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ANALYSIS OF CONSUMER'S BEHAVIOR AND ELECTRICITY PRICING IN KADUNA METROPOLIS, KADUNA STATE, NIGERIA

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ABSTRACT

This study analyzes consumer behavior and electricity pricing in Kaduna Metropolis, Kaduna State, Nigeria. The main instrument used in the study is structured questionnaire with 384 sample size. Both descriptive and inferential statistics were used. A multinomial logit model was specified and estimated using STATA. The findings show that household income level, household size, number of appliances and type of dwelling are statistically significant variables that drives consumer choices in consuming electricity. The results highlight the impact of rising electricity pricing on consumers behavior towards electricity consumption as well as the financial burden imposed on households. It is crucial to address the issue of affordability and explore effective strategies to mitigate the challenges faced by consumers. Based on the findings of the study, the following suggestions are proffered. Conscious effort should be made by households to adapt energy consumption habits and mitigate the impact of higher electricity prices. Such measures may include practicing energy-saving behaviors, adopt energy-efficient appliances, and optimize electricity usage. Policymakers should implement targeted measures that address the specific challenges faced by different consumer segments. This can include targeted subsidy programs for low-income households, financial support to adopt energy efficient technologies, and regulatory reforms to ensure transparency and accountability in electricity pricing. By adopting a comprehensive approach that combines affordability, energy conservation, reliable power supply, and renewable energy promotion, policymakers can create a sustainable and affordable electricity pricing. There is need to improve customer engagement and education reflective tariffs and educate consumers on energy efficiency, how to read meters/bills, and their rights and responsibilities.

Keywords: Electricity pricing, Electricity access, Consumer behavior, Kaduna Metropolis

1. INTRODUCTION

Electricity consumption and pricing are essential indicators of household welfare, business operations, and overall economic development. Electricity is a vital input for well-being supporting everything from lighting and cooking to industrial production and technological services. How households and businesses consume electricity reflects not only their socioeconomic status but also their adaptability to pricing and supply conditions. Rai and Henry (2020) observed that patterns of electricity usage, including peak and off-peak consumption, are directly influenced by consumer decisions, which are shaped by the perceived affordability and reliability of the service. Understanding these patterns provides

insights into energy efficiency, cost management, and demand forecasting, which are crucial for sustainable electricity provision.

Electricity distribution is fundamental for ensuring smooth functioning of both households and businesses (Beegle, 2025). The financial sustainability of electricity distribution companies like Kaduna Electric Company (KEDCO) which service Kaduna and some North-Western States have been of concern. Nigeria in recent years has experienced significant increase in electricity prices due to tariff increased by Nigeria Electricity Regulatory Commission (NERC), with potential impact on household consumption as they are segmented into Bands like A or B for those with pre-paid meter. Some of the reasons adduced for the increased include low tariff that is not cost reflective, rising production costs in the power sector, maintenance expenses, and the need for infrastructure upgrades. The cost increase typically is passed on to consumers through higher electricity bills.

The demand for electricity in Kaduna State has increased over time due to expansion in industrial activities and residential areas putting more pressure on distribution. As economic activities and urbanization continue to drive electricity consumption, the sector faces the challenge of maintaining sufficient and reliable supply and pricing, which often require additional investments and infrastructure expansion. The desire for access and affordability has called to question price increase that strain household budgets, especially low-income segments of the society. As a coping strategy, consumers are opting for energy-saving measures, such as using energy-efficient appliances, adjusting their consumption behavior, or reducing discretionary electricity usage. KEDCO has had to grapple with recovery ratios as the percentage of billed amounts successfully collected from consumers, an essential indicator of their financial health.

Consumer behavior is a fundamental determinant of market pricing. Understanding the factors influencing consumer decisions and their impact on demand and price elasticity, households can plan on how to maximize their utility, businesses can develop effective pricing strategies, and policymakers can create regulations that ensure fair market practices (Dillon, 2025). As consumer behavior continues to evolve, driven by technological advancements and changing societal values, its impact on market pricing. When electricity prices are fair, clear, and predictable, people are usually satisfied, pay their bills on time, and try to use electricity efficiently. Good pricing helps households and businesses plan their energy use and avoid wasting power. Unclear, sudden, or high tariffs can make consumers confused and under financial pressure. Some may reduce how much electricity they use, rely on private generators, or delay payments if prices seem unfair. In this way, electricity pricing affects satisfaction, payment behavior, energy use, and household or business budgeting (Rai & Henry, 2020).

