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Analysis of Factors Influencing Residents' Perceptions Regarding Potential Increases in Electricity Prices in Residential Buildings

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Abstract

This research delves into the factors affecting residents' perceptions of potential increases in electricity costs within residential buildings. Analyzing demographic variables like gender, age, employment, education, income, and household size, the study seeks their correlation with electricity consumption behavior. It also explores the influence of psychographic factors such as Knowledge (K), Environmental Awareness (EA), and Environmental Attitude (AT) on the willingness to pay (WTP) for increased electricity prices. Utilizing Spearman rank-order correlation, the study highlights the nuanced, occasionally indirect impact of demographic attributes on WTP, as well as the substantial but intricate roles of environmental awareness and attitude. A notable discovery is the significant yet nuanced influence of personal attitudes on WTP, contrasting with the milder correlations of knowledge and awareness. The outcomes illuminate the dynamic interplay between demographic characteristics, environmental cognition, and financial attitudes toward electricity costs. These insights provide crucial implications for developing comprehensive energy policies and engagement strategies to foster sustainable energy practices.

Introduction

In an era where sustainability and climate change are at the forefront of global discourse, this study provides an analytical view on how changes in electricity pricing within residential buildings are perceived and responded to by residents. Moving beyond a basic understanding of energy consumption, the research delves into a multifaceted exploration of how demographic and psychographic variables interplay to shape attitudes and behaviors towards potential electricity price increases. The aim is to dissect the often complex and indirect ways in which factors like education, income, and

environmental consciousness converges, influencing residents' financial decisions in the context of electricity costs. This approach extends the discourse beyond mere energy usage patterns, offering a broader perspective on the economic, social, and psychological dimensions that govern consumer behavior in the face of changing energy prices.

Background

The escalating energy demands of residential buildings, a significant component of global energy consumption, underscore the necessity of understanding the dynamics within these settings, especially as projections indicate continued growth in this sector until at least 2040 (Perez-Lombard et al., 2008; U.S. Energy Information Administration, 2017). The transition to energy-efficient lifestyles encompasses a myriad of behavioral, social, and economic considerations. The established habits, societal norms, and economic aspects notably influence individual energy choices (Sonenshein et al., 2014). The concept of the 'value-action gap' is particularly revealing, indicating that heightened environmental awareness does not necessarily lead to sustainable actions, often hindered by ingrained habits and societal expectations (Fischer et al., 2012; Schultz, 2014).

Economic considerations play a complex role in the adoption of sustainable options, often hindered by financial constraints even amidst growing environmental awareness. This economic-ecological balance becomes more challenging when eco-friendly choices bear higher costs, though intrinsic values and personal commitment to environmental stewardship can occasionally override these concerns (Dangelico & Vocalelli, 2017; Ambec & Lanoie, 2008).

Societal influence, as outlined by researchers like Cialdini and Jacobson (2021), is significant in fostering sustainable habits, with norm-based interventions proving effective in guiding environmentally friendly behaviors. Personalized energy consumption feedback has emerged as a potent tool in this regard (Papineau & Rivers, 2022).

Further, demographic factors such as age, income, and education level have been identified as significant

influencers of energy-saving behaviors and the propensity to pay for green products, emphasizing the role of environmental cognition, which includes knowledge and awareness, in these behaviors (Tan et al., 2023; Sapci & Considine, 2014). Yet, how these factors intersect with attitudes towards changing electricity prices remains less explored, highlighting the need for this research to illuminate the correlations between these variables and attitudes towards electricity costs in a residential setting.

Methodology

Survey Design, Distribution, and Screening Process

To investigate the factors influencing residents' willingness to pay (WTP) for electricity, we meticulously designed a comprehensive survey. This survey aimed to collect nuanced insights into people's perceptions, forming the basis of our analytical model. The survey encompassed a wide range of questions, categorized into demographic variables and environmental cognition components.

The variables were selected following an extensive review of relevant academic literature. Demographic factors, including gender, age, education level, employment status, income, and household size, are fundamental to understanding the diverse backgrounds of participants. These factors have been previously linked to environmental awareness and behavior. Schultz et al. (2018) noted that higher education levels often correlate with greater environmental consciousness, subsequently influencing eco-friendly behaviors. Similarly, Torgler et al. (2008) observed that income levels significantly impact an individual's capacity to engage in environmentally sustainable practices.

