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The Impacts Of Electricity Price And Quality On Consumers' Satisfaction In Gombe And Yola Metropolises (North-East Nigeria)

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Abstract: *This research evaluates how electricity pricing affects consumer satisfaction in Gombe and Yola Metropolises, North-east Nigeria. It also explores the link between customer satisfaction and willingness to pay electricity bills. The study distributed 400 structured surveys to electricity consumers in Gombe and Yola Metropolis. Of these, 328 were returned and analyzed using ordered logistic regression and descriptive statistics. The findings reveal that 77% of respondents would pay higher prices if the quantity of electricity supplied, measured in hours, improved. Only 22% of respondents felt they received electricity service proportionate to their bills. The study concludes that while quality and price significantly impact consumer satisfaction in electricity industry in the region, there's no strong link between satisfaction and willingness to pay, outage of the electricity in the two metropolises for over a month between April and June this year due to vandalization of 132KV lines makes a lot of impact on customer's satisfactions. These results have important implications for electricity regulators. They can rebuild consumer trust by ensuring consumer interests are considered in pricing decisions. Additionally, regulators can enforce policies to boost efficiency in the electricity sector, ensuring quality provision that improves consumer satisfaction while covering producer costs.*

Keywords: Electricity, pricing, Customer satisfaction, quality of electricity.

1. Introduction

Energy is crucial for sustainable growth and development in any nation, as most economic activities heavily rely on adequate energy supply to function effectively [8]. Therefore, energy must not only be plentiful but also affordable for users. The quality and cost of energy used for domestic and industrial purposes directly affect citizens' welfare. However, in Nigeria, access to electricity is limited, with only 48% of the population having access [1]. Moreover, Nigeria has Africa's lowest generating capacity. In 2014, electricity demand was 12,800 MW, but supply was only 3,400 MW [8]. This shortage impacts foreign direct investment and economic activities in Nigeria [8].

A major challenge for the Nigerian government is providing sustainable energy, especially electricity, to its citizens. Poor access to electricity in terms of quantity and quality has hindered economic growth over the past five decades. In an effort to improve electricity supply, Nigeria's electricity industry was restructured in 2007 into six generation companies, one transmission company, and eleven distribution companies [8]. This restructuring aimed to increase competition in the electricity industry [3]. Competition is believed to increase efficiency and make electricity prices more affordable for consumers. Each producer would likely want to increase their market share and improve their product. However, the concept of a competitive market is only effective if there are many producers ready to compete; otherwise, the industry needs regulation [1].

Several factors drive the need for electricity sector privatization. Firstly, population growth and the rise in small businesses have increased electricity demand. Secondly, aging power plants require replacement with modern facilities [8]. Thirdly, the government can no longer afford the substantial capital needed to maintain industry efficiency [4]. Privatization also opens doors for private sector involvement, potentially boosting industry efficiency. Moreover, it could reduce socioeconomic issues like unemployment, job losses, and high production costs caused by poor electricity quality. However, privatization alone doesn't guarantee quality; without proper regulation, profit-driven private firms might reduce supply quality while charging for undelivered electricity.

In Nigeria's context, a competitive electricity market should ensure quality service at lower prices, improving citizen

welfare, creating job opportunities, and reducing production costs for SMEs, thus enhancing Nigeria's global competitiveness. Yet, since deregulation, consumers have seen little benefit; electricity tariffs have increased, power supply remains unreliable, voltage fluctuations persist, and customer service is poor [7].

The Nigeria Electricity Regulatory Commission (NERC) has consistently promised that deregulation and competition will improve electricity quality. To foster competition, enhance service quality, and establish efficient pricing, NERC introduced the multi-year tariff order (MYTO) system [8]. However, there's no strong evidence that electricity quality has improved since MYTO's introduction (Usman, 2013). The MYTO tariff system appears to prioritize covering production costs over consumer welfare, possibly explaining why the government advocates for price increases despite the gap between expected and actual electricity quality [8]. This study examined how electricity tariffs affect consumer satisfaction.

