Household Demand Analyses in Uyo Metropolis: A Study of Selected Determinants Responsiveness

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ABSTRACT

The study is an attempt to evaluate household demand analyses in Uyo metropolis: a study of selected determinants responsiveness. The research employed survey data obtained from 200 households via individual interviews utilizing a meticulously designed questionnaire. Information on income, age, sex of household head, household size, educational background was collected to capture household demography. The data were also collected on household expenditure on the selected food and nonfood item, their respective prices and the quantity consumed in a given month. The study adopted the quadratic almost ideal demand system (QUAIDS) as a model. The result indicated that factors that affect household food expenditure on Rice, Beans and Garri are the prices of the goods, income, household size, level of education and the prices of other goods. Similarly, the study found negative compensated and uncompensated own price elasticity of demand for the food items rice, beans and garri while beer has a positive own price effect. All the goods were found to be price inelastic as their own price elasticity lies between -1 and 1. Again, all food items were found to have negative cross price elasticity and which is less than one indicating that they are substitutes and price inelastic. On the other hand, the study found evidence of complementary relationship between beer and food items like garri and beans. The study recommends that the government subsidize food prices, lower taxes on these goods, provide cash transfers to the poor, or promote the production of these food items by giving preference to farmers who produce them in order to lessen the impact of such price increases on the demand for these commodities.

INTRODUCTION

Household demand analysis has long been an important area of research for economists in both developing and developed economies. As a result, numerous studies have been conducted to record Nigerian household demand for a variety of items, as well as its determinants and degree of response to different circumstances. (Donatus and Ogonna (2017) Chukwuemeka and Emmanuel (2020)) These studies which

have utilized both time series and survey data have help shed light on the nature of household demand in Nigeria as well as the policy response necessary to mitigate welfare loss resulting from shocks to income or prices.

The amount that a household spends on the consumption of food and nonfood items depends on the pricing of these goods and the income of the consumer. According to the circular flow of income, household earn income from the sale of factors of production which they in turn use to purchase goods and services (Mankiw, 2005). The consumption of commodities and services, such as food, clothing, housing, fuel, light, water, furniture, transportation and communication, education, recreation, and so on, provides welfare (utility) to an individual or household. The fundamental tenet of microeconomic theory is that, given its income, each household seeks to maximize its welfare, or utility. Finding the ideal quantity of products and services is how it is accomplished (Mas-Colell et al., 1995). Consequently, a household's wellbeing will be impacted by a few 5 changes in both the income and the cost of products and services (Widodo, 2006).

Household demand analysis is very important for many reasons. The demand analysis is crucial in understanding behavioural responses due to price and income variations (Vu, 2019). This data is crucial for assessing the welfare implications of various economic shocks (Gunes, 2017) A detailed knowledge of consumer behavior obtained from demand analysis is a relevant and important matter for both tax and social policy-making as well as for the long-term investment and production. As a result, their significance has grown in political interventions concerning the issues of welfare analysis and income distribution. (Zhou, Herzfeld, and Yu, 2014) Furthermore, precise forecasting of the present and future requirements for a variety of goods and services depends critically on a grasp of the nature of household demand and an awareness of its causes. (Sher and Admad 2021).

Macroeconomically, when measured by expenditure and income approach, Household consumption expenditure is the largest and the largest share of Nigeria's GDP (gross domestic product). Furthermore, the value has grown steadily over the years indicating the importance of household consumption and demand in understanding the economy's aggregate demand. data from the statistical bulletin published by the Central Bank of Nigeria (CBN) 2021 indicate that final household consumption expenditure grew from 36 trillion naira in 2010 to about 74 trillion naira in 2015 before rising to about 108 trillion in 2021. This represents 65%, 78% and 61% of GDP in 2010, 2015 and 2021 respectively. Considering the relevance of household consumption expenditure in overall aggregate demand in the economy, a detailed understanding of factors that effects household consumption and demand at the micro level is crucial in understanding and forecasting economy's aggregate demand pattern.

Several studies have investigated household demand for various goods and services in various parts of the country. Chukwuemeka and Emmanuel (2020), Adedeji and Sowunmi (2022), Sary et al. (2022); Adetunji and Rauf (2012); Idris (2020). Most of the studies were interested in the demand for specific goods or services within a given area while Idris (2020) investigated the demand for energy amongst households in Adamawa state, Obalola, *etal* (2021) were interested in the demand for food among urban dwellers in Minna while Ben-Chendo et al (2018) analyzed food demand amongst rural dwellers. Others like Abdulganiyu and Sodiq (2017) examined the demand for vegetables while Adedeji and Sowunmi (2022) analyzed the demand for branded sausages. Consequently, this study extends the work of Obalola, *etal* (2021), Chendo etal (2018) by examining household demand analyses in Uyo metropolis: A study of selected determinants responsiveness.

Three major methodologies dominate most of studies reviewed. The linear expenditure method (LES) as applied by Obalola et al, (2021), the Almost-ideal demand system (AIDS) (see Adetunji and Rauf (2012); Sher and Ahmad (2021) and the quadratic almost-ideal demand system (QUAIDS) (see Oluwatosin *etal*, 2019; Ben-Chendo et al, 2018; Chukwuemeka and Emmanuel (2020)). This study adopts the quadratic almost-ideal demand system approach to model household demand in Uyo metropolis in Akwa Ibom state.