In exploring environmental cognition, we focus on three key areas: Knowledge (K), Awareness (EA), and Attitude (AT). Knowledge refers to an individual's understanding of environmental issues, including the complexities of climate change and sustainable practices. Awareness denotes the level of consciousness an individual possesses about the impact of their actions on the environment. Attitude encompasses the feelings and predispositions towards taking environmentally friendly actions. This triad of environmental cognition is crucial as it potentially influences participants' willingness to financially support environmental initiatives (Kollmuss & Agyeman, 2002; Oreg & Katz-Gerro, 2006).

We adopted a weighted scoring method to evaluate participants' environmental cognition. This involved a two-tier approach: a Likert scale assessment for awareness and attitude and a knowledge quiz. For awareness and attitude, participants responded to a series of five questions each, rated on a scale from 1 (minimal) to 5 (maximal). The average scores represented their overall awareness and attitude levels. To evaluate knowledge, we developed a set of five multiple-choice questions, with each correct response awarded one point. The aggregate of these points offered a quantitative measure of the respondents' environmental knowledge.

We distributed the survey through an online platform, targeting a diverse demographic across Taiwan. This approach enabled us to achieve broad geographic coverage and enhance the representativeness of the Taiwanese population. In total, we collected 585 responses.

To ensure the integrity and attentiveness of responses, we included a reverse-question strategy. This involved integrating a question posed in reverse order, serving as a tool to evaluate the carefulness of respondents' answers.

A stringent data screening process was employed to ensure the quality of the data. Out of the 585 responses, 390 were deemed valid following a thorough examination for inconsistencies, incomplete submissions, and unclear answers.

Table 1 Question Categorization

Demographic Variables	G1	Gender
	G2	Age
	G3	Completed Education Level
	G4	Total Monthly Income
	G5	Household Size
Environmental Cognition	K	Environmental Knowledge
	EA	Environmental Awareness
	AT	Environmental Attitude
Dependent Variable	WTP	Willingness to Pay

Statistical Analysis and Regression Model

Based on the survey's design and overarching objectives of the study, the following hypotheses listed in Table 2 were postulated.

Table 2 Hypotheses Formulation

H1	Better *environmental knowledge* may increase willingness to pay for electricity hikes
H2	Better *environmental awareness* may increase willingness to pay for electricity hikes
H3	Better *environmental attitude* may increase willingness to pay for electricity hikes
H4	Higher *completed education level* may increase willingness to pay for electricity hikes
H5	Higher *total monthly income* may increase willingness to pay for electricity hikes

To rigorously test our hypotheses regarding the impact of environmental cognition on willingness to pay (WTP) for electricity, we utilized a comprehensive approach in statistical analysis and modeling using IBM SPSS Statistics Software.

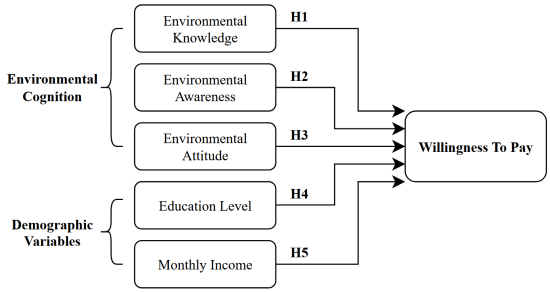

Figure 1 Hypotheses Diagram

In the process of analyzing the data collected for this study, a crucial initial step involved conducting a normality test to determine the appropriate statistical methods for examining our variables of interest, particularly the dependent variable "Willingness to Pay" (WTP) as showed in Figure 1. Normality tests are fundamental in statistical analysis as they help identify the distribution pattern of the dataset, which in turn dictates the choice between parametric and non-parametric tests for subsequent analyses. Parametric tests, which assume a normal distribution of the data, are commonly preferred for their statistical power and efficiency. However, they are not suitable for data that deviate significantly from a normal distribution.