A long-term link between institutional quality and electricity consumption in Nigeria, shows that better institutional service increases electricity use and quality impact on consumer welfare. [5]. However, it remains unclear if improved electricity quality increases willingness to pay tariffs in Nigeria. This study aims to explore this relationship.

2. An Overview of MYTO Electricity Tariff System in Nigeria

The Nigerian government has long been responsible for electricity supply since the industry's establishment in 193. The industry has undergone three name changes to improve customer service: Electricity Corporation of Nigeria (ECN) from 1956-1972, National Electrical Power Authority (NEPA) from 1972-2005, and Power Holding Company of Nigeria (PHCN) from 2005-2012. In 2012, the industry was privatized, with private companies now managing generation, transmission, and distribution under NERC's regulation [8].

NERC introduced the Multi-Year Tariff Order (MYTO) in 2007, rooted in neoclassical pricing theory. MYTO aims to incentivize efficient operations and cost reduction. It sets prices equal to an effective firm's long-run marginal cost. To encourage investment, MYTO allows providers to adjust prices based on inflation, losses, fuel costs, and exchange rates. It also permits major reviews to account for input cost changes [8].

While MYTO claims to blend rate-of-return and price-cap regulation benefits, it faces challenges. There's no benchmark to measure the most effective firm's performance for at least a decade. The model may not favor consumers, as producers can adjust prices to reflect cost changes, similar to rate-of-return and price-cap regulation. It fails to identify a fair return rate for both producers and consumers, as profit-maximizing firms can increase profits by raising production costs.

MYTO advocates price discrimination, with lower rates for small consumers. However, this approach has drawbacks. It may discourage electricity consumption, affecting producer revenue and investment. Such price discrimination inefficiently distributes income by distorting the market through subsidies. Instead, consumers should be empowered to choose their consumption levels [8].

A key assumption in these approaches is consumers' ability to pay, with prices set at or above marginal cost. They don't consider situations where consumers' ability or willingness to pay falls below marginal cost.

3. Quality and Efficiency Nexus in the Electricity Market

Quality in terms of electricity can be define as the "flow of service or level of value consumers derive from a product" [8]. While subjective and hard to measure, consumer preferences can indicate quality preferences. Regulatory agencies can also set minimum standards. This study focuses on commonly accepted electricity service standards: stable power, consistent voltage, and uninterrupted supply [8].

Consumers generally perceive a positive relationship between price and quality. However, when high prices don't match quality, consumers may default on payments or avoid purchases. Price increases have dual effects: they make products less attractive due to higher costs, but also more appealing to quality-conscious customers as high prices suggests quality. Individual market participation depends on specific utility functions.

Market Structure	Price Change	Quality Response	Consumer Welfare	Producer Response
No Competition	Price Increase	Quality Increase	No Change	Supply Increase/Constant
	Price Decrease	Quality Decrease	No Change	Supply Decrease
With Competition	Price Constant	Quality Increase	Increase	Supply Increase
	Price Decrease	Quality Increase/Unchanged	Increase	Supply Increase/Constant
	Price Increase	Quality Increase	No Change	Supply Increase

Competition With Regulatory Agency	Price Decrease	Quality Increase	Increase	Supply Decrease or force to keep Supply constant
	Price Constant	Quality Increase	Increase	Supply Decrease or force to keep Supply constant
	Price High	Quality Increase	No Change	Supply Increase

Table 1: Possibilities of price and quality relationship
Source: authors' analysis

Table 1 summarizes how price and quality shifts affect consumer welfare and producer reactions. High prices often signal quality to buyers. For sellers, steep prices suggest a need to boost supply in both quality and quantity, as product price is typically linked to its quality. The table shows that competition drives efficient operations and investment, as firms must use resources wisely. Notably, competition with regulation tends to improve company performance, especially when market incentives are lacking.

Optimal electricity pricing emerges in competitive markets with minimal government interference. However, as the table indicates, competition doesn't guarantee quality improvements. In Nigeria, where 60% of people live below the poverty line and the government has long subsidized electricity, many struggle to afford unsubsidized rates. While a competitive market where prices reflect costs is crucial for economic efficiency, reliability, and environmental responsibility in the energy sector, firms in developing countries may need more time to recoup investments compared to their developed-world counterparts [10].