The quadratic almost ideal demand system was chosen ahead of the linear expenditure approach and the Almost ideal demand system because it has the property of non-linear Engel function which is more appropriate to household data (Lewbel, 1997)

The remaining part of the paper is divided into four namely: Literature review, Methodology, Analysis and discussion of findings and conclusion and recommendation

LITERATURE REVIEW

Theoretical Literature

Marshallian Or Uncompensated Demand Functions

The Marshallian demand function is a mathematical function that relates the price of a good to the quantity demanded of the good. The function is named after economist John Marshall who first described it in 1884. According to Zarategui (2012), Marshals demand theory is built on two key assumptions, the individual assigns a different utility function to each goods consumed and that the marginal utility of money is constant. The demand function can explain how consumers respond to changes in price. The Marshallian demand function shows the number of goods a consumer demands, which is a function of its price, consumer income, and other related goods It offers a way for consumers to maximize their utility given a certain income and set of prices, so solving the problem of utility maximization. The Marshallian demand function, therefore, focuses on substitutes for the goods demanded and consumer income. The quantity of a good demanded by an individual may also be influenced by the consumer's expectations of future changes in the supply and price of goods and services.

The indirect utility in the Marshallian approach is the amount of happiness or satisfaction that a person derives from consuming a good minus the cost of that good. The individual household's problem is to choose that can maximize its utility according to its financial limitations.

As a result, the restricted optimization problem and optimal choice of xi can be found as follows:

Given that the utility function $u(x)$ satisfy all the assumption of the preference model we may formulate "consumer behavior" as the problem

s.t px=y ....*equation (1)*

where P denotes a vector of prices of the coordinate commodities of x, and y denotes income.

The solution to the problem formulated in (1) may be written as x=g(p,y)…

$x = g(p, y)$ ....*equation (1a)*

called the "Marshallian demands". Equation two states that the demand for goods x is a function of its own price, prices of other goods and income.

Substituting these demands into the utility function we obtain the indirect utility function:

$v(p, y) \equiv u(g(p, y))$ ....*equation (1b)*

which expresses the maximum achievable utility under price-income regime)

Hicksian demand function

The Hicksian demand function is a type of demand function which delivers a fixed level of utility for an individual who demands a quantity of the goods that minimize the costs of acquiring the goods. The Hicksian demand function isolates the relative price effects on the quantities of goods demanded by individuals. The Hicksian demand function only accounts for the substitution effects of goods.

By assuming that the consumer is paid with precisely enough more income following a price increase to buy some bundle on the same indifference curve, the Hicksian demand function isolates the replacement effect. The good is a normal good if the Hicksian demand function is steeper than the Marshallian demand; if not, it is subpar. Hicksian demand always slopes down.

An alternative approach which yields equivalent results is to formulate the dual problem

$$s.t. \, u(x) = u$$ ....*equation (2)*

for the sake of definiteness, we could think of u as u0, the level of utility achieved by solving (1). The problem (2) has solution,

x=h(p,u) .... *equation (2a)*

which we call the "Hicksian demands" since they represent optimal consumption behavior as a function of the utility level,, in contrast to the Marshallian formulation which is in terms of the observable level of income.

Again substituting, we have

$$c(p,u) \equiv p^{\top} h(p,u)$$ .... *equation (2b)*

Which is usually called the cost or expenditure function, and plays an important role in welfare economics.

Empirical Literature Review

Foreign Evidence

Widodo (2006) seemingly used Uncorrelated Regression (SUR) to estimate the LES coefficients. The study's conclusions show that, when it comes to food consumption, Indonesian households have the highest marginal budget share for meat and the lowest for fruits; in contrast, Japanese households have the highest marginal budget share for fish and selfish goods and the lowest one for dairy and eggs. Households in Indonesia are known for loving meat, while those in Japan are known for loving fish. Second, compared to Japanese homes, Indonesian households have a lower difference between their average and minimal consumption (subsistence level). Third, the simulation indicates that, in nominal terms (Yen, ¥), Japanese households experience a higher welfare reduction than do Indonesian households, even with an identical amount of food price increases. Nonetheless, Indonesian households experience a higher welfare loss than Japanese households in terms of the percentage of total food expenditure. Fourth, over the years 2000–2004, changes in living expenses caused both Japanese worker households and all Japanese families to rise by more than ¥4. Japanese homes are known to be "fish lovers," while all Japanese households are "meat lovers."

Hoang (2009) used sociodemographic data and a comprehensive demand system to examine the food consumption habits of Vietnamese households. The AIDS model and the most recent data from the 2006

Vietnamese household survey are used to predict demand elasticities. The findings show that income, price, socioeconomic status, and geographic location all have an impact on Vietnam's food consumption patterns. There are negative own-price elasticities and positive spending elasticities in every food. Specifically, rice has a mean own price elasticity of -0.80 and a mean expenditure elasticity of 0.36. Therefore, a one percent increase in rice prices will, on average, result in a 0.8 percent decrease in rice consumption. Conversely, a one percent rise in income causes a 0.36 percent rise in the demand for rice. It suggests that there are differences in food consumption between urban and rural locations, as well as between regions and economic levels. It makes the point that certain patterns of food demand within the categories should be the basis for developing customized food policy.