Our analysis revealed that the WTP variable does not follow a normal distribution. This finding has significant implications for the methodological approach of our study. Specifically, it suggests that employing linear regression, a parametric method traditionally used to predict the value of a dependent variable based on the value of one or more independent variables, might not be the most appropriate analytical tool. Linear regression assumes a linear relationship between the dependent and independent variables, homoscedasticity (constant variance of error terms), and normality of residuals among other assumptions. The non-normal distribution of the WTP variable challenges these assumptions, potentially compromising the validity of the linear regression model's outputs.

Given this deviation from normality, our study pivots towards non-parametric methods, which do not require the assumption of a normal distribution of the dataset. Non-parametric tests, such as the Spearman rank-order correlation analysis conducted in our study, offer a more suitable alternative for analyzing the relationships between variables when the data distribution does not meet the parametric test assumptions. The Spearman rank-order correlation is particularly useful for ordinal data or when assessing the strength and direction of monotonic relationships between two variables without assuming a linear relationship or normally distributed data.

The choice of Spearman rank-order correlation over linear regression in our analysis is further supported by the robustness of non-parametric tests to outliers and their ability to handle ordinal data, which is prevalent in survey research. This methodological adjustment ensures the reliability and validity of our findings, allowing us to draw meaningful conclusions from the data despite the challenges posed by the distribution characteristics of the WTP variable.

In conclusion, the normality test findings led to a methodological shift from parametric to non-parametric analysis in our study, underscoring the importance of preliminary data distribution checks in research. By adopting a statistical approach aligned with the distribution properties of our data, we ensure that the insights derived from our analysis are dependable and reflective of the underlying trends in the data. This adjustment highlights the adaptive nature of statistical analysis in empirical research, where methodological flexibility is paramount in addressing the idiosyncrasies of the dataset at hand.

Result Analysis

Demographic Distribution of Survey Results

The demographic breakdown of the survey results, shown in Table 3 offers a detailed snapshot of the participants' profiles, shedding light on their diverse backgrounds and potential influences on their perspectives towards electricity pricing. The survey shows a notable gender distribution, with a majority of 67.2% female participants, suggesting a significant female representation that could potentially affect the study's outcomes and interpretations. Age-wise, the survey predominantly features individuals within the 36-45 age group, constituting 44.4% of the respondents, indicating a strong engagement from this demographic segment. However, the lower representation from the youngest (18-25) and oldest (>65) age brackets, at 9.5% and 0.5% respectively, may suggest a limitation in the findings' applicability across all age groups.

In terms of educational attainment, the data reveal a highly educated cohort, with a substantial 64.4% holding a master's degree, highlighting the respondents' advanced educational background. This level of education could influence their environmental awareness and attitudes towards energy consumption and pricing. The income distribution further delineates the economic

diversity among the participants, with the largest segment (49.2%) earning between NT$ 10,001 and 40,000, followed by 35.4% in the NT$ 40,001-70,000 range, suggesting that a significant portion of the respondents falls within middle-income brackets. Such income levels are essential in assessing the financial willingness and capacity to accommodate potential electricity price increases.

Household composition also emerges as a critical demographic factor, with the majority of respondents living in households of 2 to 4 members, reflecting common family sizes that might influence collective energy usage and payment decisions. The smallest and largest household sizes, represented by 1 and 6+ members, account for 12.3% and 6.7% respectively, offering additional insights into the varied living arrangements that could impact energy consumption patterns.

Overall, these demographic insights are pivotal in understanding the multifaceted factors that shape participants' willingness to pay for electricity. They provide a contextual backdrop against which the study's findings can be analyzed, offering valuable implications for developing targeted and effective energy policies and initiatives.

Table 3 Demographic Breakdown

Demographic Variables		%
Gender	Male	32.8
	Female	67.2
Age	18-25	9.5
	26-35	30.5
	36-45	44.4
	46-55	11.3
	56-65	3.8
	>65	0.5
Completed Education Level	Below University	11.8
	Bachelor	14.1
	Master	64.4
	Doctorate	9.7
Total Monthly Income (Assumption 1 $US ~ 31$NT)	<$NT 10,000 (<$US 320)	10.0
	$NT 10,001-40,000 ($US 320-1290)	49.2
	$NT 40,001-70,000 ($US 1290-2250)	35.4
	$NT 70,001-100,000 ($US 2250-3225)	2.3
	>$NT 100,000 ($US 3225)	3.1
Household Size	1	12.3
	2	19.0
	3	32.8
	4	20.0
	5	7.7
	6	6.7

Correlation Analysis

In examining the factors that influence residents' willingness to pay for potential increases in electricity prices within residential buildings, the Spearman Rank-order correlation test has been instrumental. Our analysis delved into a range of demographic and psychographic variables, aiming to unravel the subtle dynamics of consumer willingness to accept heightened electricity costs.

