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Consumption of 3 kg LPG by upper-middle-class households: an economic approach in Bali

Abstract

This study highlights the use of subsidized 3 kg LPG by upper-middle-class households in Bali, which is intended for low-income communities. The objective of this research is to analyze the factors influencing the consumption behavior of 3 kg LPG among upper-middle-class households, focusing on variables such as income, price, convenience, and policy awareness. The method employed is a mixed-methods approach, combining quantitative analysis using Smart PLS 4 and qualitative methods through in-depth interviews. The total sample used is 100 households. Quantitative research results indicate that convenience and price have a significant impact on awareness but do not significantly affect the consumption level of 3 kg LPG. Income does not show a significant effect on awareness or consumption. Qualitative analysis reveals that the main reasons for using 3 kg LPG are its convenience and established habits. The conclusion of this study indicates that, in addition to economic factors, non-economic factors such as habits and personal preferences also play a crucial role in the decision to use 3 kg LPG. These findings provide new insights into consumer behavior literature and emphasize the need for a more comprehensive approach to designing effective energy policies. This research recommends that future energy policies consider the aspects of convenience and consumer habits to guide more efficient and targeted energy use. Furthermore, it is suggested that further research expands the geographical scope and uses a longitudinal approach to observe changes in energy usage behavior over time. Thus, this study contributes to the improvement of energy policy and a better understanding of consumer behavior in the context of energy subsidies in Indonesia.

Keywords: consumption behavior; energy policy; upper-middle-class households

JEL Classification: D12; H23; L95; Q41; Q48

Introduction

3 kg LPG is an essential commodity for Indonesian society, especially for low-income households that rely on this fuel for daily cooking needs. The Indonesian government's 3 kg LPG subsidy program aims to alleviate the economic burden on the poor and support the transition from more polluting fuels such as kerosene and firewood (Fernandes, 2018; Pradiptyo et al., 2015; Yusra et al., 2018). However, in recent years, there has been a phenomenon of increasing consumption of 3 kg LPG by the upper-middle class, which should not be the target of this subsidy. This phenomenon raises concerns because it can reduce the effectiveness of the subsidy program, cause supply shortages for the poor, and increase the government's fiscal burden. This research is important to understand the consumption patterns and factors driving upper-middle-class households to use subsidized LPG, as well as to evaluate their awareness of the subsidy policy.

Research on Liquefied Petroleum Gas (LPG) consumption has become an important topic in energy management and government subsidy policies. Various studies have highlighted the factors affecting LPG consumption, including price, income, and urbanization. Sapnken et al. (2020) and Dalaba et al. (2018) found that price, income, and urbanization have a significant positive impact on LPG consumption in the short and long term, with evidence of fuel substitution from kerosene to LPG. Puzzolo et al. (2019), Alzyadat (2022), and Adelekan & Jerome (2006) affirm that subsidized LPG prices increase LPG usage. Kalli et al. (2022) and Xu et al. (2019) add that higher food and LPG prices can reduce food security and LPG consumption, presenting challenges in achieving the Sustainable Development Goals (SDGs).

Other studies have analyzed the impact of price differences between the public and private sectors on LPG consumption. Alefan et al. (2018), Štimac et al. (2023), and Zemenkov et al. (2017) found that LPG prices in the private sector are higher than in the public sector, affecting affordability and consumption patterns. Kim (2024) and Kamugisha et al. (2019) emphasize the importance of considering standard prices for LPG, gasoline, and diesel, along with annual fuel consumption and price growth rates in the economic feasibility analysis of LPG consumption. Market dynamics also influence LPG prices. Gonzalez & Lagos (2021) found that the presence of natural gas providers can reduce retail LPG prices. Moreover, appeals have been shown to increase the willingness to pay for unsubsidized LPG and encourage actual consumption (Tang, 2024; Zahno et al., 2020).