Using a comprehensive dynamic demand system, DLES-LA/DAIDS, Zhou, Yu, and Herzfeld (2014) examined dynamic food demand in urban China and advanced demand analysis approaches. Using a transitionary demand process, the study created a new complete demand system with two stages of dynamic budgeting: a linear approximate dynamic almost ideal demand system (LA/DAIDS) in the second stage and an additively separable dynamic linear expenditure system (DLES) in the first. Based on China Urban House Surveys (UHS) provincial aggregate data (1995–2010), the study calculated China's urban demand elasticities for primary food goods. The majority of primary food goods are needs and price-inelastic for Chinese urban households, according to estimated results. The study also discovered that because dynamic adjusting costs like habit formation, switching costs, and learning process occur, the dynamic model tends to give comparatively lesser spending elasticities in magnitude than the static models do.

Palmer (2019) estimated the Linear Expenditure System of goods in Finnish Household Budget Survey data from 2012 and 2016. Regression model that appeared to be unrelated was utilized to estimate starting values from the cross-section data to use in an optimization problem imitating the Linear Expenditure System using the GAMS program. Based on the estimates, the study found that primary products, food industry products, energy, transportation and rents are necessity goods, as their income elasticity is below one for all household groups. Household goods, repairs and consumption abroad are luxury goods for all estimated household groups with income elasticities higher than one. Leisure services and hotels, restaurants & cafés are considered luxury goods for most household groups. Estimating reliable LES demand elasticities is quite difficult as there are problems with price data and zero expenditure for small commodity groups. Obtaining the elasticities from an optimization problem also introduces the problem of not so easily being able to display statistical inference and thus accuracy of said elasticities.

Vu (2019) examined the food consumption habits of Vietnamese households by utilizing sociodemographic data and a comprehensive demand system. The study used data from the most recent Vietnamese household survey conducted in 2006 to estimate demand elasticities using the AIDS model. The findings show that income, price, socioeconomic status, and geographic location all have an impact on Vietnam's food consumption patterns. There are negative own-price elasticities and positive spending elasticities in every food. According to the study, rice has a mean own price elasticity of -0.80 and a mean expenditure elasticity of 0.36. Therefore, a one percent increase in rice prices will, on average, result in a 0.8 percent decrease in rice consumption. Conversely, a one percent rise in income causes a 0.36 percent rise in the demand for rice. It suggests that there are differences in food consumption between urban and rural locations, as well as between regions and economic levels. It makes the argument that specific food demand patterns within the categories should inform the formulation of targeted food policy.

Almost half of all food expenditures made by American consumers are related to eating away from home (FAFH) Okrent, Alston (2020). Consequently, a two-stage budgeting methodology was used to forecast demand for 43 separated FAFH and food-at-home (FAH) goods. The study discovered that, in comparison to FAH items, the requests for disaggregated FAFH products exhibit different levels of price responsiveness and a tendency to be more sensitive to shifts in food expenditure patterns. It has been

discovered that there are numerous dietary groups within which there are statistically significant substitution and complimentary interactions. It is implied that assessments of health and nutrition policy based on elasticities of demand for only a subset of goods may be deceptive. Predicted changes in quantities based on estimated models that include all goods and services and those estimates that include only a subset of foods differ significantly.

Sher and Ahmad (2021) estimated several demand elasticities in order to assess Pakistan's household demand system. The study estimated the Almost Ideal Demand System (AIDS) by combining data from nine rounds of the Household Integrated Economic Survey. Rich price data that is accessible for each of the nine years' twelve months is added to household level data. The findings demonstrate that while household demand responses to price changes varied significantly between rural and urban families, reactions to changes in income are similar. It is generally observed that rural families exhibit greater price elasticity than their urban counterparts. The report suggests taxing housing, transportation, and communication more heavily than other goods on the basis of equity. It also suggests taxing various non-food items.

Sary, Phearin, Sereyvatha, Davit, Saren, and Sikalubya (2022) investigated household spending and food consumption in rural Cambodia using a two-stage ELES-AIDS budgeting approach. The Extended Linear Expenditure System (ELES) was used in the study's initial phase to track household expenses for things like food, housing, transportation, fuel, and equipment, as well as health and education. The marginal budget share for food, health, education, clothes, housing, transportation, fuel, and equipment would increase by 0.0538%, 0.0127%, 0.018%, 0.0124%, 0.0193%, 0.0059%, 0.0115%, and 0.0113%, respectively, with a 1% increase in price. The Nearly Ideal Demand System was also used in the study to evaluate the demand for food consumption. Based to the findings, a 1% increase in food costs would result in price increases of 0.1575%, 0.00645%, 0.0061%, 0.0222%, 0.0464%, 0.0464%, and 0.0174% for rice, maize, potatoes, eggs, vegetables, meat, and fruits, and a 0.1497% decrease in the price of beverages. Additionally, the expenditure elasticity of meat, fruit, and beverages is significantly and greater than one, classifying them as luxury commodities; in contrast, the expenditure elasticity of rice, maize, potatoes, eggs, and vegetables is less than one, suggesting that these commodities are necessities.

Domestic evidence

On the basis of micro-level data from a multi-stage random sampling survey of 122 households, Omonon, Nkang, and Ajao (2008) used a two-stage Linear Approximate-Almost Ideal Demand Systems model to analyze household food demand in semi-urban and rural households in south-west Nigeria. With the exception of cereals, aggregate food demand shows inelastic sensitivity to price fluctuations. The majority of food items show behavior that is both price and income elastic. Generally speaking, expenditure elasticities were found to be larger than price elasticities, with a range of o.6670 to 18.2224. Strong complimentary interactions between different dietary items were shown to exist, according to the study. The study suggested, among other things, that production of the set of food items with price inelasticity be increased, if only to the extent that producers would not be compelled to raise prices at the expense of consumers. Additionally, a higher margin of demand would result from an associated price reduction with increased supply, which would benefit both the producer and the consumer of the highly price-elastic commodities. Lastly, it is proposed that income policies, as opposed to price controls, may be a more effective way to manage the food demand issues in the study area, particularly with regard to luxuries like meat and fish.