Table 4 Spearman Correlation Analysis Result (SPSS)

WTP	Gender	-0.161
	Age	-0.077
	Educational	0.060
	Income	0.170
	Household	-0.054
	Knowledge	0.082
	Environmental Awareness	0.090
	Environmental Attitude	0.094

The Spearman correlation analysis, chosen for its appropriateness in handling non-normally distributed data, provided a nuanced view of the relationship between these variables and the willingness to pay (WTP) as shown in Table 4. Gender demonstrated an inverse relationship with WTP, even though not a strong one, with a correlation coefficient of -0.161. This suggests a slight tendency for female respondents to be less inclined towards accepting increased electricity prices, potentially reflecting broader socio-economic dynamics, including gender-based income disparities or differentiated energy consumption behaviors.

Age presented an inverse correlation with WTP as well, albeit even weaker (ρ = -0.077), hinting that older resident might be marginally less open to electricity price increases. Factors such as fixed income during retirement or generational differences in prioritizing environmental concerns could underpin this observation. Education level exhibited a positive, yet subtle, correlation with WTP (ρ = 0.060), challenging the assumption that higher education directly translates into greater financial contributions towards sustainable energy practices. This could suggest that individuals with higher education may prioritize other sustainable actions or be cognizant of alternative solutions to environmental sustainability beyond cost increases.

Income's correlation with WTP (ρ = 0.170) was also positive, supporting the theory that individuals with higher incomes may possess a greater capacity to absorb increased costs. However, the modest strength of this correlation indicates that economic capacity is one of many complex factors influencing attitudes toward electricity pricing. The size of a household showed a slight inverse correlation with WTP (ρ = -0.054), implying that larger households might be more budget-conscious due to the cumulative impact of cost increases.

Environmental knowledge and awareness were both positively correlated with WTP (ρ = 0.082 for knowledge and ρ = 0.090 for awareness), though the connections were not pronounced. These findings suggest that while environmental understanding may contribute to a willingness to invest in sustainable energy, it does not strongly determine one's propensity

to pay more. Attitudes towards environmental issues had a similar correlation with WTP ($\rho = 0.094$), indicating that while positive environmental attitudes may slightly incline individuals towards supporting higher energy costs, the relationship is not as strong as one might expect.

The overarching narrative from the Spearman correlation results points to a landscape where the expected strong links between environmental cognition and WTP are more subdued than hypothesized. While we observed certain trends, the modest nature of the correlations suggests that other, unexamined factors could play a significant role in shaping residents' WTP.

Hypothesis Testing Result Analysis

In our quest to decipher the determinants of willingness to pay for potential hikes in electricity prices, our study was anchored by five hypotheses focused on various environmental and socio-economic factors. The non-parametric nature of the Spearman Rank-order correlation was deemed fit for this task due to the non-normal distribution of our key variable, WTP. Here is a distillation of our findings:

Hypothesis 1 posited that a deeper knowledge of environmental issues (K) would correlate with a greater WTP for electricity cost increases. The results partially affirmed this, displaying a positive but modest correlation coefficient ($\rho = 0.082$). This intimates that while environmental knowledge may mildly predispose residents towards higher sustainable energy costs, it does not robustly predict WTP.

Hypothesis 2 suggested that elevated environmental awareness (EA) would bolster WTP. This was validated to an extent, with a slender positive correlation ($\rho = 0.090$). Such an outcome hints at a nuanced link where awareness incrementally nudges residents toward acquiescing to heightened electricity prices yet reveals a discernible chasm between awareness and actionable consent.

Hypothesis 3 examined whether a favorable environmental attitude (AT) impacts WTP. The correlation coefficient ($\rho = 0.094$) signals that environmental attitudes, while slightly influencing economic decisions on energy pricing, may not be potent enough alone to instigate significant financial concessions for environmental gains.