Other research also shows that personal income levels significantly influence LPG consumption patterns. Kumar et al. (2020) found a positive correlation between household income and the adoption and sustainable use of LPG. Parikh et al. (2019) emphasized that higher income levels are associated with increased spending on LPG as a substitute for traditional fuels such as wood. Kizilcec et al. (2022) highlight the crucial role of household income and education in the adoption and sustainable use of LPG. The portability of LPG also influences consumption patterns. Biswas et al. (2002), and Angoori & Kumar (2023) showed that the availability and easy distribution of LPG, especially in urban and suburban areas, and the potential accessibility in rural areas after the supply chain is established, are the main drivers of increased LPG consumption. Pollard et al. (2018) and Liu et al. (2023) added that the introduction of smaller LPG cylinders, such as 5 kg cylinders, is considered to increase portability and reduce upfront costs for low-income households, potentially increasing LPG usage.

Awareness and knowledge of subsidy policies also play a significant role in influencing LPG consumption patterns. Lestarianingsih & Adrison (2021) showed that higher education levels can increase awareness of LPG subsidies among poor households. Government initiatives such as the Direct Benefit Transfer for LPG (DBT-PAHAL) in India demonstrate the impact of policy awareness on consumption behavior (Jagadale & Kemper, 2022). Other research on LPG usage has been conducted by various researchers with diverse focuses. Almaya et al. (2021) examined the influence of world oil prices, inflation, and household consumption on Indonesia's economic growth, finding that fluctuations in world oil prices affect people's purchasing power for LPG. Mulyana et al. (2023) reviewed business development strategies for 3 kg LPG distributors in Cirebon, showing that supply availability greatly determines consumption patterns. Carrión et al. (2021) in their study on LPG adoption in Ghana found that relevant intervention programs can enhance sustainable LPG usage. Aryani & Rachmawati (2019) examined the typology of poverty in Palembang, highlighting the role of subsidized energy in the lives of poor households. Nduka et al. (2020) studied the impact of a pay-as-you-go LPG system in Nigeria, highlighting the importance of payment mechanisms in LPG adoption.

Meanwhile, Hu et al. (2019) and Sapnken et al. (2023) examined urban household energy consumption, with results showing that income and economic stability significantly influence fuel choices. Abdulai et al. (2018) reviewed the mass distribution of LPG stoves in Ghana, showing that public knowledge and awareness of subsidies greatly determine adoption levels. Das & Pal (2019) in their study on energy choices of poor households in India found that price and awareness are key factors in LPG usage. Thoday et al. (2018) discussed the mass conversion program from kerosene to LPG in Indonesia, highlighting lessons and recommendations for expanding clean energy. Fernandes (2018) studied consumer knowledge about subsidized LPG in Indonesia, showing that many consumers are unaware of the subsidy allocation.

Despite extensive research, several gaps remain unanswered. One of the main gaps is the lack of understanding of the specific factors driving upper-middle-class households to use subsidized LPG. Almaya et al. (2021) and Mulyana et al. (2023) focused more on macroeconomic and distribution aspects, without delving into individual or household motivations for LPG usage. Carrión et al. (2021) and Nduka et al. (2020) focused on policy interventions without deeply examining upper-middle-class consumer behavior. Hu et al. (2019) and Abdulai et al. (2018) reviewed economic factors in general but did not explore the role of awareness and knowledge of subsidy policies in usage decisions. Das & Pal (2019) and Fernandes (2018) identified the importance of consumer knowledge but did not explain in detail how this level of awareness interacts with economic and social factors. Thoday et al. (2018) and Stanistreet et al. (2019) focused more on policy and implementation in general without touching on the specific behavior of upper-middle-class households.

The novelty of this study lies in its holistic approach to understanding 3 kg LPG consumption by upper-middle-class households in Bali. Not only focusing on economic factors such as income and price, but this study also examines convenience and the role of awareness and knowledge regarding subsidy policies. This approach has not been widely explored in previous studies that tend to focus on one particular aspect. By combining quantitative and qualitative analyses, this research offers a more comprehensive and in-depth view of consumer motivations and behavior, which is expected to serve as a foundation for more effective and equitable energy subsidy distribution policies.

