manufacturers with smart functions are more likely to be chosen by consumers. We find that the probability of an energy-efficient AC being chosen can be increased by approximately 15% if the eco label uses an energy star rating rather than an energy efficiency ratio.



*Keywords: Energy-saving behavior; Choice experiment; Air conditioner; Developing country; Philippines*

# 1. Introduction

Energy efficiency is regarded as an 'invisible powerhouse' in many developed countries, which have made energy efficiency a key policy priority. Increasingly, developing countries have also been adopting such policies. Nevertheless, the contexts and motivations of these two groups of countries are fundamentally different. In developed countries, choices are largely influenced by a sense of obligation to seek efficiency to meet climate goals. The primary concerns are addressing the negative externalities of local pollution and the carbon emissions arising from energy and electricity production, and reducing the effects of market failures and other barriers constraining investments in energy efficiency (Fowlie and Amol, 2017). Although these concerns are applicable to developing countries, their overriding priority is the development goal of poverty reduction. In developing countries where the supply of electricity can be unstable, greater energy efficiency can contribute to lowering peak demand and therefore enhance the stability of the electricity supply. Thus, energy efficiency must be mainstreamed into the economic development agendas of developing countries as a complement to economic development objectives. Moreover, the analyses and lessons learned from the implementation of energy-efficiency policies in many developed countries (e.g. The Regulatory Assistance Project, 2012) do not necessarily translate to the developing country context. Income levels, consumer preferences, market structures and institutions are fundamentally different between the two types of countries.

Advancing to an energy-efficient economy requires a long gestation period, in part because the achievement of energy efficiency is related to income levels. In addition, information asymmetry between manufacturers and consumers can undermine investments in energy efficiency (Fowlie and Amol, 2017). Interventions such as labelling programmes and standards can help reduce such a lack of information (Newell and Siikamäki, 2014; Houde, 2018).

In this paper, our objective is to understand consumer behaviour concerning energy-efficient appliances in the context of a developing country. We take the Philippines, one of the earliest countries in Southeast Asia to adopt appliance test standards, as a case study. The Philippines began development of a test standard in 1983 but its efforts were halted in 1986 by political turmoil (Duffy, 1996). In 1991, the first Fuel and Appliance Testing Laboratory was established to conduct energy performance tests on electrical household appliances and lighting systems (Zabala, 2001). Then, in 1994, standards and labels were finalized in a collaboration between the government and private manufacturers. This system, known as the Philippine National Standard (PNS) 396, established a legal basis for energy labelling in the country (Department of Energy (DOE), n.d.). Room air conditioners (ACs) were the first products to be covered by the PNS,

followed by refrigerators and freezers, and then lighting systems, which have made the biggest advances among the products covered by the programme (Zabala, 2001; Verdote, 2010). In July 2019, the Philippines passed a new law on energy efficiency and conservation (Congress of the Philippines, 2019), establishing a framework for the institutionalization of fundamental policies on them. This law gave more force to the regulations and the implementation of policies concerning energy efficiency. The law empowers the DOE to impose minimum energy performance standards and enforce a mandatory energy efficiency rating and labelling system for energy-consuming products, including room ACs.

Given the strengthened resolve to push for energy efficiency, intervention priorities should be focused on end uses that can have the largest impact (Fowlie and Amol, 2017). This requires information on factors including electricity consumption patterns, appliance saturation and energy expenditures. The Philippines Household Energy Consumption Survey (Philippine Statistics Authority, 2011) reveals that space cooling or air conditioning is the major purpose of residential electricity use in the Philippines. ACs are used by only 16% of Metropolitan (Metro) Manila's population of 13 million and 7% of the Philippine population of 107 million, based on data from 2016.[1] However, the Japan Refrigeration and Air Conditioning Industry Association (2019) reports that the number of AC sales in the Philippines has increased. An increasing trend is expected owing to several factors, including climate, economic growth and urbanization (IEA, 2018). In these circumstances, and from the perspective of climate change policy in the Philippines, it is important to encourage people to choose energy-efficient ACs. In fact, the IEA (2018) predicts that energy-efficient ACs could halve the expected increase in electricity demand for space cooling worldwide.

We contribute to the literature by filling the gap in the understanding of consumer behaviour concerning energy-efficient appliances in a developing country context. We perform a discrete choice experiment using eco labels to elicit the type of information that encourages consumers to choose energy-efficient ACs. The choice experiment enables us to examine consumers' preferences for AC attributes, including purchase price, additional functions, country of manufacturer and energy efficiency. We compare three eco labels that present energy efficiency information in different ways: the baseline energy efficiency ratio (EER), estimated cost per hour and an energy star rating. To this end, we conducted face-to-face surveys that included our choice

[1] We obtained the data from the 'National Incidence Study,' a nationally representative survey with 1,200 respondents conducted by the Philippine Survey and Research Center from 11 July 2016 to 4 August 2016.

experiment questions with potential AC purchasers in Metro Manila, the national capital region of the Philippines, to estimate preferences for AC attributes. Using a conditional logit model, our analysis shows that the probability of an energy-efficient AC being chosen increased by approximately 15% if an eco label with an energy star rating was displayed rather than an EER. In addition, we find that consumers are more likely to choose energy-efficient ACs with smart functions made by domestic manufacturers.

The remainder of this paper proceeds as follows. Section 2 reviews relevant literature and explains our contributions. Section 3 presents our methodology, including the survey design and theoretical framework. The empirical results and discussion follow in Section 4. We summarize our findings and conclude in Section 5.

## 2. Literature Review

In the context of developed countries, there are several studies that examine whether energy information affects purchase decisions (e.g. Anderson and Claxton, 1982; Newell and Siikamäki, 2014; Zainudin et al., 2014; Houde, 2018; Damigos et al., 2020). Deutsch (2010) demonstrates that disclosure of life-cycle cost information encourages consumers in Germany to choose appliances with efficiency indicators over those without such information. Waechter et al. (2015) find that people tend to focus on energy efficiency class but largely ignore information regarding electricity consumption shown in kWh per year. In short, these studies suggest that information on energy efficiency influences purchase decisions.

Some studies examine the relative importance of energy information compared with other attributes using a choice experiment methodology. Ward et al. (2011) examine whether ENERGY STAR labels affect purchase decisions on refrigerators in the United States, and find positive effects on purchase decisions. The average willingness to pay (WTP) for the information on the label is estimated as ranging from USD 250 to USD 350. In Germany, Heinzle (2012) examines the forms of energy consumption information that contribute to the choice of an energy-efficient TV. The study reveals that the WTP for energy-efficient products is more pronounced when information on ‘lifetime energy operation costs’ is shown rather than ‘annual energy operation costs’ or ‘watts’.