Adetunji and Rauf (2012) looked into the amount of meat that households in a few chosen Southwest Nigerian states consumed. Two hundred and forty households in the study region were chosen using the systematic sampling technique, and information was gathered using a well-structured questionnaire. The gathered data was analyzed using the Almost Ideal Demand System (AIDS) Model and descriptive statistics. The survey discovered, among other things, that respondents' income levels and taste influenced the sort of

meat they liked, with beef (43.7%) being the most popular meat in the study area. When the price of chicken increased, the budget share of beef reduced and vice versa; conversely, when the price of chicken increased, the budget share of mutton, chicken, and chevon increased, respectively. When the price of mutton climbed, the budget portion of pork increased as well; nevertheless, when the price of pork itself increased, it declined. Additionally, the quantity requested would decrease by -0.827, -0.527, and -0.721 for every 1% change in the costs of beef, chicken, and chevon, respectively. It was established that hog and mutton were premium items, whereas chicken, beef, and chevon were commonplace items in southwest Nigerian homes. Programs for price intervention should be implemented in order to moderate the volatility in meat prices

Donatus and Ogonna (2017) estimated the price, income, and cross-price elasticities of demand for African breadfruit in addition to determining the amount of demand for the fruit across households. Sixty (60) breadfruit-consuming homes were chosen through a multi-stage random selection procedure and interviewed using a standardized questionnaire. Frequency distribution, percentages, and the elasticity of demand model were used to analyze the data. The study's conclusions demonstrated that there is a significant level of household demand (63%) for breadfruit in the studied area. The average amount requested each month was 7 kg, or 40 cups. 70% of the produce is consumed by the majority of respondents. Multiple regression analysis results indicate that rising household demand and substitute prices will drive up demand for African breadfruit. The study concluded that because breadfruit is in such high demand for both food and non-food applications, more farmers should engage in its production.

In Imo State, Ben-Chendo, Gbolagun, Ehirim, Obasi, Nwaiwu, and Essien (2017) examined the demand for garri consumption in households. 180 garri consumers from the state were chosen using a multi-stage sample technique, and the respondents' structured questionnaires were used to gather primary data. To accomplish the particular goals of the study, descriptive and inferential statistical tools including means, standard deviation, percentages, multiple regression, and logit regression analysis were employed. The result showed total expenditure on garri and fufu was N2, 056.75 of which yellow garri has the highest share of N1,092.88 (53.14%), followed by white garri that was N588.88 (28.63%), and fufu's share was N 375 (18.23%), It further showed that garri is a normal, price inelastic good that has strong degree of competitiveness and substitutability with fufu and income elastic. Age of the household head, household monthly income and price of garri are important factors influencing preference of yellow garri consumption. It was recommended that Price of garri should be stabilized across the markets to ensure consumers' greater access and affordability, Households should encourage to aggressively engage in cassava production and processing into preferred types of garri, fufu and other cassava products to stem ensure all year-round availability of garri and other products in the country

Abdulganiyu and Sodiq (2017). investigated Lagos State's need for major veggies. The average monthly consumption per household in Lagos's urban and rural areas was found to be 21 kg and 16 kg, respectively, according to the results. In Lagos State, the average monthly household expenditure was N2, 905.83 in urban areas and N2, 698.60 in rural regions. At different probability levels, the own price, cross price parameters, household size, and coefficients of all three variables are statistically significant in both regions. According to the own price elasticity of demand for veggies, demand was inelastic in rural areas and elastic in urban ones. Since the income elasticity of demand values in both regions are positive and greater than 1, the demand for all veggies is elastic. Given their negative signatures, the cross-price elasticities for both rural and urban locations are complementary products. According to the report, policies and tactics aimed at ensuring year-round vegetable availability ought to be actively pushed. Additionally, the public needs to be made aware of the health advantages of veggies in order to increase the intake of them in the area.

In order to determine the factors that influence food demand and how responsive it is to price and household food expenditure, Ben-Chendo, Nwosu, Nwaiwu, and Igwe (2018) set out to estimate the food

demand of rural households in the research area. In order to choose 254 rural homes in the state of Enugu, the study used a multi-stage sampling strategy. Descriptive statistics and the Quadratic Almost Ideal Demand System (QUAIDS) model were used to analyze the main data. According to the QUAIDS model's result, every staple food item that was chosen had a positive expenditure elasticity and was therefore considered a normal good. In terms of magnitude, all of the staple food items—aside from rice and yam—had expenditure elasticity values less than one and were therefore considered necessities. Both the compensated and uncompensated price elasticity estimations showed that own price elasticity was entirely negative, as predicted. Nearly all of the chosen staple food items had positive cross-price elasticity values, according to the Marshallian cross price elasticity estimates, suggesting that they are net substitutes. In contrast, the majority of the chosen staple food items had negative cross-price elasticity values, according to the Hicksian/compensated cross price elasticity estimates, suggesting that they are complements. However, the study also showed that the main factors influencing rural households' demand for the chosen staple foods in the study area were price, total food expenditure, sex, age, marital status, years of education, family size, and income of the household head. Based on the aforementioned, the study's findings ought to guide the development of food security-related policies meant to enhance the nutritional standing of the nation's poor and vulnerable households.