Therefore, the study aims to analyze the relation between consumer behaviour and electricity pricing in Kaduna Metropolis. By analyzing consumer behavior patterns and electricity pricing, the study will seek to identify the specific factors contributing to changes in recovery ratios in the context of increasing electricity prices. To achieve this, the study is organized into 5 parts. Part 1 is introduction. Part 2 is literature review which highlights conceptual and theoretical review, and empirical review. Part 3 is methodology. Part 4 is empirical analysis and discussion of findings. Part 5 is conclusion and recommendations.

2. LITERATURE REVIEW

2.1 Conceptual and Theoretical Review

Consumer behavior refers to how individuals or households make choices about using goods and services (Kotler and Keller, 2016). In terms of electricity, this means understanding how people decide when and how much electricity to use. It also includes how

they respond to problems like irregular supply or poor service. Electricity pricing refers to the way utility companies charge consumers for the electricity they use. It shows how much households and businesses have to pay based on the amount and timing of their consumption (Montgomery, 1997).. Pricing strategies refer to the way electricity providers set tariffs for consumers. Consumers' attitudes are the feelings, beliefs, and perceptions they have towards electricity supply and pricing. Socioeconomic and behavioral factors include income level, household size, education, and lifestyle, which affect electricity consumption (Aziza and Widiastuti, 2024).

Consumer behavior plays a pivotal role in shaping market pricing, dynamics and influencing economic decisions at both household and business levels. The interaction between consumers' purchasing decisions and the prices of goods and services drives the equilibrium in markets (Beegle, 2025; Browning and Zupan, 2020). Understanding this relationship is essential for households willing to maximize utility, businesses aiming to optimize pricing strategies and for policymakers seeking to regulate markets effectively (Boyd and Bellemare, 2020). The income effect and substitution effect explain how changes in consumer income and relative prices influence purchasing behavior. When consumers experience an increase in income (Fekete-Farkas, Gholampour, Bouzan, Jarghooi, Yain and Ebrahim, 2021). Price elasticity of demand is also important in understanding how consumer behavior affects market pricing. Products with elastic demand see significant changes in quantity demanded with price fluctuations, while inelastic products experience minimal changes like the elasticity supply at the moment, thereby influencing the market pricing strategy (Hasan, 2007). Market structures, such as monopolistic competition or oligopoly determine how consumer behavior influences pricing. (Katzner, 2006).

Consumers make purchasing choices based on factors such as income, preferences, price sensitivity, and psychological and social influences (Barnett and Serletis, 2008). Companies leverage consumer behavior analysis to develop strategies that enhance sales. By understanding demand and preferences, businesses can optimize their pricing models and product offerings to maximize profitability (McCluskey, 2015). Understanding these behaviors allows businesses to develop effective pricing and marketing strategies while helping policymakers design regulations that enhance market efficiency. (Lowe, Lowe and Lynch, 2017; Miljkovic and Effertz, 2010).

Ajzen (1991) developed the Theory of Planned Behavior (TPB) widely used framework for understanding how household decisions and actions are shaped. He developed the theory to explain human behavior as a result of intention, which is influenced by attitudes toward the behavior, subjective norms, and perceived behavioral control shape an individual's behavioral intentions. Schiffman and Kanuk (1993) expanded the theory with Basic Consumer Decision-Making Model, which aim to simplify the approach to decision-making. To understand consumer decision making in factors such as external influences, input, process and output must be taking into consideration as depicted in Figure 1.

