AN ANALYSIS OF HOUSEHOLD ENERGY CHOICE AND CONSUMPTION IN BAUCHI STATE, NIGERIA

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ABSTRACT

The main choice of energy sources remains one of the most important aspects of households' living. This study was conducted with the main aim of assessing the factors that influence household energy choice and consumption in Bauchi State, Nigeria. To achieve these objectives, samples were selected using cluster area sampling technique, whereby a total number of 539 respondents were utilised. The multinomial logit model (MNLM) result has shown that higher incomes, higher education levels, location in the urban areas and living in self – owned homes; have positive impacts on the probability of adopting cleaner sources of cooking fuel. Additionally, the estimated MNLM for the lighting fuel choice indicates that the age of the household head, the income level, location in the urban areas, the number of rooms and the availability of electricity; have positive impacts on the probability of using electricity. Furthermore, the estimated Ordinary Least Square (OLS) model indicates that gender and the number of rooms have positive impacts on firewood consumption, while the level of education and the firewood price have negative impacts on the quantity of firewood consumption. Moreover, the Tobit estimate indicates that age, income and firewood price; have positive impacts on the use of kerosene. Contrarily, kerosene price has a negative impact on the intensity of kerosene use. In addition, the OLS estimate for electricity expenditure indicates that location in the urban areas and the number of electricity devices at home; have positive impacts on the expenditure on electricity. Finally, the estimated Verme models for testing the relative income hypothesis indicate that the theory is relevant in explaining households' energy choice and consumption. Therefore, a sound policy that will introduce some households with modern source of energy will have strong and wide impact on more households that will move towards the use of modern energy sources through the relative influence. Additionally, raising incomes and campaign awareness will help to improve the situation. Lastly, a study that will analyse household energy choice and consumption over time is recommended.

Keywords: household, energy, choice, cooking fuel, lighting fuel

ABSTRAK

Pilihan sumber tenaga telah menjadi salah satu aspek yang paling penting dalam kehidupan isi rumah. Kajian ini dijalankan untuk menilai faktor-faktor yang mempengaruhi pilihan sumber tenaga oleh isi rumah dan penggunaannya di Bauchi, Nigeria. Untuk mencapai objektif ini, satu sampel telah dipilih dengan menggunakan teknik persampelan berkelompok iaitu seramai 539 responden. Hasil model logit multinomial (MNLM) telah menunjukkan bahawa pendapatan yang lebih tinggi, tahap pendidikan yang lebih tinggi, lokasi bandar, dan tinggal di rumah milik sendiri; mempunyai kesan positif ke atas kebarangkalian menggunakan sumber bahan api untuk memasak yang lebih bersih. Selain itu, pilihan bahan api untuk lampu menunjukkan bahawa usia ketua isi rumah, tahap pendapatan, lokasi di bandar, bilangan bilik dan ketersediaan elektrik; mempunyai kesan positif ke atas kebarangkalian penggunaan elektrik. Tambahan pula, anggaran model Kaedah Kuasa Dua Terkecil (OLS) menunjukkan bahawa jantina dan bilangan bilik mempunyai kesan positif terhadap penggunaan kayu api, manakala tahap pendidikan dan harga kayu api didapati mempunyai kesan negatif keatas kuantiti penggunaan kayu api. Selain itu, anggaran model Tobit menunjukkan bahawa umur, pendapatan dan harga kayu api; mempunyai kesan positif ke atas penggunaan minyak tanah. Sebaliknya, harga minyak tanah mempunyai kesan negatif kepada penggunaan minyak tanah. Di samping itu, anggaran OLS bagi perbelanjaan elektrik menunjukkan bahawa lokasi bandar dan bilangan peranti elektrik di rumah mempunyai kesan positif ke atas perbelanjaan elektrik. Akhir sekali, anggaran model Verme yang menguji hipotesis pendapatan relatif menunjukkan bahawa teori ini relevan dalam menjelaskan pilihan tenaga dan penggunaan isi rumah. Kajian ini mencadangkan agar pengenalan penggunaan sumber tenaga moden kepada isi rumah yang terpilih. Keadaan ini seterusnya akan nempengaruhi isi rumah lain untuk menggunakan sumber tenaga moden ini. Tambahan lagi, peningkatan pendapatan serta kempen kesedaran akan memperbaiki keadaan yang sedia ada. Akhir sekali, kajian ini ingin mencadangkan analisis pilihan sumber tenaga isi rumah dan penggunaanya mengikut peredaran masa.