Hypothesis 4, which associated higher levels of completed education with increased WTP, was met with a feeble correlation ($\rho = 0.060$). This challenges the presupposed connection that education correlates with a heightened willingness to pay more for electricity, indicating that other factors may mediate this relationship.

Hypothesis 5 considered the influence of total monthly income on WTP. The correlation ($\rho = 0.170$) was tepid yet affirmative, suggesting income plays a minor role in shaping the willingness to incur additional costs for environmental initiatives, albeit not as a decisive determinant.

Collectively, while the hypothesized associations bore statistical significance and trended as expected, the relative weakness of the correlations warrants a judicious interpretation. The findings illuminate that knowledge, awareness, and attitudes towards environmental sustainability, alongside socio-economic standing, only partly sketch the full narrative. The delicate nature of these associations underscores the necessity for a broader inquiry, potentially delving into qualitative assessments of motivations, values, and convictions that govern residents' financial conduct concerning energy use. Consequently, future endeavors should aim to amalgamate qualitative findings with quantitative data, rendering a more layered and holistic understanding of the elements influencing WTP for escalations in electricity costs.

Willingness-To-Pay (WTP)

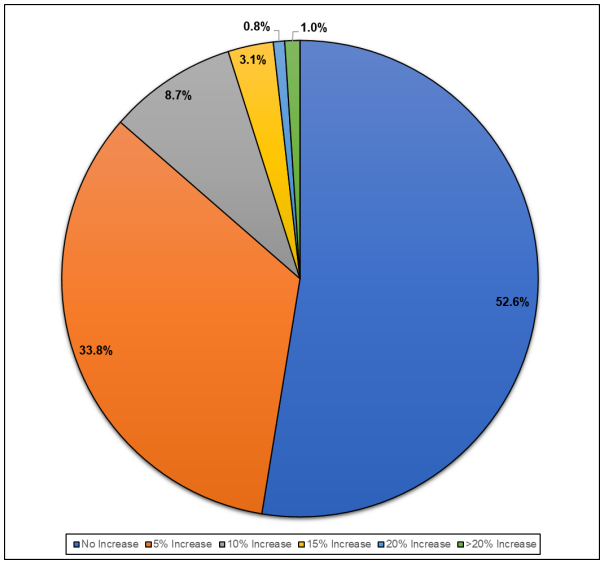

Figure 2 Willingness to Pay for Electricity Price Hike

The analysis of the Willingness to Pay (WTP) distribution, as visually articulated in the accompanying pie chart (Figure 2), starkly contrasts the correlations uncovered in our study. It is evident that a significant majority, 52.6% of respondents, are resistant to any elevation in electricity prices. This pronounced preference for the status quo may suggest that larger intervals between proposed price increases—from no increase to a potential 20% rise—act as deterrents rather than motivators for higher expenditures.

In examining the correlation findings, where education and income levels exhibited only modest associations with WTP, the pie chart's distribution implies a more complex landscape where the decision to resist higher prices transcends these demographic factors. This aligns with the observed correlation coefficients, which suggest that while environmental knowledge, awareness, and attitudes do factor into WTP, their influence is not as potent as one might expect. This disparity between anticipated and actual willingness to pay points to a rich tapestry of unexamined qualitative elements such as personal values, economic resilience, or unacknowledged external influences that could significantly shape financial decisions related to energy costs.

The resistance to price increases depicted in the pie chart highlights the challenge for those crafting policies and interventions aimed at promoting environmentally motivated price adjustments. To effectively align consumer behavior with sustainable energy pricing, a comprehensive strategy must be adopted—one that transcends mere information dissemination to include economic incentives, communication strategies that resonate on a personal value level, and community engagement to foster a sense of collective responsibility.

The skew observed in the pie chart could indeed be attributed to the design of the survey's interval options. The preference of more than half of the participants for no price increase underscores a potential threshold effect, where the choice of intervals may influence the distribution of responses significantly. If we consider the psychological underpinnings of decision-making, particularly within the domain of behavioral economics, there's a well-documented tendency for individuals to favor avoiding losses over securing equivalent gains. This loss aversion might be exacerbated when faced with substantial cost increments, leading to a steadfast adherence to the current pricing.