A few choice experiment studies with similar research objectives have been conducted in developing countries.[2] Both Shen and Saijo (2009) and Zhou and Bukenya (2016) conduct surveys in China and find that the China Energy Efficiency label significantly and positively impacts the decision-making of home appliance purchases. To the best of our knowledge, no analysis has been undertaken of consumer behaviour in response to energy labelling using data from the Philippines. Although studies have been conducted on test procedures for rating and testing appliances (Zabala, 2001; Mahlia and Saidur, 2010) and on energy consumption behaviour (Sahakian, 2011), investigations of consumer responses to energy labelling are lacking, particularly given that the demand for ACs is expected to increase.

We contribute to filling this gap in the literature by investigating what information effectively encourages consumers to choose energy-efficient ACs. We employ a transdisciplinary approach, in that the estimation of the model is based on economic theories, but we also employ concepts and insights from the field of engineering, particularly in developing the attributes and levels of energy efficiency in the choice experiment questions. In addition, we include the new energy label design that will be released in the Philippines as one form of energy efficiency information to estimate preferences for the new design, which may contribute to effective policy design in the future.

# 3. Methodology

## 3.1 Survey overview

To develop our choice experiment questions, we conducted activities that are critical to determining AC attributes and levels, including market research, two focus group discussions (FGDs) and a pre-test survey. We performed the market research by visiting several appliance shops in Metro Manila during February 2019 and investigating popular AC models, including their country of manufacturer, price range and functions. Our FGDs had 12 participants, who were men and women aged 25–45 years, all of whom were the decision-makers in their households in terms of purchasing appliances. We conducted FGDs to explore views and attitudes regarding energy consumption in general and ACs through the spontaneous and free-flowing

[2] In addition to the choice experiment studies, one study uses a hedonic price model; Zhang and Tao (2020) empirically investigate the relative importance of the energy efficiency level in purchasing appliances using data from China.

exchange of opinions, preferences and ideas among participants. From our FGDs, we found that energy efficiency, AC price and quality measures, including country of manufacturer, suitability (e.g. physical size and capacity) and functions, affect purchase decisions. Our FGDs were conducted in February 2019. Then, in March 2019, five respondents participated in our pre-tests. The pre-test questionnaire was developed with reference to the results of the FGDs. Both the FGDs and pre-tests were conducted with the assistance of the Philippine Survey and Research Center (PSRC).[3]

Finally, the main survey was conducted from 13 July to 16 August 2019 via face-to-face interviews.[4] We targeted 600 residents between 25 and 65 years of age in the 16 cities of Metro Manila, namely Caloocan, Las Piñas, Makati, Malabon, Mandaluyong, Manila, Marikina, Muntinlupa, Navotas, Paranaque, Pasig, Pasay, Quezon City, Rizal, San Juan, Taguig and Valenzuela. We adopted a two-step recruitment procedure. First, PSRC randomly visited households in the 16 cities and asked householders if they were decision-makers concerning appliance purchases. Only those household members who indicated that they decided alone, or with another household member, what brand or type of ACs to purchase were requested to complete the survey. Second, respondents were required to be interested in purchasing an AC within the next two years. Because significant income inequality exists in the Philippines, considerable numbers of people cannot afford to purchase ACs. Considering that our research objective is to investigate how households can be incentivized to choose energy-efficient ACs, it is reasonable to focus only on respondents who are potential purchasers.[5] Respondents could be interested in purchasing an AC for the first time or in purchasing an additional or a replacement AC. During the sampling procedure, the survey company attempted to develop a balanced sample according to gender, age range and household size range among three groups of participants who were organized according to the types of energy-efficient information that they were shown, comprising EER, estimated cost per hour and an energy star rating system.

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[3] PSRC is one of the leading independent research and survey agencies in the Philippines. They were responsible for hosting the FGDs and pre-tests and recruiting respondents.

[4] PSRC was responsible for programming the questionnaire on the tablet and conducting the interview. The enumerators were aided by a tablet.

[5] We recognize that it would be meaningful to use a sample that matches the population to investigate the impact of label design in the longer term. We defer this to future research.

The questionnaire consists of four parts: choice experiments, questions to measure environmental and energy awareness, questions to determine awareness of energy labels and questions to gather socio-demographic information.

### 3.2 Design of choice experiment

Based on the results of the pre-test surveys and related studies, we established four attributes for our choice experiment questions: *purchase price* (Shen and Saijo, 2009; Davis and Metcalf, 2016; Zhou and Bukenya, 2016; Jain et al., 2018), *country of manufacturer* (Zhou and Bukenya, 2016; Jain et al., 2018),[6] *additional functions* (Shen and Saijo, 2009; Jain et al., 2018) and *energy efficiency* (Shen and Saijo, 2009; Davis and Metcalf, 2016; Zhou and Bukenya, 2016; Jain et al., 2018). The energy efficiency attribute includes three types of information: the EER, estimated cost per hour and the energy star rating. We established four levels for each of these attributes. As there are physical limitations governing the installation of either a window or a split AC in a living space, we developed six choice experiment questions for each of these two types of AC. Thus, in total, there were 12 choice experiment questions. Tables 1 and 2 summarize the attributes and levels for window and split ACs, respectively.

–insert Table 1 here–

–insert Table 2 here–

The first attribute is the purchase price, with levels of Philippine pesos (PhP) 15,000, PhP 20,000, PhP 25,000 and PhP 30,000 for a window AC, and PhP 25,000, PhP 30,000, PhP 35,000 and PhP 40,000 for a split AC.[7] These price ranges were based on our market research on popular AC models of 1 horsepower (HP).

The second attribute is the country of manufacturer. Again, we established four levels or possible responses, namely the Philippines, Japan, Korea and the United States. Our market research, FGDs and pre-tests confirmed that the majority of ACs are manufactured by companies from these four countries in the case of both window and split ACs.

[6] Jain et al. (2018) and Zhou and Bukenya (2016) also include 'brand' as one of their attributes.

[7] USD 1 = PhP 51 as of January 2022.