Oluwatosin, Adekunmi, Ajiboye, Toluwase, Osundare, and Abdu-Raheem (2019) investigated the food demand of farming households in Nigeria by determining the socioeconomic characteristics of the farming households, evaluating the monthly expenditure share of different food categories in the total household food budget, examining the factors influencing food demand, and analyzing the expenditure elasticities of the food classes. A multi-stage sampling procedure was utilized to randomly pick 120 agricultural households, and a questionnaire was used as the study instrument to collect primary data from them. The Quadratic Almost Ideal Demand System (QUAIDS) model and descriptive statistics were used to analyze the data. The average age of the household heads was 45.7 years, and 61.7 percent of them were male, according to the data. With a mean household size of seven people and a mean monthly income of N19, 435.20, the majority of household heads (92.5%) were educated. The food class containing roots and tubers accounted for the biggest percentage (48%) of the overall food expenditures of the families, according to a review of the average monthly expenditure share of the main food classes sought by the households.

Idris (2020) looked into the factors that influence household energy consumption and demand in order to offer insightful data on the energy consumption trends in Mubi, the capital of Adamawa State, Nigeria. The study investigated the households' propensity to switch between several energy sources, including electricity, solar, wind, kerosene, LPG, wood fuel, and conventional biomass. For this study, secondary sources of data were utilized extensively. Data were gathered from the Yola Electricity Distribution Company's Mubi branch (YEDC, Mubi) and the Yola NNPC depot. To evaluate the data, multiple regression analysis was used. The study discovered that household income and energy prices had a considerable impact on households' and individuals' energy consumption. The study suggests that, given the negative correlation between family energy usage and energy prices, there should be a widespread awareness campaign in Mubi regarding the benefits of adopting clean energy sources, such as electric cookers and LPG, which are non-hazardous and promote health.

Obalola, Tanko, Aboaba, Abubakar, ODUM, Agboola, Ibrahim, Audu, and Damilola (2021) examined the factors that influence urban families' demand for food commodities in the city of Minna. 110 household heads in urban households provided the data; these were chosen using a three-step random sample procedure. In order to examine the data for the study, multiple regression analysis was used. The findings demonstrated the price inelasticity of cowpea, yam, and rice. For rice, yam, and cowpea, the corresponding cross-price elasticities were -0.132, 0.028, and 0.005. The rice demand elasticity calculated for own price, cross price, and income was –0.308, –0.132, and 0.018, respectively. The calculated values

for yam were -1.262, 0.028, and 0.289, in that order. Cowpea had readings of -0.530, 0.005, and 0.002, in that order. Yam was shown to be a luxury good and rice and cowpeas to be regular goods in terms of income elasticity. The implementation of food aids policies, which are social protection initiatives, is necessary to reduce the inflationary pressure on food products in metropolitan areas.

In Imo State, households' need for solid fuel and its replacement for domestic cooking energy was modeled by Chukwuemeka and Emmanuel (2020). Using a multi-stage sample approach, information was gathered from 262 households in Imo State regarding the socioeconomic characteristics of the respondents, the amount of money spent each month on energy used for domestic cooking, unit costs, and the quantity of various energy sources. To accomplish the study's goals, data were analyzed using QUAIDS inferential statistics, quartile distribution, and descriptive statistics. The quadratic expenditure element in the firewood, sawdust, and wood-shaving expenditure share equations is statistically significant, according to an empirical examination of the demand for home energy utilization. It suggests a severe rejection of their expenditure linearity null hypothesis. Moreover, the budget percentages of the various energy consumed are highly influenced by the pricing and demographics of the head of the family. Every energy source has elastic expenditure elasticity. While charcoal and wood shavings are price inelastic, firewood, sawdust, and kerosene (both Marshallian and Hicksian) have own prices that are price elastic. The cross elasticity of the Uncompensated Marshallian for nearly all energy sources is complimentary. The corrected Hicksian cross elasticity values, however, showed that practically all energy uses are interchangeable, with the exception of firewood, charcoal, firewood and wood shaving, firewood and kerosene, and sawdust and wood shaving, which are complementary.

In Southwest Nigeria, Sowunmi, Daramola, and Tijani (2020) investigated how the recession affected households' needs for staple foods. Using a multistage sampling technique, data were gathered from 380 respondents who were selected from the urban areas of Lagos, Osun, and Oyo states. The data was analyzed using the Quadratic Almost Ideal Demand System and descriptive statistics. According to the survey, the cost of necessities increased dramatically during the recession. Families were forced to devote a larger portion of their monthly income to buying necessities. Additionally, 51.1 percent of the respondents were employed by the government and reported irregular or variable monthly pay at that time. 36.4% of households reported experiencing food insecurity. After Lagos and Oyo states, Osun State spent the most per person per month (₦5,147.13) on food, while rice had the largest expenditure share (0.26), followed by yam (0.18), beans (0.106), vegetable oil (0.104), and garri (0.101). The breakdown also revealed that basic foodstuffs accounted for 11.7, 18.1, and 17.7 percent of monthly household expenditures in Lagos, Osun, and Oyo states, respectively.