It is conceivable that presenting narrower intervals, such as 1% or 2% increases, might have yielded a distribution of responses that were less inclined towards the no increase option. Smaller increments, perceived as more manageable, could provide a more delicate exploration of the threshold at which individuals transition from acceptance to resistance in terms of price increases. This could especially be true if the justification for the increase is convincingly communicated and aligned with the respondents' environmental values or tangible benefits.

Thus, while the correlations between WTP and variables such as education, knowledge, and attitudes are telling, they do not fully encapsulate the behavioral intricacies manifest in the WTP distribution. Future research and policy formulation must take into account not just the scale of price increases but also the psychological and socio-economic backdrop against which such changes are proposed.

In sum, the insights gleaned from the survey highlight the nuanced interplay between consumer thresholds, cost considerations, and environmental stewardship. They underscore the importance of designing future studies and stakeholder initiatives that carefully calibrate the granularity of options presented to the public. Such precision in survey design is crucial for capturing a more accurate portrayal of consumer willingness to pay and for navigating the complexities inherent in advocating for economically viable and environmentally beneficial policy changes.

Comparative Analysis of WTP

The interpretation of Willingness to Pay (WTP) as a comparative analysis across various demographic and socioeconomic categories provides an insightful perspective on the values and priorities of different segments within the population. Visualization can be seen in Figure 3.

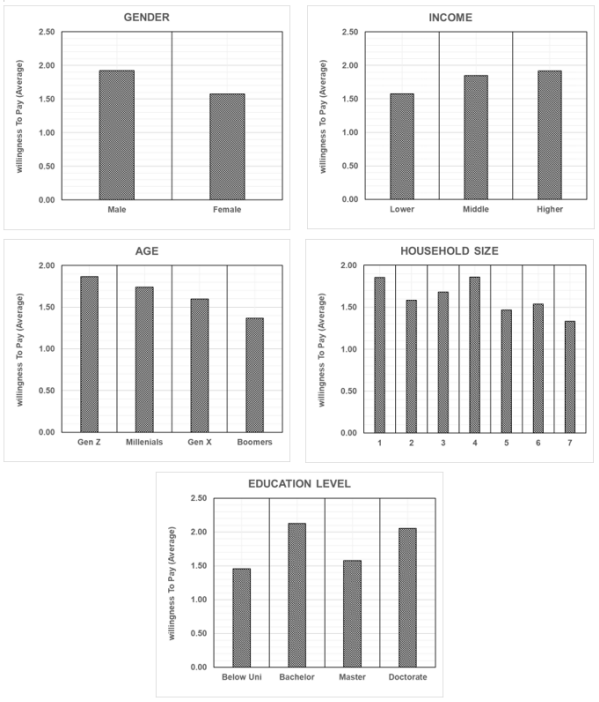

Figure 3 Willingness to Pay based on Different Variables

Gender Differences in WTP: The WTP averages indicate that males (1.92) are more willing to pay for electricity price increases than females (1.57). This could reflect differences in income levels, with men possibly having more disposable income on average, or it may be

influenced by societal roles where men, traditionally, might be more involved in financial decision-making. However, it's crucial to recognize that these figures do not exist in isolation but are part of a broader socioeconomic context that influences such choices.

Generational Perspectives on WTP: When broken down by generation, the data suggests a gradual decrease in WTP with increasing age: Gen Z (1.86), Millennials (1.74), Gen X (1.60), and Boomers (1.37). This trend may reflect lifecycle effects, where younger individuals are potentially more adaptable to changes and might prioritize environmental considerations more heavily than older generations, who could have fixed incomes or be more resistant to change.

Educational Attainment and WTP: Interestingly, the highest WTP is observed among those with Bachelor's degrees (2.13) and Doctorates (2.05), while those with a Master's degree have a lower average WTP (1.58), closely followed by individuals below university level (1.46). This could suggest that while higher education generally correlates with a greater understanding of and commitment to environmental issues, the relationship with WTP is not linear. Those with the highest and lowest education levels show a higher willingness to pay, possibly reflecting a strong sense of responsibility towards environmental issues at the doctoral level and a recognition of the importance of sustainable practices among those with less formal education.