The third attribute is additional functions, again with four response levels. For window ACs, these comprise none, noise reduction, air purification and smart functions. Respondents from our FGDs considered basic functions such as a timer, fan, swing and remote control as essentials rather than additional functions of ACs. By contrast, a noise reduction function was deemed an attractive additional feature because window ACs are often noisy when in use. Air purification was another attractive function identified by the FGDs, particularly for people concerned about the health of their children. ACs with smart functions are a hypothetical additional function. Smart functions enable people to monitor electricity consumption and turn their unit on and off via mobile phone or tablet. A 'smart AC plug', sold separately from ACs, is becoming popular in the Philippines and has similar smart functions. Given its popularity, it is likely that a built-in smart function that helps people to save electricity would be popular. Additional functions for split ACs have four levels: none, autocleaning, air purification and smart functions. Autocleaning for split ACs is an advanced function; ACs with this function are not yet available in the Philippines but it is the most popular function in Japan.[8] As there are many ACs from Japanese manufacturers available in the Philippines, we include this attribute level to account for the possibility that it may be introduced in the future.

The fourth attribute is energy efficiency, with three types of information included regarding energy labels: EER, estimated cost per hour and energy star rating. Our aim is to examine the type of information that will encourage consumers to choose an energy-efficient AC. The information choices were guided by our discussions with the DOE and the Manila Electric Company (Meralco).[9] The DOE issues EERs in their 'Energy Guide' and Meralco issues an 'Orange Tag' that contains estimated cost per hour. Both EER and the estimated cost per hour are information found on AC energy labels on the market. The third type of information is an energy star rating, with a number of stars based on the EER; the DOE is proposing to use new labels with energy

[8] In July 2017, MyVoice Communications conducted a representative 'Questionnaire Survey on Household Air Conditioners' in Japan. In the results, which they shared with us, one of the questions asked 'Assume that you are going to purchase air conditioners. Which functions do you consider the most in the top of the basic function of heating and cooling?" and the greatest number of people (44.2%) answered "auto-cleaning function.'

[9] We visited the DOE and Meralco on 23 and 24 May 2019, respectively. Meralco is the largest electricity distribution company in the Philippines.

start ratings (see Figure 1).[10] Hereinafter, the EER, estimated cost per hour and the energy star rating are termed the 'baseline', 'new label 1' and 'new label 2', respectively.

Each of the three types of information under the energy efficiency attributes had four levels of preferences concerning window and split ACs. For window ACs, EER baselines are 9, 11, 13 and 15. We set 9 as the lowest level because DOE requires a minimum EER of 9.1. The second-lowest level was set at 11 because the highest EER among non-inverter ACs was 11.2 at the time of our survey design (DOE, 2019a). The highest efficiency for inverter ACs was 13. Finally, we set 15 as the highest efficiency level; this is above the efficiency level of the most efficient model currently on the market. For split ACs, the EER baselines are, again, 9, 11, 13 and 15. The lowest efficiency level was 9 for the same reason as for window ACs; 11 is the highest EER among non-inverter ACs (DOE, 2019b); and EERs 13 and 15 capture the preferences for higher energy efficiency ACs with inverters.

To compare the impacts of the three types of energy efficiency information on the choice of AC, we need to ensure that the levels correspond. First, the baseline (the EER) must correspond with new label 1 (estimated cost per hour). Equation (1) calculates estimated cost per hour by multiplying the estimated energy consumption per hour by the electricity price per hour:[11]

$$Estimated\ costs\ per\ hour = \text{Estimated energy consumption per hour } \left({}^{kWh}/_{hr}\right) \text{ x cost } \left({}^{PhP}/_{kWh}\right) \quad (1)$$

The standard rate that Meralco used for its Orange Tag at the time of the survey design was PhP 9.744/kWh. Estimated energy consumption per hour is obtained based on actual tests in the Meralco laboratory under night-time use, and settings of 25 degrees Celsius with high fan mode. The factor depends on the capacity (HP), type (window or split) and technology (inverter or

[10] Energy Guides and Orange Tags are existing labels but they are not placed on all ACs. Under the current laws, only window ACs without an inverter have an Energy Guide. Orange Tags have been displayed on specific ACs since February 2019.

See https://meralcomain.s3.ap-southeast-1.amazonaws.com/images/ckeditor-documents/Orange%20Tag%20Appliances%202019_AirCon_0.pdf?null for the standard rate as of February 2019.

[11] We obtained this information from our discussion with Meralco.

conventional).[12] Meralco provides an appliance calculator to compute the estimated energy consumption per hour. The calculator uses the formula in Eq. (2):

$$\text{Estimated energy consumption per hour } \left({}^{kWh}/_{hr}\right) = \left({}^{Power\ consumption}/_{1000}\right) \times factor \times 1\ hour \quad (2)$$

To the match baseline and new label 1, we assume that the AC in our choice experiment has 1 HP. This assumption is reasonable because Meralco advised that 1-HP ACs are the most popular model among Filipino consumers. In addition, we assume that the cooling capacity is 9,500 kJ per hour, as this is the representative value of certified 1-HP window and split ACs in March 2019 (DOE, 2019a and 2019b). The EER is calculated as follows in Eq. (3):

$$EER = \frac{Cooling\ capacity\ (1\ HP,\ \ FIXED)}{Power\ consumption} \quad (3)$$

Because cooling capacity is fixed, power consumption is the only connection between the baseline and new label 1. Accordingly, the power consumption corresponding to each level of baseline EER was established based on the available lists of certified window and split ACs (DOE, 2019a; DOE, 2019b). Tables 1a and 2a in the Appendix present the correspondence between EER and estimated cost per hour for window and split ACs, respectively.

New label 2 (the energy star rating) is simply based directly on the baseline. One-, two-, three- and four-star ratings correspond to EERs of 9, 11, 13 and 15, respectively. In the choice experiment questionnaire, respondents are shown the energy star rating information and the corresponding EER, mirroring the proposed new DOE label (Figure 1).

– insert Figure 1 here –

To summarize, we established four levels for the three types of energy efficiency information, the baseline (EER), new label 1 (estimated cost per hour) and new label 2 (energy star rating), as shown in Tables 1 and 2. We divided our sample into three groups of 200 respondents according

[12] Meralco provided us with the factors that they used in the conversion.

to the energy efficiency information. In our choice experiment questions, we present energy labels with one of the three types of energy information to each of the three groups.

We created an efficient experimental design using the dcreate command in STATA 15, including an alternative specific constant (ASC) option. The ASC option is that neither AC 1 nor AC 2 with differing attributes is chosen. An example of a choice experiment set in our study is shown in Table 3. In the survey, the definition of each attribute and level was explained to the respondents. Then, they were asked to choose the most preferable of three options, AC 1, AC 2 and ASC.