A major issue in Nigeria's electricity market is creating a pricing system that promotes timely bill payments while meeting consumer needs. Many researchers have studied the impact of nonlinear electricity pricing in America, and found that increasing block pricing creates a trade-off between efficiency and fairness in regulated tariffs [12]. This is because block pricing raises the marginal price as households use more electricity. In Nigeria, block pricing lets electricity companies adjust prices based on costs. This means retail energy prices change with international energy prices to reflect full consumption costs. Companies using this tariff system often become inefficient and may try to boost revenue by increasing costs, which can hurt low-income households [9].

Setting electricity prices involves trade-offs. If prices are too low, it discourages production from high-cost plants and may lead to less investment, as producers can't cover capital costs. If prices are too high, it transfers wealth from consumers to producers and may cause industry inefficiency. High electricity prices don't necessarily increase investment unless demand also rises [3].

Supporters of electricity industry privatization believe private ownership and profit motives will improve efficiency, reduce corruption and increase debt recovery. When compared pre- and post-reform electricity markets in Nigeria using a linear programming model, it was found that post-reform benefits the country more by increasing industry investment [7]. However, they argued that post-reform success depends on removing subsidies, raising electricity prices and cutting transmission losses.

Besides affecting prices, competition is expected to impact quality. Competition should ideally improve both price and quality, ensuring high quality at lower prices [3]. Some researchers argued that an efficient market must inform consumers about both price and quality. When consumers see a market as efficient, they trust its prices and quality more. They noted that demand tends to fall if consumers perceive prices as unfair relative to quality. Thus, willingness to pay depends on individual attitudes towards gains and losses, which largely depend on perception [1].

Many researchers have studied the long-term relationship between institutional quality and electricity use. Using a bound test approach, they found a one-way link from institutions to electricity consumption. Their study shows that better institutional service quality tends to increase electricity use. They suggested that improving institutional service quality creates room for more investment, increasing energy needs [6].

Poor electricity supply affects not just consumers, but also suppliers and the whole economy. It raises costs for private investors, reduces international competitiveness, lowers investment returns, and increases business uncertainty [5]. When electricity is available but expensive, it hurts the competitiveness of small and medium enterprises. Some studied how analog meter users in Kano, Nigeria, viewed billing. Using frequency tables and percentages, the author found that 38 percent of meters are outdated. The study also revealed that poor, unreliable power supply and billing systems are the main reasons consumers don't pay electricity bills promptly [2].

4. Methodology

The research utilized primary data for analysis, collected through structured questionnaires designed to meet the study's goals. Customer responses were gathered using 5-point Likert scales. The questionnaires' first section included respondents' age, gender, and residence. All participants lived in Lafia, Nasarawa state.

The study population consisted of electricity consumers in Yola, Adamawa state's capital and Gombe, Gombe Stare's capital. Yola has 73,560 registered electricity consumers (Yola Electricity Distribution Company [YEDC], while Gombe has 65,789 registered electricity consumers (Jos Electricity Distribution Company [JEDC], 2016). The study used Yamane's (1967) sample size formula: n = N / (1 + Ne^2).

Here, n is the sample size, N is the population size, and e is the precision level. This study used a 5% precision level. The calculated sample size at 5% precision (e) is 398.

The study used convenience sampling to select respondents due to difficulties meeting people at home during work hours. Responses were collected from people at their workplaces. To ensure reliable and valid responses, questionnaires were only given to homeowners or renters connected to the national power grid. Questions were kept simple and easy to understand.