Income Levels and WTP: As expected, WTP increases with income, with the 'Higher' income group (1.92) showing a slightly higher willingness to pay than the 'Middle' (1.85) and 'Lower' (1.58) income groups. This pattern aligns with the principle that increased financial security may grant individuals greater flexibility to support environmentally friendly initiatives through increased utility costs.

Household Size and WTP: The average WTP appears to be higher for individuals living alone (1.85) and those in four-person households (1.86), with a notable decrease for larger households of six (1.54) and seven (1.33) members. This could reflect the heightened financial pressures larger households face, leading to a more conservative approach to additional expenses. Single-person households might have more autonomy over their finances, potentially allowing for greater discretionary spending on causes they value, such as environmental sustainability.

In synthesizing these findings, it's evident that WTP is a complex interplay of factors that transcend simple economic capability or educational background. The nuances within each demographic category suggest that personal values, societal roles, generational priorities, and the economic implications of larger household sizes all play a part in shaping attitudes towards paying for increased electricity prices. These insights are invaluable for policymakers and energy providers as they work to develop strategies that are sensitive to the diverse needs and capacities of the population. They underscore the importance of tailoring approaches to electricity pricing that consider not only the ability to pay but also the willingness that stems from individual beliefs and the contextual realities of different life stages and household compositions.

Discussion

In the realm of residential electricity consumption, the dynamics that govern an individual's willingness to pay (WTP) for price increases are multifaceted and complex. The results of our study offer a nuanced portrait of these dynamics, challenging conventional wisdom and underscoring the intricate interplay of demographic and psychographic factors.

The significant representation of women in our survey sample, accounting for nearly 70%, signals the critical role they play in household decision-making concerning energy usage and financial matters. This demographic skew hints at underlying societal dynamics that could influence consumption patterns and price sensitivity, suggesting that gender may be a more pivotal factor in energy economics than previously recognized. The predominant participation of the 36-45 age demographic points to the influence of middle-aged adults—often at the peak of their earning potential and household responsibility—on energy consumption decisions. This group's willingness to pay for increased electricity costs potentially reflects a balance between economic stability and environmental conscientiousness.

On the contrary, the notably lower representation of younger adults (18-25) and seniors (over 65) in the study indicates that our findings may not fully encapsulate the WTP attitudes across the lifespan. Younger individuals may have different financial priorities or lower income stability, affecting their WTP, while seniors may have fixed incomes or reduced energy needs, influencing their price sensitivity differently.

The slight correlation between income levels and WTP, as revealed by our analysis, is particularly revealing. It challenges the assumption that the willingness to accept increased energy costs correlates strongly with financial capacity. This finding intimate that despite financial stability, there is a prevailing hesitancy towards electricity price hikes, suggesting that other, non-economic factors play a significant role in the decision-making process. Likewise, the minimal impact of educational attainment on WTP disrupts the anticipated narrative that higher education begets a higher willingness to pay, pointing instead to a complex

interplay of awareness, personal values, and perhaps a more discerning approach to financial contributions toward sustainable energy practices.

The weak associations found between knowledge and environmental awareness with WTP suggest that while cognizance of sustainability issues is present, it does not robustly translate into a readiness to incur higher costs. This reveals a gap between environmental cognition and economic behavior, where knowledge and awareness alone are insufficient to influence financial decisions. In contrast, the slightly stronger correlation of environmental attitudes with WTP underscores the power of personal beliefs and values in shaping economic choices, hinting at the psychological underpinnings that might motivate or dissuade financial commitments to sustainable practices.

The Spearman correlation analysis has illuminated relationships of varied strengths between these variables, with environmental awareness and attitudes showing a notable connection. This correlation underscores the importance of emotional and psychological factors in economic decision-making, particularly in domains that directly affect everyday life, such as electricity consumption. However, the generally modest correlations with WTP across all predictors suggest that decision-making about energy costs is influenced by a complex array of considerations that extend beyond basic demographic and psychographic profiles.

The modest adjusted R-squared values obtained in our models signal the presence of additional influential factors not accounted for in our study, indicating that the full spectrum of variables affecting WTP for electricity hikes has yet to be uncovered. This highlights the necessity for further research to explore these latent factors and integrate a broader range of considerations, including qualitative data that may shed light on the underlying motivations and barriers affecting consumer behavior in the face of rising energy costs.