–insert Table 3 here–

### 3.3 Econometric model

We employ a choice experiment using the stated-preference approach developed by Louviere and Hensher (1982) and Louviere and Woodworth (1983). The choice experiment aims at investigating respondents' preferences across a set of alternatives expressed as a bundle of attributes. We asked respondents to choose their preferred option given alternatives and repeated this procedure six times, enabling us to estimate utility functions. The theoretical framework of a conditional logit model is as follows. We assume that respondent *n* has the random utility function proposed by Lancaster (1966) and given in Eq. (4):

$$U_{ni} = V_{ni} + \varepsilon_{ni}, \qquad (4)$$

where $V_{ni}$ and $\varepsilon_{ni}$ denote the observable utility and the stochastic component of utility, respectively. The error term is identically independently distributed and follows a Type-I extreme value distribution. The probability that alternative $i$ is chosen out of the alternatives in choice set $C = \{1,2,\dots,J\}$ by respondent $n$ can be expressed as in Eq. (5):

$$P_{ni}\left(U_{ni} > U_{nj}, \forall j \in C, i \neq j\right) = \frac{exp(\mu V_{ni})}{\sum_{j \in C} exp(\mu V_{nj})}, \quad (5)$$

where $\mu$ is a scale parameter. We assume a linear model for $V_{ni}$.

We estimate the results for the three groups separately for both window and split ACs. In

each model, the observable utility comprises the attribute variables: purchase price, country of manufacturer, additional functions and energy efficiency. Other than purchase price, all attributes are dummy variables. We treat 'Philippines', 'no additional function' and 'efficiency level 1' as base levels for the country of manufacturer, additional functions and energy efficiency, respectively. The coefficients for each attribute level are expressed relative to these base levels. In addition, we estimated the average marginal effects.

# 4. Results and Discussion

## 4.1 Descriptive analysis

The descriptive statistics of our respondents are presented in Table 4. To examine how information affects decision-making in different ways, the individual attributes of the three groups (baseline, new label 1 and new label 2) must be matched. Table 4 shows the results of conducting Bonferroni's multiple comparison tests. It indicates that the mean values of socio-demographic characteristics (gender, age, educational attainment and income) are homogenous among the three groups, namely baseline, new label 1 and new label 2. Moreover, there are no statistically significant differences between the three groups in terms of monthly electricity fees, hours of AC use per day, awareness and the degree of trust in labels. Therefore, using these groups to achieve our main research objective is valid.

Our sample is overrepresented in terms of the number of people who have graduated from university. Even though 20% of all university graduates among all regions in the Philippines are from Metro Manila (Commission on Higher Education, 2019), approximately 50% of our sample graduated from university. In addition, more than half of our respondents earn more than the average Metro Manila income of PhP 460,000 per year (PSA, 2018).[13] This is expected, given the criteria we established for our respondents, namely we selected only individuals who were interested in purchasing an AC within the next two years. Therefore, because we seek to investigate the preferences of potential buyers, the composition of our sample is not problematic.

We found that the average monthly electricity bill is approximately PhP 3,700 (equivalent to approximately USD 72 as of January 2022). As revealed in our FGDs and pre-tests, electricity expenses account for a large portion of respondents' expenditure. The average daily AC usage is about eight hours, which may indicate night-time use. Most respondents recognized the Energy

[13] The median monthly household income of our respondents is PhP 60,000–PhP 99,999, which is considerably higher than the average of PhP 38,000 per month (PhP 460,000 divided by 12 months).

Guide issued by the DOE but fewer were aware of Meralco's Orange Tag. About 42% of AC owners among respondents considered both the Energy Guide and the Orange Tag when they purchased an AC previously. Approximately 39% considered only the Energy Guide and about 5% considered only the Orange Tag, while another 5% referred to other energy labels.[14] In total, 91% of AC owners in our sample had considered energy labels when purchasing an AC in the past. We also asked respondents whether they would consider energy labels when buying an AC in the future. We found that 47% of respondents reported that they would consider both the Energy Guide and the Orange Tag, 36% would consider only the Energy Guide, 7% would consider only the Orange Tag, and 3% would refer to other labels.[15] In total, approximately 93% of respondents would consider labels in the future.

Moreover, the descriptive analysis suggested that most of the respondents do trust the information on the energy labels issued by the DOE and Meralco, and that energy labels play an important role in the decision concerning which AC to buy.

–insert Table 4 here–

## 4.2 Estimation results from the conditional logit model

Estimation results from the conditional logit model for window ACs are presented in Table 5. Regarding additional functions, the dummy variable for noise reduction is significantly positive but only for the new label 2 (energy star rating) group. In other groups, this dummy variable is not statistically significant, which is in line with Jain et al. (2018). Air purification is positive but not statistically significant in our study, whereas an earlier study conducted in China found that air purification functions increase the possibility an AC being selected (Shen and Saijo, 2009). Smart functions are estimated as positive and statistically significant, except for the new label 1 (estimated cost per hour) group. For the country of manufacturer, the dummy variables for Korea and the US have significantly negative values, meaning that respondents tend not to choose window ACs manufactured by companies from these two countries relative to ACs manufactured in the Philippines. Conversely, the relative preference for window ACs manufactured by Japanese

[14] We base consideration of labels when purchasing an AC in the past on all AC owners in our sample. Although we calculate this separately for each group, similar results are observed between groups.

[15] Results for consideration of labels when purchasing an AC in future are calculated for all respondents. Similar results are observed when we calculate separately for each group.

firms is mixed. Most importantly, our results find that energy efficiency significantly affects purchase decisions. This finding is consistent with the related studies (Shen and Saijo, 2009; Davis and Metcalf, 2016; Zhou and Bukenya, 2016; Jain et al., 2018). All variables for energy efficiency (levels 2, 3 and 4) are statistically significant. In addition, as the level of efficiency increases, most of the estimated coefficients increase, meaning that respondents prefer window ACs with higher energy efficiency. Except for the baseline, the most efficient level (level 4) has the largest coefficient and the greatest marginal effect. Finally, the ASC option has a significantly negative estimated value, indicating that people prefer to purchase an AC as opposed to not buying one. Contrary to related studies (Shen and Saijo, 2009; Davis and Metcalf, 2016; Zhou and Bukenya, 2016; Jain et al., 2018) purchase price is not estimated as significant and negative. In other words, ACs are price inelastic for respondents who are potential consumers and earn higher incomes.