This study aims to identify the factors influencing the consumption of 3 kg LPG by upper-middle-class households in Bali. Specifically, this research will analyze the impact of household income, market LPG prices, and convenience on consumption levels, as well as the role of awareness and knowledge of subsidy policies as intervening variables. Through this approach, it is hoped to gain a more comprehensive understanding of the motivations and behaviors of upper-middle-class households in using subsidized LPG. This study is expected to make a significant contribution to the field of economics and public policy. Theoretically, this research will enrich the literature on consumer energy behavior, especially in the context of government subsidy programs. The findings from this study can provide new insights into the interaction between economic factors and policy awareness in determining household energy consumption patterns. Practically, the results of this research can be used as a basis for the government to formulate more effective policies in targeting energy subsidies and to develop educational programs that increase public awareness about the allocation of subsidies.

This research is relevant to government policies in ensuring the accurate distribution of subsidized energy. By understanding the factors that drive upper-middle-class households to use subsidized 3 kg LPG, the government can develop more accurate and effective policies. Furthermore, this study also contributes to the academic discussion on consumer behavior and energy subsidy policies, which are crucial in the context of climate change and energy sustainability. The relevance of this research lies in its ability to inform journal readers about the challenges and solutions in implementing energy subsidy policies in developing countries.

Research Method

This study uses a mixed-methods approach combining quantitative and qualitative methods. The quantitative approach is used to measure the relationships between specific variables through statistical analysis of numerical data collected from questionnaires. The qualitative approach is used to gain an in-depth understanding of the phenomenon of 3 kg LPG usage by upper-middle-class households through in-depth interviews and descriptive analysis. The choice of this mixed-methods

approach is based on the need to obtain a comprehensive and detailed picture, which cannot be achieved by using just one approach. The research design includes descriptive and correlational surveys for the quantitative approach, and case studies for the qualitative approach. The descriptive and correlational survey design allows the researchers to measure and analyze the relationships between variables such as income (X1), price (X2), practicality (X3), awareness (Y1), and consumption level (Z1) of 3 kg LPG. The research hypotheses proposed include: (1) upper-middle-class household income has a negative and significant effect on the consumption of 3 kg LPG, (2) market price of LPG has a negative and significant effect on the consumption of 3 kg LPG by upper-middle-class households, (3) the practicality of 3 kg LPG has a positive and significant effect on its consumption by upper-middle-class households, and (4) awareness of subsidy policies has a negative and significant effect on the consumption of 3 kg LPG by upper-middle-class households. The qualitative case study design helps to understand the reasons and motivations behind the use of 3 kg LPG by upper-middle-class households in depth. This design choice is based on the research goal to combine extensive quantitative analysis with deep qualitative insights.

The study was conducted in the Province of Bali, Indonesia. This location was chosen due to the diverse characteristics of upper-middle-class households in this area, which allows for representative analysis. The subjects of the research are upper-middle-class households that use 3 kg LPG. The sample size for the quantitative sample is 100 respondents, determined based on the Slovin formula from a total population of 384 households. For the qualitative case study, 10 respondents were selected who met the purposive sampling criteria, namely, having upper-middle-class income and using 3 kg LPG. Participant characteristics include various socio-economic backgrounds relevant to the analysis. The data collection technique for the quantitative approach uses a survey with a questionnaire instrument. The questionnaire contains closed-ended questions with a Likert scale to measure respondents' perceptions of the variables studied. The data collection process involves distributing the questionnaire to randomly selected respondents. For the qualitative approach, data is collected through in-depth interviews using an interview guide. The interviews are conducted to explore the reasons and motivations behind the use of 3 kg LPG. The data collection procedure includes the preparation, implementation, and documentation of interviews.

The research instrument used for quantitative data collection is a specially designed questionnaire for this study. This questionnaire has been tested for validity and reliability through initial trials and statistical analysis. The instrument for qualitative data collection is an interview guide containing open-ended questions. The interview guide is developed based on a literature review and research objectives. The validity and reliability of the qualitative instruments are maintained through data triangulation and re-checking with respondents. Quantitative data is analyzed using Structural Equation Modeling Partial Least Squares (SEM PLS) with the help of SMART PLS 4 software. This technique is chosen for its ability to analyze structural relationships between variables in a complex model. The data analysis procedure includes testing the measurement model and the structural model, as well as interpreting the results. Qualitative data is analyzed using thematic analysis and coding techniques. Thematic analysis is used to identify themes and patterns in interview transcripts, while coding is done to organize the data and find deep meanings in respondents' answers.