In conclusion, our discussion emphasizes the intricate and layered nature of consumer responses to increased electricity pricing. It draws attention to the nuanced impact of gender, age, socioeconomic status, knowledge, awareness, and attitudes, all of which converge to shape the complex decision-making landscape surrounding WTP in the context of residential energy consumption. These insights underscore the need for a comprehensive approach in policy development and consumer engagement strategies, one that acknowledges the multi-dimensional influences on WTP and seeks to align sustainable energy practices with the diverse values and needs of residents.

Conclusion

Our study's intricate exploration of the determinants of consumers' willingness to pay (WTP) for electricity has cast light on the complex interplay between demographics, environmental cognition, and economic decision-making. The gender and age demographics, alongside socioeconomic factors like income and education levels, present a nuanced narrative of their influence on WTP. Notably, environmental attitudes have a more considerable impact on WTP than knowledge or awareness, although the relationship is complex. The study's results underscore the multifaceted nature of predicting WTP and the necessity of adopting a multifactorial approach in future inquiries. Consumer patterns and preferences in electricity pricing are shaped by a rich tapestry of influences, highlighting the importance of well-informed, diverse strategies for research and policymaking. Future research should pivot towards examining external factors and regional disparities to further delineate WTP's dynamics, ensuring policies are effectively tailored to the public's diverse needs and contributing to the broader goal of sustainable energy consumption.

Future Work

In future research, we aim to delve into the nuances of environmental awareness and income's influence on willingness to pay (WTP) for electricity, utilizing qualitative approaches to unpack underlying behaviors. We will also investigate gender-specific energy behaviors and the decision-making roles within different age demographics, particularly those underrepresented in our study, to formulate tailored energy-saving initiatives. A closer look at the interplay between socioeconomic status and energy consumption through qualitative methods will enhance our understanding of these complex relationships.

Psychological factors' impact on energy behaviors warrants further exploration to reveal underlying mechanisms influencing consumer choices. Moreover, expanding our focus to include broader greener lifestyle choices will provide insights into sustainable living practices beyond electricity pricing. Cross-cultural and regional studies will shed light on the influence of cultural norms and policies on WTP, guiding more culturally attuned and region-specific energy strategies.

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Appendix

Survey Questions:

General Information

1. Gender
2. How old are you?
3. What is your latest completed education level?

4. What is the amount of your individual total monthly income? (Including salary, part-time, allowance, investment income, pension, etc.)
5. Please write down the exact number of people living with you including yourself (friends, roommates, family members, etc.)

Environmental Knowledge

1. What is sustainability?
2. What is the BEST description of a sustainable city?
3. What creates the most greenhouse gas emissions?
4. Which of the following gases is not greenhouse gas?
5. How does the greenhouse effect work?

Environmental Awareness (Likert)

1. I consciously conserve water usage in my daily routines, such as taking shorter showers, turning off the faucet while brushing teeth, and watering plants sparingly.
2. I always sort recyclable items and place them in their respective bins, avoiding disposal in regular trash.
3. I prioritize purchasing products that are made from recycled materials or have environmentally friendly packaging.
4. I strive to reduce energy consumption in my home by using energy-efficient appliances and lights, and by turning off devices when they're not in use.
5. I make an effort to understand and reduce my carbon footprint, considering aspects such as food consumption, travel, and home energy use.
6. I often dispose of recyclable items directly in regular trash rather than sorting them into their respective bins.

Environmental Attitude (Likert)

1. Individuals have a personal responsibility to contribute to the conservation of the environment.
2. The impact of climate change is severe and poses a significant threat to future generations.
3. Governments should prioritize investments in renewable energy sources over traditional fossil fuels.
4. Consumer decisions, such as purchasing eco-friendly products and reducing waste, can significantly influence the state of the environment.
5. Strict environmental regulations are necessary to protect our natural resources and should be enforced more rigorously.

Willingness To Pay

1. Given the positive side of an electricity price hike, how much more would you be willing to pay per kWh? (Current average electricity price: NT$2.8/kWh)