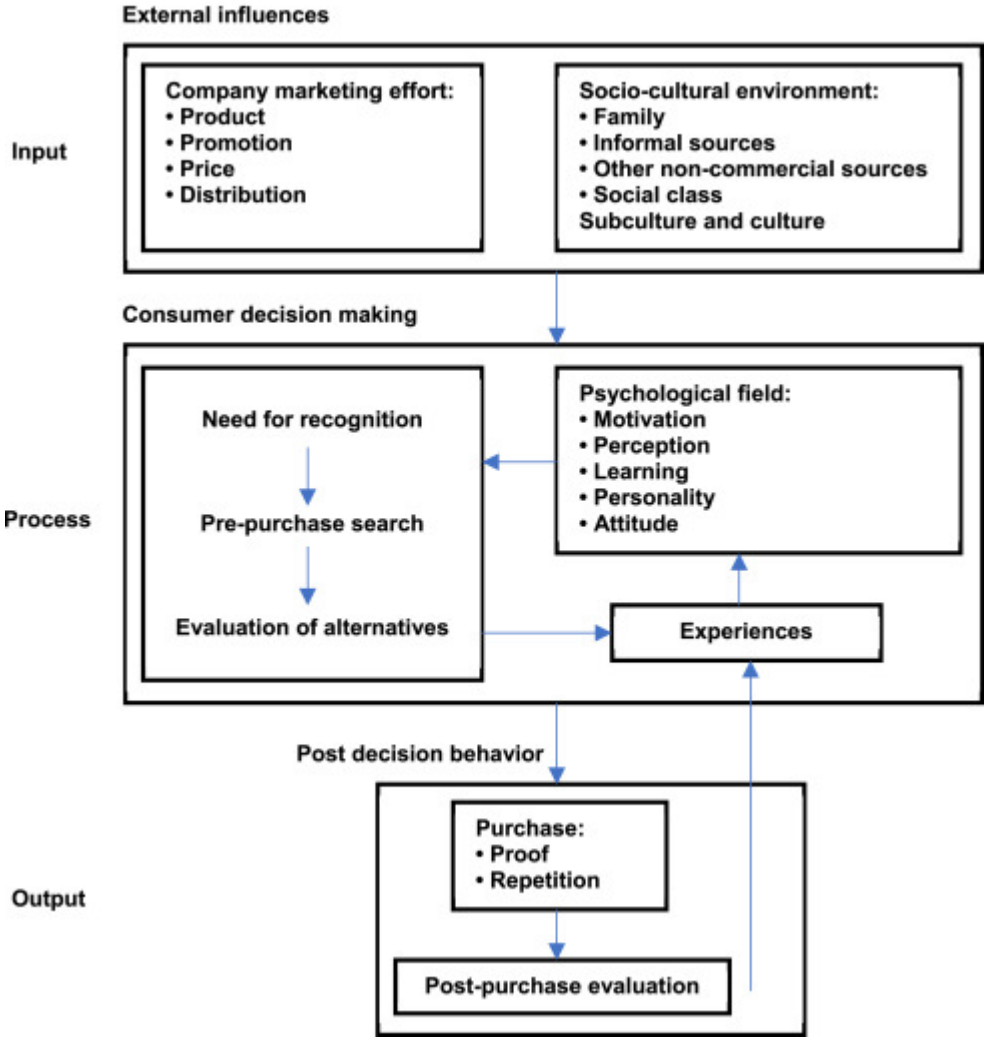


Figure 1: Basic model of consumer decision making (Schiffman & Kanuk, 1993).

2.2 Empirical Review

There are empirical studies on the relationship between consumer behavior and electricity pricing. Kazuma and Ikuho (2025) examined the effects of information provision on various household energy-saving behaviors using randomized controlled trials in Japan. Objective measures of household electricity consumption levels were collected through meter readings and subjective measures of behavioral changes through a questionnaire. The results showed that information on the Past has more impact on reducing electricity consumption for households with a higher volume of electricity consumption than others. The channels for this reduction are the behaviors of 'not leaving the air conditioner on,' a constant time-consuming behavior, and 'lowering the refrigerator's internal temperature,' a hassle-free one-time behavior.