Next, we investigate the information that can encourage consumers to choose energy-efficient ACs. We compare the marginal effects of energy efficiencies among the three groups (see Table 5, columns headed AME denoting average marginal effects). Recall that our respondents were shown either baseline (EER), new label 1 (estimated cost per hour) or new label 2 (energy star rating) energy efficiency information, which allows us to estimate the probability that consumers would choose energy-efficient ACs relative to the baseline.

The possibility that an AC with the most efficient level (level 4) is chosen over an AC of the lowest efficiency (level 1) increases by 6.1% for baseline information, 13.5% for new label 1 and 20.6% for new label 2 (see the results under variable level 4, AME columns in Table 5). The Chow test confirms that the differences between baseline and new label 1 (new label 2) are statistically significant at 5% (1%). To summarize, the estimation results suggest that new label 2 (energy star rating) has the greatest likelihood of encouraging people to choose the most energy-efficient window ACs.

–insert Table 5 here–

The estimation results in Table 6 reveal preferences towards the attributes of split ACs. For additional functions, respondents in two of the three groups (excluding new label 1) prefer ACs with smart functions, mirroring our results for window ACs. Although the autocleaning function is an advanced feature that is not yet available in the Philippines, it could be an attractive feature for consumers in Metro Manila. By contrast, there is no statistical difference in preferences

between 'no additional functions' and the air purification function for all groups. Regarding the country of manufacturer, coefficients for preferences for ACs manufactured in Japan have mixed results. Conversely, preferences for Korean- and US-manufactured split ACs are significantly negative in all groups. Energy efficiency affects purchase decisions for split ACs. All energy efficiency variables are statistically significant, as they were for window ACs. As efficiency increases, most of the estimated coefficients become larger, meaning that respondents prefer ACs with higher energy efficiency. We obtain similar results for the ASC option and purchase price as were observed for window ACs.

Similar to the analysis on window ACs, we examine the impact of the different labels on choosing efficient ACs. Relative to the lowest efficiency level (level 1), the possibility that a split AC with the highest efficiency level (level 4) is chosen increases by 6.5%, 14.9% and 22.3% under the baseline, new label 1 and new label 2, respectively (see Table 6, columns headed AME, results under variable level 4). The Chow test confirms that the differences between baseline and new label 1, and baseline and new label 2 are statistically significant at the 1% level. In other words, new label 2 increases the likelihood of consumers choosing the most efficient AC by 15.8% compared with the baseline information. Although new label 1 is less powerful, it increases this possibility by 8.4% relative to the baseline information.

As a robustness check, we conduct the same analysis for window and split ACs for respondents who are interested in purchasing 1) their first AC, 2) a replacement AC and 3) an additional AC.[16] Although the significance of some variables varies from the results in Tables 5 and 6, we find a consistent trend among the estimated coefficients for energy efficiency. The estimation results suggest that when the highest energy efficiency level is shown on an energy star rating (new label 2), respondents tend to choose such ACs more relative to the situation where such information is shown as an EER (the baseline). This applies to both window and split ACs for three groups of purchasers noted above. Therefore, we argue that adoption of an energy star rating system is a robust strategy to encourage consumers to choose ACs of the highest efficiency levels.

Overall, the study finds that respondents in Metro Manila tend to choose ACs manufactured by firms in the Philippines, with smart functions and higher energy efficiency. Similarly, an earlier study (Zhou and Bukenya, 2016) finds that Chinese people prefer domestic firms relative to leading foreign companies. Although we cannot identify why people prefer domestically

[16] In the interest of brevity, these estimation results are not reported. They are available upon request.

manufactured ACs because of the limitations of our survey data, possible explanations are loyalty to one's own nation and/or the expectation that purchasing a domestically produced AC will have a positive impact on the country. The estimation results observed for split ACs demonstrate that people would be likely to choose ACs with an autocleaning function if this function were introduced in future.

–insert Table 6 here–

### 4.3 Upfront cost vs. running cost

Our estimation results from all models show that the estimated coefficients of purchase price are not significantly negative, which contrasts with the results of previous studies (Shen and Saijo, 2009; Ward et al., 2011; Heinzle, 2012; Newell and Siikamäki, 2014; Davis and Metcalf, 2016; Zhou and Bukenya, 2016). There are several reasons behind this finding.

First, our results run counter to the typical 'energy efficiency gap' argument. Under this argument, consumers often do not purchase energy-efficient appliances even if they benefit from a reduction in their electricity bills that outweighs the higher cost of the initial, more energy-efficient purchase (Gillingham and Palmer, 2014). Nonetheless, our insignificant result for purchase price is consistent with findings of a low own-price elasticity for ACs (Rapson, 2014). Filipinos may place greater importance on running costs compared with upfront costs, which may be because the electricity rates in the Philippines are among the highest rates in Asia (Ravago et al., 2019). Murray and Mills (2011) and Ward et al. (2011) find that individuals in areas with higher electricity rates tend to purchase washing machines with the ENERGY STAR label in the US. Similarly, our analysis finds that the estimated coefficients for energy efficiency are very high, especially in the case of ACs of the highest efficiency level (level 4).

The second possible reason for the insignificance of purchase price is that our respondents have higher incomes compared with the average Filipino in Metro Manila and with Filipinos in general. The four AC purchase price levels in our choice experiment were determined by our market research in appliances shops located in Metro Manila, which would target consumers at various household income levels. Therefore, the purchase prices shown in our choice experiment could be considered relatively low prices by our respondents.

Finally, our respondents see price as a proxy of AC quality. The estimation results show that the purchase price coefficients for window ACs for new label 2 are even significantly positive. This could be caused by a belief that higher price means higher quality (Trajtenberg,1989).

Although we control for quality of ACs by including *additional functions* as well as *energy efficiency*, our respondents might consider an AC with a higher price as a better product.

The discussion above has some important implications. The diffusion of energy-efficient ACs can be improved when features such as smart functions are present to help consumers use ACs more efficiently. As a caveat, this may only apply to high-income households, considering the characteristics of our sample. AC prices are likely to matter to consumers in lower-income households.

## 5. Conclusion and Policy Implications

We conducted a consumer survey on ACs in Metro Manila in the Philippines to examine preferences concerning the AC attributes of purchase price, country of manufacturer, additional functions and energy efficiency in a developing country context. Our choice experiment analysis reveals that energy-efficient ACs with smart functions made by Filipino manufacturers are more likely to be chosen. Similar results are elicited for both window and split ACs.