One of the fast foods is branded sausage, which is becoming more and more popular in Nigeria as a result of rising household affluence, its accessibility, and its low cost. Adedeji and Sowunmi (2022) used 290 respondents (sellers and buyers) gathered through a three-stage sampling technique to investigate the market concentration and demand for branded sausage rolls in Oyo State. According to the study, bigi and the rite spicy had 22.7% and 21.4% of the consumer base, respectively, while Gala (small and huge) had the largest share (41.3%). With 1.8% of consumers, the Yum-Yum brand had the lowest percentage. Customers spent an average of ₦824.18 on gala (large and small sizes) each month, with rite spicy and bigi coming in second with moderate monthly expenditures of ₦582.98 and ₦520. Bigi had the lowest sales revenue inequality (0.26), while Gala (small and huge) had the most (0.42). Gala had the highest market concentration (50%) while bigi had the lowest (40%). The big and small sizes of gala accounted for 54.4 percent of the market, while bigi and rite spicy came in second and third, with 23.9 and 21.1 percent, respectively. Consumers' preferences for sausage rolls were impacted by monthly income, flavor, quality, price, and availability, whereas their monthly spending on sausage rolls in the study area was determined by monthly payment, household size, and brand consumption. With 1.8% of the sausage market's total consumers, the Yum-Yum brand had the lowest percentage.

METHODOLOGY

The research was carried out in Uyo, Akwa Ibom State, which is in Nigeria's South-South geopolitical zone. The Atlantic Ocean borders the state on the south, Rivers State and Abia State on the west, and Cross River State on the east. The Qua Iboe River, which splits the state in half before emptying into the Bight of Bonny, is the source of the state's name. In 1987, Akwa Ibom which has 31 local government units and its capital city of Uyo was divided from Cross River State.

Of the 36 states, with an estimated population of approximately 5 million, Akwa Ibom is the fifteenth most populated and 30th largest state out of the 36. With a population of over 390,400, Uyo, the state capital, is the most populous local government (NPC, 2021).

5 million people. Uyo, the state capital is the most populated local government with a population of about 390, 400 people (NPC, 2021).

This study attempts to examining household demand analyses in Uyo metropolis: A study of selected determinants responsiveness. To collect accurate and reliable data, the study adopted a simple random method in the data collection process. A simple questionnaire was used to collect information directly from randomly selected respondents/ household. Information on the types of goods and services consumed, income, prices of goods and services consumed, quantities of consumed goods and other demographic data were collected through direct one on one interaction with the respondents

Model specification

To capture the objective of the study, we employed both descriptive statistics and model-based estimation techniques, specifically, the quadratic almost ideal demand system (QUAIDS) as applied by Poi (2012). Fist developed by Banks *etal* (1996), the QUAIDS model is based on the utility function that is not direct.

Model is derived from the indirect utility function.

$$\ln V(P, I) = \left[\left(\frac{\ln I - \ln a(p)}{b(p)}\right) + \lambda(p)\right]^{-1} \quad \text{............................... equation (3)}$$

where $lna(p)$ is the transcendental logarithm function

$$a(p) = \alpha_0 + \sum_{n=1}^{N} \alpha_i . lnP + \frac{1}{2}\sum_{n=1}^{N}\sum_{i=1}^{n} \gamma_{ij} \, lnP_i lnP_k \quad \text{....................... equation (4)}$$

In this function, p_i is the price of good $i = 1, ..., k$; $b(p)$ is the Cobb–Douglas price aggregator

$$p_b = \prod_{i=1}^{k} p_i^{\beta_i} \quad \text{.. equation (5)}$$

$$\lambda(p) = \sum_{1=i}^{k} \lambda_i lnp_i \quad \text{.. equation (6)}$$

It is necessary that a(p) be homogeneous of degree one in homogenous of degree zero in order to guarantee the homogeneity property of the indirect utility function.

However, the budget shares in the QUAIDS model are clearly described as follows by applying Roy's identity to the indirect utility function: Let qi represent the amount of good i consumed by a family, and define the spending share for:

$$W_i = \alpha_1 + \sum_{j=1}^{K} \gamma_{ij} . lnp_j + \beta_i ln \left\{\frac{m}{a(p)}\right\} + \frac{\lambda_i}{b(p)}\left[ln\left\{\frac{m}{a(p)}\right\}\right]^2 \quad \text{......................... equation (7)}$$

On the other hand, we obtain the following by considering the first derivative of Equation (5) in relation to prices and expenditures:

$$\frac{\delta w}{\delta \ln m} = B + 2\frac{\lambda_i}{b(p)} \ln\left\{\frac{m}{a(p)}\right\} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ \textit{equation (8)}}$$

$$\frac{\delta w}{\delta \ln p_i} = Y_i - u\left(\alpha_i + \sum Y_i \ln p_i\right) - \frac{\lambda_i \beta_j}{b(p)}\left[\ln\left\{\frac{m}{a(p)}\right\}\right]^2 \dots\dots\dots\dots\dots\dots\dots\text{ \textit{equation (9)}}$$

We get the expenditure elasticity and uncompensated price elasticity from equations (7) and (8). (e_{ij}^u),and

Hicksian or compensated price elasticity(e_{ij}^c) as thus: w u

$$e_i = 1 + \frac{u_i}{w_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ \textit{equation (10)}}$$

$$e_{ij}^u = 1 + \frac{u_i}{w_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ \textit{equation (11)}}$$

$$e_{ij}^c = e_{ij}^u + w_j e_j \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ \textit{equation (12)}}$$