Ibrahim and Lawal (2025) examined the role of digital payment platforms in improving electricity bill compliance among urban youth. The research was conducted in Lagos and Kaduna, Nigeria, using an online survey of 500 young adults aged 18–35. Regression analysis of the data showed that the convenience of digital payment options increased the rate of timely bill settlement. However, a persistent lack of trust in the digital

billing and payment system continued to deter full compliance, suggesting that technological solutions must be paired with trust-building measures.

Hardmeier and Berthold (2024) analyzed factors influencing households' willingness to shift electricity-consuming activities away from peak hours, as well as the maximum shift duration of using certain devices. The results indicated that household with more flexible lifestyles and those who perceive shifting activities as taking less effort are more willing to shift their activities and indicate longer shift durations. The data also show that attitudes towards the environment, as well as financial, ecological, and motivational factors, play a role in explaining the variance in the willingness to shift and the shift duration. To conclude, increasing flexibility in everyday life could make a valuable contribution to the optimal use of electricity resources

Garba and Ibrahim (2024) explored the relationship between electricity reliability, perceived pricing fairness, and overall consumer satisfaction. The study was carried out in Niger State, Nigeria, through a survey of 450 households. Correlation and regression analysis revealed that consumers' perception of pricing fairness had a stronger influence on their satisfaction levels than the reliability of supply alone, suggesting that equitable pricing can mitigate dissatisfaction even in the face of intermittent supply.

Adaramola, Oderinde and Nweke-Eze (2024) investigated the relation between electricity pricing and households in Lagos State, Nigeria covering three specific locations (Ayobo, Iyana-Ipaja and Ikeja). The results revealed that majority of the respondents are less familiar with cost/pricing method of electricity in Nigeria. There is negative welfare effect of the recent pricing adjustment on households in the selected study areas. Iztok, Sanja, Mirjana, Olga and Polona (2023) used Randomized Control Trials to identify energy saving instructions effect on household's electricity consumption in Republic of Serbia. The study employed the Difference in Difference method to analyze between the treatment and control group and estimates the overall impact of the energy saving instructions. The results showed that in situations where electricity price is very low, energy saving information does not have the significant impact on change in consumer behavior. Inefficient use of electricity might be due to the different efficiency of heating devices used.

Abdullahi and Bello (2023) analyzed the effect of prepaid metering systems on electricity consumption patterns. The study focused on Kano and Kaduna States in Northern Nigeria. A cross-sectional survey of 400 households was conducted, and data were analyzed using logistic regression and ANOVA. The study found that while prepaid meters promoted more conscious consumption and reduced wastage, they also intensified financial pressure on low-income households, revealing a dual impact of this pricing infrastructure on different consumer segments.

Yimeng and Teng (2022) analyzed the direct impact of knowledge about the electricity pricing policies on residents' electricity saving behaviour and the indirect impact of these pricing strategies on residential consumers' fuel choices in China. Two.Stage-Least-Squares model. The findings indicated that energy sources with higher health risks like raw coal and briquettes are more likely to be used in rural households than in urban households. When applied for time-of-use (TOU) tariffs can help rural residents reduce their electricity expenditure, and thus increase their ability to consume cleaner energy (LPG) instead of coal. Similarly, choosing TOU and possessing a higher understanding of tiered electricity pricing significantly improves urban residents' electricity saving behaviors. Urban residents with higher energy saving awareness are more likely to purchase energy sources with more convenience and less carbon emissions – natural gas instead of LPG.

Okonkwo and Adeoye (2021) analyzed gender differences in electricity consumption and sensitivity to tariff changes. Their research focused on South-East Nigeria and was based on a quantitative survey of 400 male- and female-headed households. Data analysis using t-tests and chi-square tests found that female-headed households exhibited greater price sensitivity and were more proactive in adopting energy-saving behaviors compared to their male-headed counterparts, highlighting the gendered dimension of energy consumption.

3. METHODOLOGY

3.1 Research Design

The study adopts a descriptive survey research design with a mixed-methods approach (quantitative and qualitative). This design is appropriate because it allows for the collection of both numerical and narrative data to provide a comprehensive understanding of the relationship between electricity pricing and consumer behavior. The quantitative aspect will facilitate the measurement of variables such as consumption patterns, pricing strategies, and socioeconomic factors, while the qualitative aspect will provide deeper insights into consumers' attitudes, perceptions, and experiences.