398 structured questionnaires with closed-ended questions were distributed. 328 questionnaires were returned and validated, showing an 83% response rate. Responses were coded into quantitative options and entered into Stata software. Ordered logistic regression and Pearson chi-square tests were used to achieve the study's main objectives. Ordered logistic models are suitable when the dependent variable has naturally ordered multiple response categories (Green, 2008). Responses were categorized as strongly agree, agree, indifferent, strongly disagree, and disagree. The logistic regression model is:

$$\text{Logit}\,[Yi = 1,2\ldots5] = \alpha + \beta i\, Xi + \varepsilon i$$

Where:
Yi is the ordered dependent variable from 1 to 5 (1= strongly disagree, 5 = strongly agree). Xi represents ordered independent variables. ε is the error term, independent and identically distributed. Pearson chi-square analysis examined the relationship between consumer satisfaction and willingness to pay electricity bills. The null hypothesis assumes no relationship between these variables.

5. Results and Discussion

To meet the study's objectives, we first assessed how electricity meter use affects consumers' perceptions of electricity quality and price, and their satisfaction levels. Results are presented in the following tables.

Price of electricity	Agree	Disagree	Indifferent	Total
No meter	23	139	13	171
Have meter	28	111	14	157
Total	51	250	27	328

Table 2: Relationship between Electricity Meter Ownership and Price Perception

Source: Field Work

Table 2 shows the relationship between electricity meter ownership and price perception in Gombe and Yola Metropolises. Column 2 shows that 241 (139+102) respondents (77% of total) are dissatisfied with electricity prices in Lafia. Of those who disagree, 139 don't have meters and 102 do. This suggests that both metered and unmetered consumers are unhappy with electricity bills.

Quality of electricity	Agree	Disagree	Indifferent	Total
No meter	18	143	13	171
Have meter	26	116	12	157
Total	44	259	25	328

Table 3: Relationship between Electricity Meter Ownership and Quality Perception

Source: Field Work.

Table 3 shows the link between meter ownership and electricity quality perception in Yola and Gombe Metropolos. It reveals that 143 respondents without meters and 105 with meters feel the electricity quality doesn't match the price, especially with estimated bills. This means 76% of respondents are unhappy with the electricity quality.

To dig deeper, we checked if there's a significant difference in satisfaction between consumers with and without meters regarding their bills. We used Analysis of Variance (ANOVA) to test this, as shown in Table 4.

Source	SS	df	ms	F	Prob > F
Between Groups	3.3979	4	.84949	3.25	0.0125
Within Groups	79.2773	303	.26164		
Total	82.6753	307	.2693		

Bartlett's test for equal variance: chi2 (4) = 3.5518 porb>chi2 = 0.47000

Table 4: ANOVA on Meter Ownership's Impact on Customer Satisfaction

Source: Field Work

Table 4 presents the ANOVA results on whether having a meter affects customer satisfaction with electricity use in Gombe and Yola Metropolises. We tested the null hypothesis of equal variance against its alternative at a 5% significance level. The ANOVA shows an F-value of 3.55 and a p-value of 0.47. This indicates no significant difference in satisfaction

between those with and without meters. So, owning a meter doesn't seem to influence how consumers view electricity quality and price in the two cities. This means our regression results won't be biased towards any specific consumer group.

6. How Price and Quality of Electricity Service Affect Customer Satisfaction in Gombe and Yola Metropolises.

We used a five-point Likert scale to gather responses on consumer satisfaction with electricity price and quality, where 1 = strongly disagree and 5 = strongly agree. We then used ordered logit regression to study how electricity quality (AVHC) and price perception (EBEC) impact consumer satisfaction (HQE) in Lafia. Table 5 shows these results.

	Ordered Logit	Marginal Effects
VARIABLES	**HQE**	**HQE**
AVHC	0.6299*** (5.201)	0.0142*** (3.15)
EBEC	0.5846*** (6.576)	0.0132*** (3.27)
Constant cut 1	2.0646*** (7.536)	
Constant cut 2	3.9382*** (11.447)	
Constant cut 3	4.5606*** (12.283)	
Constant cut 4	6.0587*** (12.913)	
Observations	328	
LR chi-square	91.51**	
Log-likelihood	-353.05	

z-Statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5: Regression Analysis

Table 5's likelihood ratio chi-square of 91.51 shows the model is statistically significant overall. The significant cut values indicate that respondents clearly distinguish between response categories. AVHC and EBEC coefficients are statistically significant at 1%. The results show that, all else being equal, better electricity quality increases the log odds of higher customer satisfaction by 0.63. The marginal effect reveals that respondents who strongly agreed have a 1.42% higher predicted probability of satisfaction compared to other categories.