Description of variables

Variable	Description
lfrgn_riceprice	Log of foreign rice price
lbeerprice	Log of beer price
lwhitebeanprice	Log of price of white beans
lyellowgarriprice	Log of price of yellow garri
frgn_riceexp	expenditure share for rice
whitebeanexp	expenditure share for beans
yellowgarrexp	expenditure share for garri
Beerexp	expenditure share for beer
Income	Household income
Hhsize	Household size
Age_hh	Age of household head
Edu_hh	Household head education
m_hh	Male headed household; a dummy variable equals one if the household head is a male

Source: Author's computation, 2023

ANALYSIS AND INTERPRETATION OF DATA

Household demand analyses in Uyo metropolis: A study of selected determinants responsiveness was analysed using QUAIDS model. The QUAIDS model's parameters were estimated using Stata 17 and the iterated, feasible, generalized non-linear least-squares (IFGNL) estimation method, with the theoretical constraints of addition, homogeneity, and symmetry enforced throughout estimation. The goal of this IFGNL estimate technique is to satisfy economic theory while addressing residual heteroscedasticity.

Table 1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
frgn riceexp	200	635.895	2350.607	2600	28000
yellowgarriexp	200	55.755	292.314	1800	14000

whitebeanexp	200	222.245	466.057	7700	16000
frgn riceprice	200	1651.49	4088.572	900	1300
yellowgarriprice	200	326.785	379.547	630	800
whitebeanprice	200	286.443	300.647	800	1100
Hhsize	200	5.258	3.326	1	12
age hh	200	48.376	15.742	23	61
Income	200	937.066	2531.024	46750	2868000
age hh	200	48.376	15.742	12	120
hh edu	200	1.423	1.037	0	3
Mhh	200	.822	.383	0	1

Source: Author's computation, 2023

Evidence from the descriptive statistics in table 1 indicate that there are 200 hundred observations in the study. The maximum monthly expenditure on foreign rice was capped at 28000 per month while the minimum monthly expenditure stood at 2600. For Garri maximum monthly expenditure stood at 14000 while the minimum 1800. For beans the value is 16000 and 1770 respectively.

The maximum price per kg of foreign rice, bean, and garri are 1300, 800 and 1100 respectively while the minimum prices are 900, 630 and 800 respectively

The maximum household size is 12 while the minimum is 1. Age of household head ranged from 23 to 61, while 82% of household interviewed had male as the head of household

Interpretation of Analysis

Table 2 Determinant of household demand

VARIABLES	(1) Rice Model one	(2) Beans Model two	(3) Garri Model three	(4) Beer Model Four
lfrgn_riceprice	0.275***	-0.208***	-0.254***	-0.170***
	(0.020)	(0.027)	(0.027)	(0.026)
Lbeerprice	-0.368***	0.170	0.790***	1.234***
	(0.129)	(0.173)	(0.170)	(0.168)
Lyellowgarriprice	-0.046**	-0.034	0.185***	-0.013
	(0.021)	(0.028)	(0.028)	(0.027)
Lwhitebeanprice	-0.025	0.363***	0.008	0.007
	(0.023)	(0.031)	(0.030)	(0.030)
Hhsize	0.019**	-0.013	0.008	0.028**
	(0.009)	(0.013)	(0.012)	(0.012)
Lncome	0.872***	0.597***	0.839***	0.580***
	(0.044)	(0.059)	(0.058)	(0.057)
age_hh	0.007***	0.003	0.001	-0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
1.hh_edu	-0.085	-0.283*	-0.352**	0.633***
	(0.110)	(0.147)	(0.144)	(0.142)
2.hh_edu	-0.063	-0.341**	-0.330**	0.808***

	(0.108)	(0.145)	(0.142)	(0.140)
3.hh_edu	-0.046	-0.218	-0.363**	0.722***
	(0.114)	(0.152)	(0.149)	(0.148)
1.mhh	0.308***	0.041	-0.236*	-0.182
	(0.106)	(0.143)	(0.140)	(0.138)
Constant	0.198	0.064	-3.935***	-4.649***
	(0.758)	(1.017)	(0.996)	(0.986)
Observations	200	200	200	200
R-squared	0.927	0.552	0.653	0.489

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation, 2023

Evidence from the estimated double log model indicate that price is directly related to household expenditure for the selected goods. For instance, the estimated model one indicates that a 1% increase in the price of foreign rice will on average lead to a 0.25% increase in the expenditure of foreign rice demanded all things being equal. The implication is that as the price of rice rises, household expenditure on rice rises. Other factors that have a positive impact on household expenditure on foreign rice include, household income, household size, age of household head and male headed households. These variables were also found to be statistically significant indicating that they are an important determinant of household expenditure on foreign rice. The result is consistent with the findings of Ben-Chendo et al (2017) who found that the prices of rice, yam and cassava are directly related to their expenditure share. On the other hand, the study found that the prices of beans, garri and beer are inversely related to the expenditure on rice in Uyo metropolis.

The price of beans and Garri were also found to be positively related to the expenditure on bean and garri respectively. The estimated models two and three shows that a 1% increase in the price of beans will on average increase the expenditure on beans demanded by about 0.326 % all things being equal while a 1% increase in the price of garri will on the average reduce the demand for garri by about 0.185% implying that for both goods price is inelastic with respect to expenditure. This implies that 1% increase in price leads to a less than commensurate increase in the expenditure share of the selected goods.