To ensure the validity and reliability of the study, several steps are taken. The validity and reliability of the quantitative instruments are tested through statistical analysis, including construct validity and reliability tests with Cronbach's Alpha. Data triangulation is used to enhance the validity of qualitative findings by combining various data sources. Qualitative validity is also maintained through member checking, where interview results are confirmed back with respondents to ensure data accuracy and

honesty. The analysis process is conducted systematically and transparently to maintain the reliability of the research results. Ethical considerations in this study are crucial to ensure that the research is conducted with integrity and respects participants' rights. The researchers obtained research permits from the authorities and informed consent from all participants before data collection. Informed consent includes explanations regarding the research objectives, procedures, participants' rights, and confidentiality guarantees. The collected data is kept confidential and used solely for this research purpose. Participants are given the freedom to withdraw from the study at any time without consequences. All research procedures have been approved by the research ethics committee to ensure that the study is conducted following applicable ethical standards.

Result and Discussion

The measurement model analysis in this study uses Smart PLS 4 to evaluate the convergent validity of the indicators for each variable. Convergent validity refers to the extent to which indicators designed to measure a construct actually measure that construct. Based on the analysis results, all indicators used in this study have outer loading values greater than 0.70. These high outer loading values indicate that each indicator has a strong and consistent correlation with the construct it measures. Figure 1 below shows the results of the outer loading analysis for each construct.
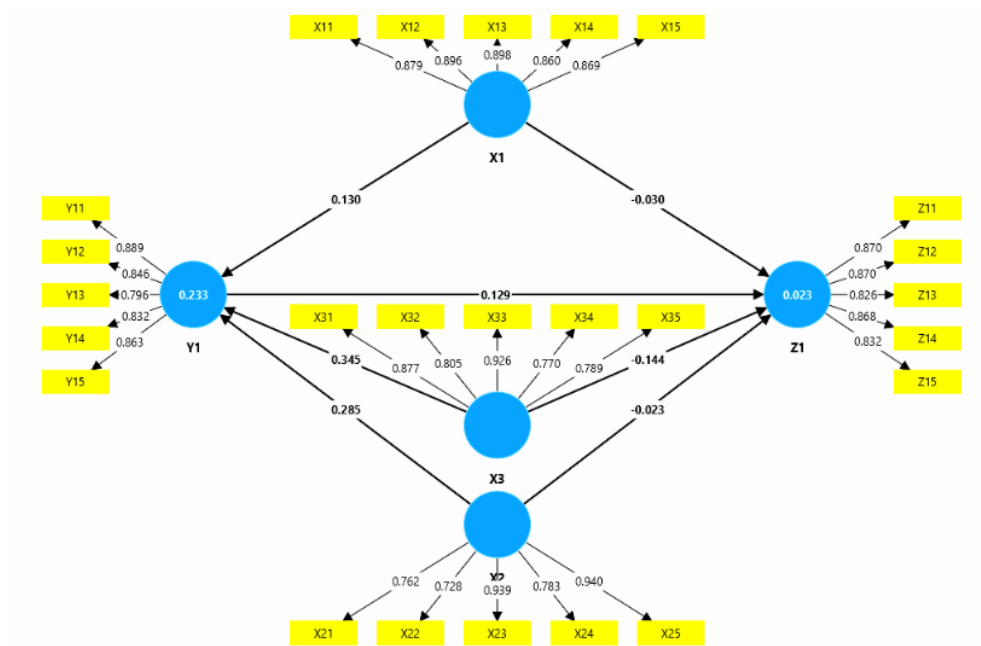

Figure 1 Outer Loading Analysis Results for Each Construct

The outer loading analysis results indicate that all indicators used in this study have good convergent validity. This means that each indicator accurately measures the intended construct, thus the measurement model used in this study can be considered valid and reliable. Meanwhile, the evaluation of construct reliability and validity is conducted to ensure that the measurement instruments used in this study are reliable and valid. This evaluation includes statistical indicators such as Cronbach's Alpha, Composite Reliability (rho_a and rho_c), and Average Variance Extracted (AVE).