Kata kunci: isirumah; tenaga; pilihan; bahan api memasak; bahan api lampu

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LIST OF ABBREVIATIONS

Abbreviation	Full Meaning
BASEEDS	Bauchi State Economic Empowerment and Development strategy
CIA	Central Intelligence Agency
ECN	Energy Commission of Nigeria
EEC	Energy Efficiency Centre
EIA	Energy Information Administration
GDP	Gross Domestic Product
HDI	Human Development Index
IEA	International Energy Agency
IIA	Independence of Irrelevant Alternatives
LGAs	Local Government Areas
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MNLM	Multinomial Logit Model
NBS	National Bureau of Statistics
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
RIH	Relative Income Hypothesis
SORS	Statistical Office of the Republic of Slovenia
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
VIF	Variance Inflation Factor

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Energy is one of the most important aspects of human life. It is a commodity that is vital for the existence of modern life. In fact, the nature and extent of energy demand and utilization in a national economy are, to a large extent, indicators of its level of economic development (Energy Commission of Nigeria (ECN), 2003). This is because in every economy, all sectors ranging from residential, manufacturing, agriculture, transport as well as services sectors depend to a large extent on various energy sources to function.

However, despite that the importance of different end uses for energy varies significantly from country to country because of differences in climatic conditions, policies, level of economic development and other factors, it is generally agreed that the household sector is one of the most important energy consumption sector (Wang, Zhang, Yin, & Zhang, 2011). It has the highest rate of energy consumption in most countries (Oyedepo, 2013). For instance, energy consumption of the residential sector accounts for about approximately 30% of the total world energy consumption (Swan & Ugursal, 2008). Table 1.1 indicates the share of household energy consumption (in relation to other sectors) nationally for some selected countries in the world.

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Appendix A

RESEARCH QUESTIONNAIRE

RESEARCH QUESTIONNAIRE
SCHOOL OF ECONOMICS FINANCE AND BANKING
UNIVERSITI UTARA MALAYSIA
MALAYSIA.

Sir/madam, I`m a student of the above mentioned department, I`m carrying out my research study titled `**An analysis of the determinants of household energy choice and consumption in Bauchi State, Nigeria**` for the fulfilment of the award of Doctor of Philosophy in Economics. Kindly assist by responding to the following questions. Your responses are guaranteed to be treated confidentially. Thanks for your cooperation and contribution.

PART A: SOCIO-ECONOMIC FEATURES OF THE HOUSEHOLD

1. GENDER (Household head):
   a. Male ( )
   b. Female ( )
2. Age (Number of years) ……..
3. MARITAL STATUS (Household head):
   a. Single ( )
   b. Married ( )
   c. Widow ( )
   d. Divorced ( )
   e. Separated ( )

4. LEVEL OF EDUCATION:

a. Non formal education/Qur`anic school. ( )

b. Primary school. ( )

c. Secondary school. ( )

d. Graduate. ( )

e. Postgraduate. ( )

5. Number of the household members (including the head) ..……..

6. OCCUPATION:

Unemployed ( )

Farmer ( )

Teacher ( )

Banker ( )

Lecturer ( )

Medical Practitioner ( )

Businessman ( )

Others (please specify) ……. ( )

7. Average Monthly Income (Naira) ……

PART B: DWELLING CHARACTERISTICS

1. We are living in:

   a. Self owned dwelling ( )

   b. Rented dwelling ( )

   c. Dwelling provided by employer ( )

   d. Free dwelling but owned by another non h/h member ( )

2. If living in a renting home; specify the annual cost of rent (Naira) ……..

3. DWELLING LOCATION:

   a. Urban Area ( )

   b. Rural Area ( )

4. Dwelling size ……

5. Please choose the measurement used for measuring the dwelling size:
   a. Feet ( )
   b. Meter square ( )
   c. Centimetre square ( )
   d. Other (specify)……. ( )

6. Number of rooms ……..
(Such as; bedrooms, sitting rooms, reading rooms, kitchens, etc., excluding toilets)

7. SHARING OF DWELLING
   Does your household lives with another household in the same building

   a. Yes ( )
   b. No ( )

8. NATURE OF THE DWELLING (TICK AS APPROPRIATE)

Traditional home made of mob	
Single detached house	
Semi detached house	
Row house	
Apartment or flat in a duplex	
Apartment in a building	
Single attached house	

Brief description of the above categories:

Single-detached house – A single dwelling not attached to any other dwelling or structure (except its own garage or shed.) A single-detached house has open space on all sides, and has no dwellings either above it or below it.