Furthermore, we find that the type of information shared can result in a difference in the choice of AC. Compared with the default information (EER), consumers have a higher probability of choosing the most energy-efficient ACs if the information is shown in terms of estimated cost per hour or using an energy star rating. Prominently displaying an energy star rating may lead to an increase in consumers choosing energy-efficient ACs by approximately 15% for both types of ACs. Providing information on estimated cost per hour is helpful because it indicates running cost, which consumers may find easier to understand than EER (Newell and Siikamäki, 2014). This result is confirmed by our robustness check. The results of our FGDs and pre-tests reveal that many participants prefer the Orange Tag (estimated cost per hour) because the calculation in Philippine pesos allows them to better gauge their savings. An energy star rating *does not* list information on running costs; however, the strong preference for energy star ratings accords with discussions in previous studies (Waechter et al., 2015), suggesting that consumers mainly focus on energy efficiency class (e.g. A) when purchasing appliances. Individuals often use mental shortcuts to reach decisions and they tend to focus on highly accessible attributes (Kahneman, 2011).

One possible reason that the EER is less effective in encouraging individuals to choose energy-efficient ACs may be the difficulty of interpreting the information. Some participants in FGDs and pre-tests noted, ‘the current label with EER is difficult to understand’. Moreover, 44% of our respondents who were shown either estimated cost per hour or an energy star rating in

choice experiment questions misunderstood a lower EER (number) as being more efficient.[17] Therefore, energy efficiency shown using an EER may even lead to the purchase of a less efficient AC. The energy star rating label is expected to replace the current EER design in the Philippines.[18] Thus, the results of this study support this shift in policy direction towards energy-efficient labelling. In particular, this paper can provide the DOE with initial feedback on how residents in Metro Manila will react to the proposed new label.

Another interesting finding is that respondents considered running costs (energy efficiency) significantly more than upfront costs (purchase price), which is the opposite result to the 'energy efficiency gap' argument (Gillingham and Palmer, 2014). Although related studies in developed countries (Shen and Saijo, 2009; Ward et al., 2011; Heinzle, 2012; Newell and Siikamäki, 2014; Davis and Metcalf, 2016) and developing countries (Zhou and Bukenya, 2016) find that the estimated coefficient of the price of appliances is negative and significant, purchase price in most models in our study is not statistically significant. This may reflect the assumption that people in Metro Manila consider running costs to be more important compared with upfront costs because of the high cost of electricity in the country. The significance of smart functions supports this argument.

Our results have important policy implications for the mitigation of greenhouse gas (GHG) emissions. GHG emissions are expected to increase in developing economies in the coming decades (Arimura and Sugino, 2021). Given the reliance on fossil fuel in the power sectors of developing economies, energy efficiency is expected to play a critical role in the household sectors of these countries. The diffusion of energy-efficient appliances is an indispensable element in the development of low-carbon societies. Our analysis suggests that how information on energy-efficient appliances is provided is important in promoting such products in the Philippines. Regulators in other developing countries can learn from our analysis and find appropriate ways to provide such information.

Our analyses are limited to the individuals who were interested in purchasing ACs within two years and who have higher incomes than the average residents in the Metro Manila region. Therefore, preferences towards AC attributes, especially the purchase price, could be changed by

[17] In our choice experiments, 200 respondents were shown an EER. They had read the instructions explaining the definition of an EER. Therefore, we excluded the respondents who were clear on the meaning of an EER from the quiz questions.

[18] See DOE's Department Circular (DC) 2016-04-0005, Annex B.1.-PPR 01-AC:2018.

a representative sampling. Moreover, the information on the label, which can aid in selecting energy-efficient ACs, may vary between different regions within the country. Thus, for further research, we plan to expand the survey participants to include individuals who cannot afford to purchase ACs now but are planning to purchase an AC in the future. Other regions in the Philippines can be studied to test regional differences. Furthermore, it would be useful to conduct similar studies in other Asian countries, as all face an expected increase in demand for ACs and rising greenhouse gas emissions (IEA, 2018). In future studies, it will also be crucial to examine the impact of other types of information or labelling beyond the three aspects analysed in this study.

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# Appendix

**Table 1a: Correspondence between EER and Estimated Cost per Hour for Window ACs**

| ***EER*** ***(Power Consumption)*** | ***Estimated Cost per Hour*** ***(With/without inverter)*** |
|---|---|
| 9 (1,050) | $\frac{1{,}050}{1{,}000} \times 0.59 \times P\ 9.744 = P\ 6.04$ (Without inverter) |
| 11 (850) | $\frac{850}{1{,}000} \times 0.59 \times P\ 9.744 = P\ 4.89$ (Without inverter) |
| 13 (750) | $\frac{750}{1{,}000} \times 0.37 \times P\ 9.744 = P\ 2.70$ (With inverter) |
| 15 (650) | $\frac{650}{1{,}000} \times 0.37 \times P\ 9.744 = P\ 2.34$ (With inverter) |

**Table 2b: Correspondence between EER and Estimated Cost per Hour for Split ACs**

| ***EER*** ***(Power Consumption)*** | ***Estimated Cost per Hour*** ***(With/without inverter)*** |
|---|---|
| 9 (1,050) | $\frac{1{,}050}{1{,}000} \times 0.49 \times P\ 9.744 = P\ 5.01$ (Without inverter) |
| 11 (850) | $\frac{850}{1{,}000} \times 0.49 \times P\ 9.744 = P\ 4.06$ (Without inverter) |
| 13 (750) | $\frac{750}{1{,}000} \times 0.27 \times P\ 9.744 = P\ 1.97$ (With inverter) |
| 15 (650) | $\frac{650}{1{,}000} \times 0.27 \times P\ 9.744 = P\ 1.45$ (With inverter) |

# Tables

**Table 1: Attributes and Levels for Window ACs**

| Attributes | Levels | | | |
|---|---|---|---|---|
| Purchase price | PhP 15,000 | PhP 20,000 | PhP 25,000 | PhP 30,000 |
| Country of manufacturer | Philippines | Japan | Korea | United States |
| Additional functions | None | Noise reduction | Air purification | Smart functions |
| Energy efficiency | Efficiency Level 1 | Efficiency Level 2 | Efficiency Level 3 | Efficiency Level 4 |
| EER (Baseline) | 9 | 11 | 13 | 15 |
| Estimated cost per hour (New label 1) | PhP 6.04 | PhP 4.89 | PhP 2.70 | PhP 2.34 |
| Energy star rating (New label 2) | ★ | ★★ | ★★★ | ★★★★ |