The results obtained show that all constructs have very good reliability and validity. Table 1 below presents the reliability and validity values of the constructs.

Table 1 Reliability and Validity Values of the Constructs

Variable	Cronbach's Alpha	Composite Reliability (Rho_A)	Composite Reliability (Rho_C)	Average Variance Extracted (AVE)
X1	0,928	0,948	0,945	0,776
X2	0,909	1,158	0,919	0,698
X3	0,908	1,078	0,920	0,698
Y1	0,901	0,914	0,926	0,715
Z1	0,911	0,984	0,931	0,729

Source: PLS-SEM Algorithm Test Result, 2024

Cronbach's Alpha values for all constructs are above 0.90, indicating a very high level of internal consistency. This means that all indicators used to measure the constructs provide consistent and reliable results. Additionally, the Composite Reliability (rho_a and rho_c) values also show very good results, with all constructs having values above 0.90. Composite Reliability provides a better picture of construct reliability compared to Cronbach's Alpha as it considers the factor loadings of each indicator. These results indicate that the constructs measured in this study are reliable. The Average Variance Extracted (AVE) for all constructs also shows satisfactory results with values above 0.50. This indicates that the constructs have good convergent validity, meaning the constructs can capture a significant amount of variance from their indicators compared to the variance caused by measurement error. Overall, the measurement instruments used in this study are reliable and valid. Therefore, the measurement model used can be trusted to measure the studied constructs and provide a solid foundation for further analysis.

Discriminant validity measures the extent to which constructs that should not correlate with each other are truly uncorrelated. Two measures used to test discriminant validity are the Heterotrait-Monotrait Ratio (HTMT) and the Fornell-Larcker Criterion. The HTMT results show that all values are below 0.85, indicating that the constructs in this study have good discriminant validity. HTMT measures the relationships between different constructs, and these results show that the constructs are indeed distinct from each other as proposed by the theory. The Fornell-Larcker Criterion also shows that each construct has a higher square root AVE than the inter-construct correlations. This means that the variance captured by the construct is greater than the variance captured by other constructs. In other words, the constructs have good discriminant validity, indicating that each construct is unique and does not overlap with other constructs. Table 2 below presents the discriminant validity analysis results.

Table 2 Discriminant Validity Analysis Results

Variable	Heterotrait-Monotrait Ratio (HTMT)	Fornell-Larcker Criterion
X2 <-> X1	0,059	-0,028
X3 <-> X1	0,110	0,080
X3 <-> X2	0,114	0,058
Y1 <-> X1	0,161	0,149
Y1 <-> X2	0,239	0,301
Y1 <-> X3	0,301	0,372

Z1 <-> X1	0,111	-0,021
Z1 <-> X2	0,065	0,008
Z1 <-> X3	0,117	-0,100
Z1 <-> Y1	0,096	0,064

Source: PLS-SEM Algorithm Test Result, 2024

These two measures collectively provide strong evidence that the constructs measured in this study are discriminantly valid. Good discriminant validity ensures that the results obtained from data analysis can be trusted and support the overall validity of the research model. The quality evaluation of the model in this study is conducted by examining the R-square criteria. R-square measures the proportion of variance in the dependent variable that can be explained by the independent variables in the model. R-square adjusted provides an adjustment to the R-square for the number of predictors in the model and the sample used. Table 3 below presents the R-square and R-square adjusted values.

Table 3 R-square and R-square Adjusted Values

Variable	R-square	R-square Adjusted
Y1	0,233	0,209
Z1	0,023	-0,018

Source: PLS-SEM Algorithm Test Result, 2024

The R-square results show that variables X1, X2, and X3 collectively explain 23.3% of the variance in Y1, indicating a moderate predictive power of the model. However, for variable Z1, the model only explains 2.3% of the variance, showing very low predictive power. The adjusted R-square value for Y1 is 0.209, slightly lower than the R-square, indicating adjustment for the number of predictors in the model. Meanwhile, the adjusted R-square for Z1 is -0.018, indicating that after adjustment, the model does not have significant predictive power for this variable.