3.2 Population and Sample Size of the Study

The target population for this study comprises households within Kaduna Metropolis who are connected to the Kaduna Electric Distribution Company. Based on records from the Kaduna Electric Plc and the Kaduna State Urban Planning and Development Authority, the estimated population of electricity consumers in the metropolis is approximately 350,000.

Based on this population, a normal confidence level of 95% and error tolerance of 5% were used. We therefore will determine the sample size using adjusted Taro Yamane's) formula (Yamane, 1967):

Taro Yamane's formula is given as:

$$n = \frac{N}{3 + N(e)^2} \qquad 1$$

Where

n = Sample size

N = Population

e = Error of tolerance i.e. given as 5% or 0.05

3= Statistical constant

From the formula where the population of the study is given and confidence interval of 95%, the sample size is approximately four hundred and five (384).

3.3 Sampling Technique

A cluster and purposive sampling technique will be employed to ensure representation across different residential areas within Kaduna Metropolis. The metropolis will be stratified into four zones (North, South, East, and West) based on Kaduna Electric's operational districts. From each zone, respondents will be randomly selected using a simple random sampling method from a list of registered customers where 384 respondents were selected.

3.4 Method of Data Collection

The data will be obtained through the use of structured questionnaire. The structured questionnaire design will indicate demographic characteristics of the respondents, circular economy, their activities and challenges in the study area. Hence, the primary source provides

mainly qualitative data (primary data). The secondary source on the other hand, will provide information using existing data through review of literature.

3.5 Instruments for Data Collection

The field survey was conducted using the Policy Performance Evaluation Questionnaire (PPEQ) as a major instrument to gather the primary data. The structured questionnaire is designed to gather data to achieve the objective of the study. The questionnaire was designed to generate responses on questions relating to relevant variables including household income, household size, level of education, gender, number of appliances and type of dwelling and electricity pricing. The questions will be based on a 5-point Likert attitudinal scale of 5 - Strongly Agree, 4 -Agree, 3 -Undecided, 2 -Disagree and 1 -Strongly Disagree.

3.6 Reliability and validity

Measurement data were obtained by using structured questionnaire. Each object is calculated on a 5-point Likert scale, with 5 strongly in agreement and 1 strong in disagreement. The exploratory factor analysis (EFA) of the items was confirmed using confirmatory factor analysis (CFA). The CFA model's factor loadings shows that each is statistically significant (p value < 0.05). These are representative of the underlying latent construct of the items. This shows that the model meets the convergent validity (Anderson and Gerbing, 1988). The Cronbach's alpha (Cronbach, 1951) composite reliability (CR) of each construct is also presented. Cronbach's alpha and CR values of all constructs were greater than 0.76 (threshold value) as recommended by (Hair. Anderson, Babin, and Black, 2010). The measurement model's reliability is therefore specified.

3.7 Method of Data Analysis

The study employed both descriptive and inferential statistical tool of analysis. The descriptive statistics summarize and describe some of the statistical characteristics of the variables. The inferential statistics used Multinomial logit regression method and STATA for estimation. This technique determines whether relationship exists between consumer behavior and electricity pricing and access.

3.8 Multinomial Logit Model Specification

According to Creswell and Creswell (2017), multinomial logit model has a single decision among two or more alternatives where unordered choice models are motivated by random utility model. For the consumer behavior faced with j choices, suppose that the utility choice is:

The independence of disturbance in the original model:

$$\text{Ln}\left[\frac{P_{ij}}{P_{ik}}\right]=X_i(\beta_i-\beta_k)=X_i\beta_j \qquad if\ k=0 \qquad 1$$

The multinomial Logit regression is;

$$\text{Ln}\left[\frac{P_i}{P_o}\right]=Z_i\,\beta_o+\beta_1X_1+\beta_2X_2+\ \ldots\ldots\ldots\ldots\ldots+\beta_7X_7+\varepsilon_i \qquad 2$$

Where; Z_i = 1, if Electricity pricing is effective and 0 is otherwise; β_o = Intercept showing probability of electricity pricing outcome if all other explanatory variables are kept constant at zero; β_1 - β_7 = parameters of the ith that are estimated; the moderating consumer behavior variables included: monthly income, household size, level of education, gender, number of

major appliances, type of dwelling (dummy), and a behavioral index score (composed of energy-saving habits).

4. DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Correlation random effect – Hausman Test

Table 1 presents the outcome of the Hausman test, employed to make a decision regarding the choice between random effects (RE) and fixed effects (FE) estimation results. Hausman test hypothesis for fixed and random effects states that if p-value < 5%, then use FE, if p-value > 5% then use RE. The p-value of 1.000 from the table exceeds the predetermined level of significance of 0.05. Therefore, the null hypothesis (H_0) that the random effect is appropriate for this model is accepted. The estimation of the model was conducted using a random effects approach, as indicated. Consequently, the random effects method was employed, and the outcome of the regression estimation is presented in Table 1.

Table 1: Correlated random effects - Hausman Test

Correlated Random Effects - Hausman Test				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		0.000	7	1.000
Cross-section random effects test comparisons:				
Variable	*Fixed*	*Random*	*Var(Diff.)*	*Prob.*
Monthly income	*-0.108*	*0.086*	*0.005*	*0.006*
Household size	*-0.144*	*-0.208*	*0.003*	*0.288*
Level of education	*0.23*	*0.292*	*0.004*	*0.336*
Gender	*-0.937*	*-1.050*	*0.006*	*0.170*
Number of Appliances	*0.6149*	*0.4518*	*1.3610*	*0.1886*
Behavioral Index	*0.3696*	*0.0940*	*3.9307*	*0.0008*
Type of dwelling (dummy)	*-0.0279*	*0.0313*	*-0.8731*	*0.4080*

Source: Author's computation from STATA output,

4.2 Random Effect Regression Model Estimates

The result of the random effect regression is presented in Table 2. The constant term (C) in the regression equation denotes the intercept, which signifies the value of the dependent variable when all other independent variables are set to zero. In the present scenario, the constant value is determined to be 5.728. Nevertheless, the t-statistic value of 1.041 fails to reach statistical significance (p > 0.05), indicating that the constant term could not possess substantial predictive power in relation to consumer behavior. The coefficient associated with household income, household size, number of appliances and type of dwelling (dummy) are positive and significant determinants of electricity pricing this sis supported by Ibrahim and Lawal (2025); Yimeng and Teng (2022); and Rai and Henry (2020). The variable of gender and level of education are negative but not statistically significant

Table 2: Random effect regression model estimates

Cross-section random effects test equation:				
Dependent Variable: Elp				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*5.728*	*9.759*	*1.041*	*0.448*
Monthly income	*0.895*	*0.411*	*2.177*	*0.043*
Household size	*1.922*	*0.530*	*3.627*	*0.008*
Level of education	*0.842*	*0.549*	*1.412*	*0.138*
Gender	*-1.325*	*1.323*	*-1.002*	*0.104*
Number of Appliances	*0.116*	*0.066*	*1.960*	*0.063*
Behavioral Index	*-0.239*	*0.103*	*-2.318*	*0.0042*
Type of dwelling (dummy)	*0.502*	*0.218*	*2.211*	*0.050*
	Effects Specification			
R-squared	*0.885*	*Mean dependent var*		*11.295*
Adjusted R-squared	*0.714*	*S.D. dependent var*		*14.402*
F-statistic	*13.089*	*Durbin-Watson stat*		*1.931*
Prob(F-statistic)	*0.000*			

Source: Author's computation from STATA output

The R-squared value of 0.885 represents the goodness-of-fit of the whole model, suggesting that around 88.5% of the variability in household livelihood can be accounted for by the independent variables. The obtained F-statistic of 13.089, along by a probability value of 0.000, indicates that the model exhibits statistical significance as a whole. The Durbin-Watson statistic, with a value of 1.931, suggests the existence of positive autocorrelation inside the model.