**Table 2: Attributes and Levels for Split ACs**

| Attributes | Levels | | | |
|---|---|---|---|---|
| Purchase price | PhP 25,000 | PhP 30,000 | PhP 35,000 | PhP 40,000 |
| Country of manufacturer | Philippines | Japan | Korea | United States |
| Additional functions | No additional function | Autocleaning | Air purification | Smart functions |
| Energy efficiency | Efficiency Level 1 | Efficiency Level 2 | Efficiency Level 3 | Efficiency Level 4 |
| EER (Baseline) | 9 | 11 | 13 | 15 |
| Estimated cost per hour (New label 1) | PhP 5.01 | PhP 4.06 | PhP 1.97 | PhP 1.71 |
| Energy star rating (New label 2) | ★ | ★★ | ★★★ | ★★★★ |

**Table 3: Example of Choice Set for Window ACs under Baseline Information**

| | AC 1 | AC 2 | |
|---|---|---|---|
| **Purchase price** | PhP 25,000 | PhP 30,000 | **I purchase neither AC 1 nor AC 2** |
| **Additional functions** | Noise reduction | Smart functions | |
| **Country of manufacturer** | Philippines | Japan | |
| **EER** | 11 | 15 | |
| **Choose one** | | | |

Note: After explaining the attributes and levels, the survey personnel told each respondent, 'While you are choosing, please assume that all other air-conditioning characteristics other than those mentioned earlier are the same between the two products. Do you understand? [If YES] Are you okay to proceed? [If YES] For the next questions, I am going to ask you to pick your preferred air-conditioning unit based on different combinations of attributes. Please remember that there is no right or wrong answer; I would just like to know your preference. Which option do you prefer?'

**Table 4: Descriptive Statistics**

| Type of Information | | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **Female** | | | | | |
| | Baseline | 0.5 | 0.5 | 0 | 1 |
| | New Label 1 | 0.51 | 0.5 | 0 | 1 |
| | New Label 2 | 0.49 | 0.5 | 0 | 1 |
| **Age** | | | | | |
| | Baseline | 43.89 | 10.74 | 25 | 65 |
| | New Label 1 | 43.36 | 10.45 | 25 | 65 |
| | New Label 2 | 44.68 | 9.92 | 25 | 65 |
| **University**[1] | | | | | |
| | Baseline | 0.52 | 0.5 | 0 | 1 |
| | New Label 1 | 0.48 | 0.5 | 0 | 1 |
| | New Label 2 | 0.47 | 0.5 | 0 | 1 |
| **High Income**[2] | | | | | |
| | Baseline | 0.29 | 0.45 | 0 | 1 |
| | New Label 1 | 0.26 | 0.44 | 0 | 1 |
| | New Label 2 | 0.26 | 0.44 | 0 | 1 |
| **Monthly Electricity Fee (in PhP)** | | | | | |
| | Baseline | 3,762.44 | 2,376.37 | 1,000 | 18,000 |
| | New Label 1 | 3,710.61 | 2,292.98 | 1,000 | 19,000 |
| | New Label 2 | 36,43.72 | 2,115.33 | 1,000 | 13,000 |
| **Daily Use (hours)**[3] | | | | | |
| | Baseline | 8.53 | 3.51 | 1 | 21 |
| | New Label 1 | 8.5 | 3.73 | 2 | 22 |
| | New Label 2 | 8.73 | 4.26 | 1 | 22 |
| **Awareness_EnergyGuide**[4] | | | | | |
| | Baseline | 0.85 | 0.36 | 0 | 1 |
| | New Label 1 | 0.85 | 0.36 | 0 | 1 |
| | New Label 2 | 0.89 | 0.32 | 0 | 1 |
| **Awareness_OrangeTag**[4] | | | | | |
| | Baseline | 0.66 | 0.47 | 0 | 1 |
| | New Label 1 | 0.71 | 0.46 | 0 | 1 |
| | New Label 2 | 0.66 | 0.47 | 0 | 1 |
| **Trust_EnergyGuide**[5] | | | | | |
| | Baseline | 3.93 | 0.84 | 1 | 5 |
| | New Label 1 | 3.96 | 0.82 | 1 | 5 |
| | New Label 2 | 3.94 | 0.84 | 1 | 5 |
| **Trust_OrangeTag**[5] | | | | | |
| | Baseline | 3.61 | 0.95 | 1 | 5 |
| | New Label 1 | 3.71 | 0.82 | 1 | 5 |
| | New Label 2 | 3.67 | 0.86 | 1 | 5 |

Using Bonferroni's multiple comparison tests, we find no statistically significant differences among the three groups for all variables.

[1] Takes a value of 1 if a respondent answers either "completed college", "commenced graduate/master's degree", or "completed graduate/master's degree".

[2] Takes a value of one if a respondent's household earns more than PhP 100,000 per month.

[3] Only applies to respondents who already own air conditioners.

[4] Takes a value of 1 if a respondent is aware of the relevant label.

[5] We used a five-level Likert scale as follows: 1 = Strongly Distrust, 2 = Distrust, 3 = Uncertain, 4 = Trust, 5 = Strongly Trust.