Path coefficients in the structural model indicate the strength and direction of relationships between latent variables. P-values are used to test the statistical significance of these relationships. Figure 2 below presents the path coefficients and p-values results.
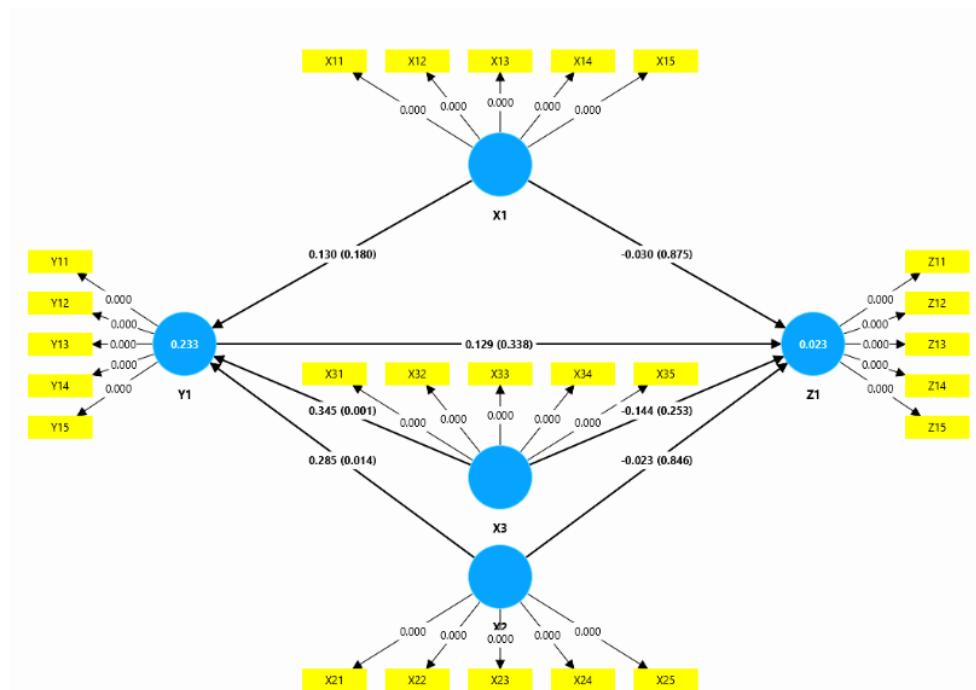
Figure 2 Path Coefficients and P-Values Results

The relationship between X2 and Y1 (p = 0.014) and between X3 and Y1 (p = 0.001) is statistically significant, indicating that these two variables have a significant positive effect on Y1. Conversely, the relationship between X1 and Y1, although positive, is not significant (p = 0.180), indicating that X1 does not have a strong enough effect on Y1. For variable Z1, no significant relationships were found. The relationships between X1, X2, X3, and Y1 with Z1 are all statistically insignificant (p > 0.05). This indicates that these variables do not have a meaningful impact on Z1 in this study.

The total indirect effects analysis results show that there are no significant indirect effects of X1, X2, and X3 on Z1 through Y1. Although all these indirect effects are positive, the p-values indicate that these effects are not strong enough to be considered statistically significant. The indirect effect of X1 on Z1 through Y1 is the weakest (p = 0.512), indicating that there is almost no influence of X1 on Z1 mediated by Y1. Similarly, the indirect effects of X2 on Z1 (p = 0.405) and X3 on Z1 (p = 0.370) are also insignificant, indicating that the contributions of X2 and X3 to Z1 through Y1 are not statistically significant. These results suggest that although X1, X2, and X3 have direct effects on Y1, these effects are not significantly mediated through Y1 to Z1.

Thematic analysis and coding techniques were employed to identify themes and patterns in the interview transcripts, resulting in several key findings regarding the respondents' perceptions, preferences, and consumption habits of 3 kg LPG gas. Most respondents stated that their primary reason for using 3 kg LPG gas was its practicality and ease of use. Respondents appreciated the small size of the 3 kg LPG cylinder, which is easy to lift and move. One housewife mentioned, "The 3 kg LPG cylinder is very practical; I can easily carry it myself without any help." This ease of use also influenced the preferences of respondents living in rented rooms or houses with limited kitchen space, where storing larger gas cylinders would be impractical.