4.3 Regression Model Estimates

Estimation of the specified model using multiple regression was also conducted to further analyze the relationship. The model was significant ($F = 55.89$, $p < 0.001$), indicating that perceptions of electricity pricing are are associated with consumer behavior. This supports the findings of Dillon (2025); Okworokwo and Adeoye (2021); Browning and Zupan (2020), and suggests that pricing strategies directly influence consumer behavior (Beegle, 2025). The results are summarized in Table 3.

Table 3: Regression model estimates

Variable	Unstandardized coefficients (B)	Standard error	Beta (*B*)	t-value	Sig.(p-value)
(Constant)	45.220	8.134	-	5.559	0.000
Monthly income	0.412	0.089	0.254	4.629	0.000
Household size	8.756	1.245	0.318	7.033	0.000
Level of education	2.671	0.964	0.453	3.007	0.000
Gender	-4.140	1.892	-0.285	4.209	0.000
Number of Appliances	12.103	2.011	0.281	6.017	0.000
Behavioral Index	-5.892	1.467	-0.178	-4.016	0.000
Type of dwelling (dummy)	15.342	4.221	0.152	3.635	0.000

$R^2 = 0.507$, Adjusted $R^2 = 0.498$, $F = 55.89$, $p < 0.001$

The model explains approximately 50.7% of the variance in electricity pricing. All variables are statistically significant predictors. Income, household size, and appliance ownership positively influence consumption, in line with the findings of Aziza and Widiastuli (2024). The negative beta for the Behavioral Index indicates that proactive energy-saving habits significantly reduce consumption and energy cost or price paid for. This underscores the interaction between electricity price and and conscious consumer behavioral choices, as suggested by the Theory of Planned Behavior (Ajzen, 1991).

The analysis reveals interplay between electricity pricing and consumer behavior. Electricity pricing strategies by consumers significantly influence consumption, with consumers actively reducing usage in response to high or unpredictable costs where supply is effective and accessible. High prices where supply is unreliable creates negative attitudes towards price changes and drive perceptions of unfairness and financial strain on the side of the consumer. The findings suggest that electricity pricing is influence by level of income, household size, type of dwelling, and appliance ownership, but can be moderated by conscious energy-saving behaviors. Consumers desire a pricing structure built on transparency, equity, and incentives for efficient use, supported by reliable technology and trusted payment systems.

5. CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This study analyzes consumer behavior and electricity pricing in Kaduna Metropolis, Kaduna State, Nigeria. The main instrument used in the study is structured questionnaire with 384 sample size. Both descriptive and inferential statistics were used. A multinomial logit model was specified and estimated using STATA. The findings show that household income level, household size, number of appliances and type of dwelling are statistically significant variables that drives consumer choices in consuming electricity. The results highlight the impact of rising electricity pricing on consumers behavior towards electricity consumption as well as the financial burden imposed on households. Consumer behavior plays a crucial role in shaping market demand and influencing policies. Understanding how households make purchasing decisions, what factors drive their preferences, and how service providers respond to these behaviors is essential. It is crucial to address the issue of affordability and explore effective strategies to mitigate the challenges faced by consumers.

5.2 RECOMMENDATIONS

Based on the findings of the study, the following suggestions are proffered. Conscious effort should be made by households to adapt energy consumption habits and mitigate the impact of higher electricity prices. Such measures may include practicing energy-saving behaviors, adopt energy-efficient appliances, and optimize electricity usage. Policymakers should implement targeted measures that address the specific challenges faced by different consumer segments. This can include targeted subsidy programs for low-income households, financial support to adopt energy efficient technologies, and regulatory reforms to ensure transparency and accountability in electricity pricing. By adopting a comprehensive approach that combines affordability, energy conservation, reliable power supply, and renewable energy promotion, policymakers can create a sustainable and affordable electricity pricing. There is need to improve customer engagement and education reflective tariffs and educate consumers on energy efficiency, how to read meters/bills, and their rights and responsibilities.

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