Furthermore, the estimated model identified several variables that were positively related to household expenditure demand for beans and garri in Uyo metropolis. These variables include income, age of household head, household size and level of education all of which were found to have a positive and statistically significant impact on the quantity of beans purchased. The estimated income elasticity of bean and garri is 0.563 and 0.8 respectively indicating that both goods are normal goods. On the other hand, the study also found an inverse relationship between household level of education and the consumption of beans and Garri.

Evidence from model four shows that the price of beer is positively related to its demand. A 1% increase in the price of beer was to estimate to have 1.234% increase in the expenditure of beer in Uyo metropolis. The implication is that expenditure on beer is price elastic indicating that a percentage A rise in beer prices will result in a more than 1% increase in the expenditure on beer. Other factors that have a positive impact on beer consumption were found to be household income, household size and level of education. These variables are also statistically significant. However, variables age of household head and

sex of household head were found to be inversely related to beer demand in Uyo metropolis

Marshalian and Hicksian own and cross price elasticity of demand

The empirical estimates of the Table 3 show the QUAID model's Marshallian and Hicksian own and cross price elasticity for the research area.

Table 3. The Marshallian uncompensated own and cross price demand elasticity

	Beer	Beans	Garri	Foreign Rice
Beer	0.2051085	0.2110686	0.3618069	-.51739115
Bean	.01574091	-.89135277	.00616217	-.03602083
Garri	-.12311165	-.2453192	-.80569213	-.72984223
Foreign Rice	-.13020566	-.11390918	-.09727219	-.71366636

Authors computation (2023)

It is evident from the table that the demand's uncompensated own price elasticity for the chosen commodities which lies in the diagonal matrix are all less than one indicating that they are demand inelastic. The uncompensated own price elasticity of demand is 0.201, -0.891, -0.805 and -0.713 for beer, beans, Garri and Foreign rice respectively. Apart from beer, the own price elasticity of demand for beans, garri and rice is negative indicating that they are normal goods. For instance, a 1 percent increase in the price of beans will lead to a -0.891% drop in the quantity of beans purchased. For garri and rice, a similar rise in price will decrease demand by -0.805% and -0.713% respectively. Positive cross price elasticity indicates that the goods are complement while negative cross price elasticity is an indication that both goods are substitutes. The uncompensated cross price elasticity between foreign rice and beer is 0.517, for foreign rice and beans is -0.036, and -0.73 for foreign rice and garri indicating that rice and the selected goods are substitutes. Also, Beans and Garri was found to have positive cross price elasticity of demand with Beer indicating that they are complements. All the cross-price elasticity are less than

Table 4. The Hicksian or compensated own and cross price elasticity of demand

	Beer	Beans	Garri	Foreign Rice
Beer	.19414548	.08001236	.33862093	-.61277877
Beans	.05383279	-.43597158	.08671626	.29542253
Garri	-.04301449	.71222711	-.63630817	-.03290444
Foreign rice	-.08582104	.41670056	-.00341065	-.32746887

Authors computation (2023)

The compensated own price elasticity of demand is 0.194, -0.436, -0.636 and -0.327 for beer, beans, Garri and Foreign rice respectively. Apart from beer, the own price elasticity of demand for beans, garri and rice is negative indicating that they are normal goods. For instance, after compensation, a 1 percent increase in the price of beans will lead to a -0.436% drop in the quantity of beans purchased. For garri and rice, a similar rise in price will decrease demand by -0.636% and -0.327% respectively. The demand's adjusted own price elasticity for beans is positive and less than one (0.19) implying that beer is not a normal goods. The cross-price elasticity is all less than one and negative food expenditure indicating that they are substitutes but positive for beer and Beans as well as beer and Garri indicating that they are complements.

CONCLUSION AND RECOMMENDATION

The study attempts to evaluate household demand analyses in Uyo metropolis: A study of selected determinants responsiveness. The study made use of survey data collected from 200 household through one-on-one interview using a well-structured questionnaire. Information on income, age, sex, household size educational background was collected to capture household demography. Data was also collected on household expenditure on the selected food and nonfood item, their respective prices and the quantity consumed in a given month.

After careful theoretical and empirical review both domestic and foreign, the study analysed the collected data The Quadratic Nearly Ideal Demand System (QUAIDS) model is utilized. Evidence from the model indicate that factors that affect household food expenditure on Rice, beans and Garri are the prices of the goods, income, household size, level of education and the prices of other goods.

Similarly, the study found negative compensated and uncompensated own price elasticity of demand for the food items like Rice, beans and Garri while beer has a positive own price effect. All the goods were found to be price inelastic as their own price elasticity are all greater than -1. Again, all food items were found to have negative cross price elasticity and less than one indicating that they are substitutes and price inelastic. On the other hand, the study found evidence of complimentary relationship between beer and food items like garri and beans.

Recommendations

Evidence from the models indicate that the selected food items are price inelastic. This implies that increases in prices will be borne by the final consumers rather than the producers. To reduce the impact of such price increases, government can subsidize food prices, give cash transfer to the poor or encourage the production of such food items by giving preferences to farmers who produce such food items.

There is a positive correlation between income and food demand in the research area, suggesting that income policies could be a more effective means of addressing food demand issues in the area than price policies.

Households should encourage to aggressively engage in cultivation of rice, beans and cassava which can be further processed into preferred types of garri, fufu and other cassava products to ensure all year-round availability of garri and other products in the households and reduce adverse price effects

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