Price emerged as a major theme in the interviews. Although the respondents are from middle-to-upper-income households, they still consider price in their consumption decisions. One respondent, a civil servant, stated, "The price of 3 kg LPG is more affordable compared to larger cylinders. Even though I can afford the more expensive ones, why pay more if the cheaper option is sufficient?" This indicates that despite having higher financial capability, many middle-to-upper-income households still seek cost efficiency in their household expenses. Some respondents showed a high awareness of the 3 kg LPG subsidy policy. They understand that the 3 kg LPG cylinders are subsidized by the government and intended for low-income households. However, this awareness does not always stop them from using the subsidized cylinders. "I know this is subsidized for the poor, but the reality is that this gas is easier to find in local stores and more practical for everyday use," said a local entrepreneur. This reflects a gap between policy and practice in the field.

Respondents also revealed that personal habits and preferences play a significant role in their decision to use 3 kg LPG. Some respondents have been using 3 kg LPG for a long time and feel comfortable with it. "We've been using 3 kg LPG for a long time, we're used to it, and there's been no problem so far," said a housewife. This preference is often maintained even when other alternatives are available, indicating that established habits are difficult to change. The distribution and availability of 3 kg LPG also emerged as important factors in the interviews. Some respondents noted that 3 kg LPG cylinders are more easily found and widely distributed in their area. "In my neighborhood, stores sell more 3 kg cylinders than the larger ones. So it's more practical to buy the smaller ones," said a private employee. This wide availability makes 3 kg LPG a more accessible choice for middle-to-upper-income households.

Some respondents highlighted the moral and ethical aspects of using 3 kg LPG. Despite recognizing the economic benefits of using subsidized gas, some respondents feel guilty about using subsidies intended for the poor. "Sometimes I feel guilty using 3 kg LPG because I know it's for the less fortunate. But what can I do, it's the most practical," confessed a housewife. This sentiment indicates a moral dilemma among users. Respondents also mentioned that social influence and the surrounding environment affect their decisions. Some respondents admitted to following the example of neighbors or friends who also use 3 kg LPG. "All the neighbors here use 3 kg LPG, so I just follow suit," said a private employee. This shows that consumption decisions are also influenced by social environment and local norms.

Using Smart PLS 4 for quantitative data analysis, the main findings of this study indicate that the price and practicality of LPG have a positive and significant impact on subsidy policy awareness, while income does not have a significant impact. Furthermore, subsidy policy awareness does not have a significant impact on the level of 3 kg LPG consumption. The initial hypothesis stated that the price and practicality of 3 kg LPG would have a significant impact on subsidy policy awareness. The research findings support this hypothesis, showing that price and practicality have a strong correlation with subsidy policy awareness. Lower prices and practicality of use make households more aware of the benefits of existing subsidy policies, in line with findings by Adusah-Poku & Takeuchi (2019), Kumar et al. (2022), and Mensah & Adu (2015). The cheaper and more practical use of 3 kg LPG attracts middle-to-upper-income households, increasing their awareness of the applicable subsidy policy. This shows that effective pricing policies and the provision of user-friendly products can enhance public awareness of subsidy programs.

The initial hypothesis also stated that income would have a significant impact on subsidy policy awareness. However, the research findings indicate that income does not have a significant impact. This finding contradicts Kolawole et al. (2017), Oteng-Abayie et al. (2018), and Ogundunmade & Adepoju (2022) who found that income significantly affects subsidy policy awareness. This discrepancy may be due to the uneven distribution of subsidy policy information in Bali, allowing households of various income levels to have the same access to information. This suggests that a better and more evenly distributed information dissemination strategy can help increase policy awareness across all income levels.