Table 5 also shows that when customers' view of electricity bills as a consumption indicator rises by 1%, their satisfaction log odds increase by 0.58. The marginal effect indicates that those who strongly agree that bills reflect consumption have a 1.32% higher predicted satisfaction probability than other groups.

The goal is to determine if electricity price and quality in Gombe and Yola Metropolises impact consumer satisfaction. Results indicate that 6.3 out of 10 respondents believe price affects their satisfaction, while 5.8 out of 10 think quality influences their contentment in the area.

7. Consumer satisfaction and payment willingness

Economic theory suggests that product payment willingness depends on expected utility and income. Customers are more likely to pay when expected utility (satisfaction) is high. We conducted further analysis to examine the link between consumer satisfaction and willingness to pay electricity bills. We performed chi-square tests for quality satisfaction (HQE) and bill payment (PFCE), as well as price satisfaction (HPE) and bill payment (PFCE). Table 6 presents the Pearson chi-square test results for consumer satisfaction and payment willingness in Gombe and Yola Metropolises.

VARIABLES	Pearson Chi-square	P-value
PFCE & HQE	23.02	0.113
PFCE & HPE	22.32	0.33

Table 6: Chi-Square test for customer satisfaction and payment willingness

Table 6's Pearson chi-square results show we don't reject the null hypothesis of no relationship in both cases. This means there's no connection between quality satisfaction and bill payment willingness. Also, price perception doesn't affect payment willingness. These findings suggest consumers pay bills even when quality and price are unfavorable. A possible explanation is that many consumers are compelled to pay regardless of service received.

The analysis implies that most Gombe and Yola Metropolises electricity customers don't see price as a quality indicator. Unlike other markets where price signals quality and determines expected utility, this may explain why many electricity consumers have low payment willingness. Customer satisfaction is generally poor due to inadequate power supply.

Lastly, with the electricity regulatory commission's recent bid to increase tariffs, respondents were asked if they'd pay more for better quality. Their responses are shown in Table 7.

Willingness to pay high price	Freq.	Percentage

Agree	254	77.44
Disagree	43	13.11
Indifferent	31	9.45
Total	328	100.00

Table 7: Consumer willingness to pay higher prices for improved electricity quality

Table 7 displays consumers' willingness to pay more for better electricity supply. Column 1 shows that 254 respondents (77%) agreed to pay higher prices for quality services. Only 11% disagreed with increasing prices for higher quality.

8. Conclusion.

This study explored electricity price and quality impacts on consumer satisfaction in Gombe and Yola Metropolises. We found that both factors significantly influence consumer contentment in the local electricity industry. Results show that consumer satisfaction rises by 63% with quality improvements and 58% when price perception aligns with consumption.

We also examined the link between consumer satisfaction and bill payment willingness. Surprisingly, our findings reveal no strong connection between these factors. This contradicts basic economic theory, which suggests consumers pay for products based on expected satisfaction. While quality and price affect consumers, satisfaction levels don't influence payment willingness, indicating that consumer choice isn't reflected in Nigeria's electricity market. This isn't unexpected, as consumers are often forced to pay bills regardless of consumption or face disconnection. Another possible explanation is illicit deals between consumers and electricity agents, allowing partial payments.

The study also highlights ongoing issues with poor billing management and unreliable service in the electricity sector. To address these problems, providers and regulators should prioritize consumer satisfaction when setting prices that reflect consumption levels and ensuring quality service. The government plays a crucial role in establishing competitive markets and guiding firms to reduce market failures through efficient pricing policies and quality products. We recommend that the government and electricity providers rebuild consumer trust by implementing consumer-inclusive policies and focusing on maximizing consumer welfare.

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