## Table 5: Estimation Results for Window ACs

| Explanatory variables | Baseline | | New Label 1 | | New Label 2 | |
|---|---|---|---|---|---|---|
| | Coeff. (S.E.) | AME (S.E.) | Coeff. (S.E.) | AME (S.E.) | Coeff. (S.E.) | AME (S.E.) |
| ***Additional functions*** | | | | | | |
| Noise reduction | 0.163 (0.122) | 0.027 (0.020) | 0.053 (0.123) | 0.008 (0.019) | 0.667*** (0.130) | 0.075*** (0.015) |
| Air purification | 0.007 (0.115) | 0.001 (0.019) | –0.056 (0.117) | –0.009 (0.018) | 0.159 (0.126) | 0.018 (0.014) |
| Smart functions | 0.391*** (0.118) | 0.065*** (0.019) | 0.173 (0.119) | 0.027 (0.019) | 0.617*** (0.131) | 0.070*** (0.015) |
| ***Country of manufacturer*** | | | | | | |
| Japan | 0.222* (0.117) | 0.037* (0.019) | -0.182 (0.119) | –0.029 (0.019) | –0.279** (0.132) | –0.032** (0.015) |
| Korea | –0.457*** (0.121) | –0.076*** (0.020) | –0.634*** (0.123) | –0.100*** (0.019) | –1.163*** (0.132) | –0.131*** (0.017) |
| US | –0.392*** (0.120) | –0.065*** (0.020) | –0.651*** (0.121) | –0.102*** (0.019) | –0.885*** (0.126) | –0.100*** (0.016) |
| ***Energy efficiency*** | | | | | | |
| Level 2 | 0.392*** (0.129) | 0.065*** (0.021) | 0.680*** (0.131) | 0.107*** (0.020) | 1.187*** (0.143) | 0.134*** (0.018) |
| Level 3 | 0.227* (0.123) | 0.038* (0.020) | 0.818*** (0.126) | 0.129*** (0.019) | 1.099*** (0.132) | 0.124*** (0.017) |
| Level 4 | 0.369*** (0.116) | 0.061*** (0.019) | 0.861*** (0.118) | 0.135*** (0.018) | 1.821*** (0.129) | 0.206*** (0.020) |
| ***Purchase price*** | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000** (0.000) | 0.000*** (0.000) |
| ***ASC*** | –3.393*** (0.295) | –0.562*** (0.056) | –4.267*** (0.391) | –0.670*** (0.071) | –3.351*** (0.418) | -0.379*** (0.059) |
| *Log likelihood function* | –1,432.472 | | –1,360.343 | | –1,234.999 | |
| AIC | 2,886.944 | | 2,742.687 | | 2,491.999 | |
| BIC | 2,955.02 | | 2,910.762 | | 2,560.074 | |
| *Number of choices* | 3,600 | | 3,600 | | 3,600 | |

The symbols ***, ** and * denote that $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.
Coeff., S.E., AME, AIC and BIC indicate coefficient, standard error, average marginal effects, Akaike information criterion and Bayesian information criterion, respectively.

## Table 6: Estimation Results for Split ACs

| Explanatory variables | Baseline | | New Label 1 | | New Label 2 | |
|---|---|---|---|---|---|---|
| | Coeff. (S.E.) | AME (S.E.) | Coeff. (S.E.) | AME (S.E.) | Coeff. (S.E.) | AME (S.E.) |
| ***Additional functions*** | | | | | | |
| Autocleaning | 0.302** (0.122) | 0.049** (0.020) | 0.103 (0.123) | 0.016 (0.019) | 0.682*** (0.130) | 0.087*** (0.018) |
| Air purification | 0.125 (0.115) | 0.020 (0.019) | –0.052 (0.117) | –0.008 (0.018) | 0.076 (0.125) | 0.010 (0.016) |
| Smart functions | 0.344*** (0.118) | 0.056*** (0.019) | 0.084 (0.119) | 0.013 (0.018) | 0.609*** (0.129) | 0.078*** (0.017) |
| ***Country of manufacturer*** | | | | | | |
| Japan | 0.190 (0.117) | 0.031 (0.019) | –0.029 (0.119) | –0.004 (0.018) | –0.417*** (0.128) | –0.053*** (0.016) |
| Korea | –0.453*** (0.121) | –0.073*** (0.020) | –0.430*** (0.123) | –0.065*** (0.019) | –1.034*** (0.130) | –0.133*** (0.019) |
| US | –0.270** (0.119) | –0.044** (0.019) | –0.383*** (0.120) | –0.058*** (0.018) | –0.848*** (0.125) | –0.109*** (0.017) |
| ***Energy efficiency*** | | | | | | |
| Level 2 | 0.384*** (0.129) | 0.062*** (0.021) | 0.609*** (0.130) | 0.092*** (0.021) | 0.800*** (0.138) | 0.102*** (0.020) |
| Level 3 | 0.226* (0.122) | 0.036* (0.020) | 0.737*** (0.125) | 0.112*** (0.020) | 1.006*** (0.129) | 0.129*** (0.020) |
| Level 4 | 0.403*** (0.116) | 0.065*** (0.019) | 0.985*** (0.118) | 0.149*** (0.020) | 1.737*** (0.127) | 0.223*** (0.025) |
| ***Purchase price*** | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000* (0.000) |
| ***ASC*** | –3.034*** (0.347) | –0.490*** (0.076) | –3.830*** (0.417) | –0.581*** (0.092) | –2.903*** (0.406) | –0.372*** (0.073) |
| *Log likelihood function* | –1,450.885 | | –1,375.98 | | –1,287.632 | |
| AIC | 2,923.77 | | 2,773.96 | | 2,597.264 | |
| BIC | 2,991.845 | | 2,842.036 | | 2,665.339 | |
| *Number of choices* | 3,600 | | 3,600 | | 3,600 | |

The symbols ***, ** and * denote that $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.
Coeff., S.E., AME, AIC and BIC indicate coefficient, standard error, average marginal effects, Akaike information criterion and Bayesian information criterion, respectively.

# Figure

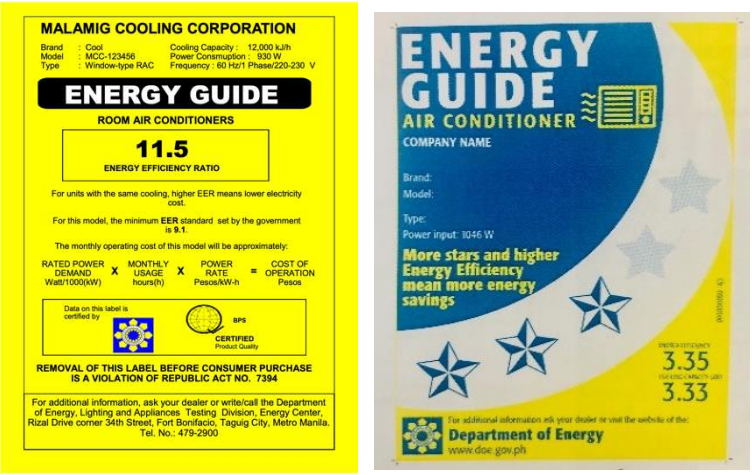


**Figure 1. The baseline current energy label (left)[a] and the proposed new label 2 (right)[b]**

[a] The left image is from the 'Consumer Guide to Room Air Conditioners' issued by the Philippines' Department of Energy (2016).

[b] The right image is contained in the DOE's Department Circular (DC) 2016-04-0005, Annex B.1.-PPR 01-AC:2018. Note that with the passage of the Energy Efficiency and Conservation Law of 2019, the DC in effect has been superseded. To date, the Implementing Rules and Regulations (IRR) accompanying this law are still being drafted and awaiting issue. After this, the Philippine Energy Standards and Labelling Program and Particular Product Requirements will be released in accordance with the law and IRR.