The final hypothesis stated that subsidy policy awareness would significantly affect the level of 3 kg LPG consumption. The research findings show that subsidy policy awareness does not have a significant impact on consumption levels. Studies by Saxena & Bhattacharya (2018) and Ndunguru & Lema (2021) how policy awareness can influence energy consumption, but this research indicates that subsidy policy awareness does not affect 3 kg LPG consumption. This may be due to other factors such as personal preferences and consumption habits that are more dominant in the decision to use LPG in Bali. This indicates that policy interventions focusing solely on increasing awareness may not be sufficient to change consumption behavior without considering other factors. This study shows that there is no significant indirect effect of independent variables on the level of LPG consumption through subsidy policy awareness. This contradicts the literature showing that mediation effects can play a significant role in research models, as indicated by Azis (2006) and Hsing (1992). These findings may suggest that other stronger factors influencing LPG consumption were not included in this model.

This research makes a significant contribution to existing theory and literature in the field of energy economics and consumer behavior. The research findings enrich the understanding of factors influencing the use of 3 kg LPG by middle-to-upper-income households, particularly in the context of practicality, price, and availability. This supports consumer behavior theory stating that ease of use and low cost are key factors in purchasing decisions (Iman & Hudrasyah, 2023; Kristiani & Soetjipto, 2019; Rao et al., 2020; Rochman et al., 2023). Additionally, these findings challenge the assumption that higher-income households will tend to use non-subsidized products, showing that consumption behavior is not solely based on financial capability but also personal habits and preferences (Srinivasan & Carattini, 2020; Sugiarto, 2023). Thus, this research adds a new dimension to the literature on energy consumer behavior, emphasizing the importance of considering non-economic factors in energy policy analysis.

From a practical perspective, the research findings provide important insights for policymakers and practitioners in the energy sector. Firstly, the study highlights the need to re-evaluate energy subsidy policies, particularly for 3 kg LPG, to ensure that subsidies are targeted appropriately. Policy recommendations may include tightening the distribution of 3 kg LPG to focus more on low-income households and providing practical and affordable energy alternatives for middle-to-upper-income households. Furthermore, the findings underline the importance of education and information dissemination about more environmentally friendly and efficient energy choices, which can be carried out through public campaigns and collaboration with local communities. For practitioners, these findings can be used to develop more effective marketing strategies, emphasizing the practicality and economic benefits of alternative energy products that are better suited for different market segments.

Conclusion

Practicality and price have a significant impact on household awareness regarding the use of 3 kg LPG but do not significantly affect consumption levels. Additionally, income does not have a significant impact on household awareness regarding the use of 3 kg LPG. Qualitative analysis reveals that the main reasons upper-middle-class households use 3 kg LPG are its practicality and established habits. These findings contribute importantly to the literature on consumer energy behavior, showing that non-economic factors such as habits and personal preferences play a crucial role in energy use decisions.

This study has several limitations that should be considered when interpreting the results. First, the limited qualitative sample size, consisting of only 10 respondents, may restrict the generalizability of the findings to a broader population. Although in-depth interviews provide rich insights, the results may not fully represent the views of all upper-middle-class households in Bali. Second, the study focuses on a single geographic area, so the findings may not be entirely applicable to different contexts within Indonesia or other countries. Moreover, the quantitative and qualitative approaches used in this study may be influenced by respondent bias and researcher interpretation. Therefore, further research with larger samples and broader geographic variation is needed to validate and extend these findings. These limitations also highlight the importance of data triangulation and the use of various data collection methods to ensure the accuracy and reliability of the research results.

Future research can explore other regions in Indonesia to understand regional variations in the use of 3 kg LPG. Additionally, future studies could consider longitudinal approaches to track changes in energy use behavior over time. Further research could also examine the impact of educational campaigns and new policies aimed at shifting upper-middle-class households from 3 kg LPG to more appropriate alternative energy sources. A more comprehensive mixed-methods approach, including field experiments, could also be employed to gain a deeper understanding of the factors influencing household energy use decisions.

Author Contributions

Conceptualisation, D.P.Y.P. and I.K.P.; Methodology, I.K.D.; Investigation, A.A.S.P.; Analysis, D.P.Y.P.; Original draft preparation, D.P.Y.P.; Review and editing, I.K.P.; Visualization, I.K.D. and A.A.S.P.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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