Semi-detached house – One of the two dwellings attached side by side (or back to back) to each other, but not attached to any other dwelling or structure (except its own garage or shed.) A semi-detached dwelling has no dwellings either above it or below it and the two units, together, have open space on all sides.

Row house – One of three or more dwellings joined side by side (or occasionally side to back), such as a town house or garden home, but not having any other dwellings either above it or below.

Apartment or flat in a duplex – One of two dwellings, located one above the other.

Apartment in a building that has storeys – A dwelling unit attached to other dwelling units, commercial units, or other non-residential space in a building that has storeys.

Single-attached house – A single dwelling that is attached to another building.

PART C: ENERGY USE AND RELATED INFORMATION

1. What is the Main Source of Your Cooking Fuel (Tick only one option)

Firewood	
Kerosene	
Electricity	
Gas	

2. Choose the Second Alternative of Cooking Fuel Source (Tick only one option)

Firewood	
Kerosene	
Electricity	
Gas	
Other (Specify) …….	

3. Select the main source of lighting fuel (tick only one)

Firewood	
Kerosene	
Electricity	
Petroleum	
Diesel	
Candles/	
Traditional lamp	
Rechargeable lantern	
Battery/Dry/Cell torch light	
Others (specify)	

4. For how many hours do you get electricity supply in a day ……..

5. Select your second (2nd) and third (3rd) alternative sources of lighting by writing appropriately against any two of the following lighting fuel sources (i.e. chose two options) Write 2nd against your second alternative and 3rd against your third alternative

Firewood	
Kerosene	
Electricity	
Petroleum	
Diesel	
Candle	
Traditional lamp	
Rechargeable lantern	
Battery/Dry/cell torch light	
Other (specify)	

6. Specify the total monthly quantity of each of the following fuel sources as used by your household

FUEL	**MEASUREMENT**	**QUANTITY**
Firewood	Bundle	
Kerosene	Litre	
Electricity	Unit/kwh	
Petroleum	Litre	
Gas	Litre	
Candle	Unit	
Traditional lamp	Unit	
Rechargeable lantern	Unit	
Battery/Dry/cell torch light	Unit	
Other (specify)		

7. Specify the total average monthly expenditure on each of the following fuel source by your household

FUEL SOURCE	**AMOUNT (₦)**
Firewood	
Kerosene	
Electricity	
Petroleum	
Diesel	
Gas	
Candle	
Traditional lamp	
Rechargeable lantern	
Battery/Dry/cell torch light	
Other (specify)	

8. For each of the following fuel sources, indicate the unit price (based on each fuel's measurement) at which you buy each of them.

FUEL	**MEASUREMENT**	**Price per measurement**
Firewood	Bundle	
Kerosene	Litre	
Electricity	Unit/kwh	
Petroleum	Litre	
Diesel	Litre	
Gas	Litre/cylinder	
Candle	Unit	
Traditional lamp	Unit	
Rechargeable lantern	Unit	
Battery/Dry/cell torch light	Unit	
Other (specify)		

9. Select the major means of transportation for the household
   a. Commercial taxi/okada ( )
   b. Private owned motor car ( )
   c. Private owned motorcycle ( )
   d. Bicycle ( )
   e. Other (specify)…….. ( )

10. Number of cars owned by the household
   a. 1 – 3 ( )
   b. 4 – 6 ( )
   c. 7 – 9 ( )
   d. 10 and above ( )

11. Number of motorcycles owned by the household
   a. 1 – 3 ( )
   b. 4 – 6 ( )
   c. 7 – 9 ( )
   d. 10 and above ( )

NOTE

All the cars and/or motorcycles owned by each member of the household should be considered.

12. Select the main fuel source for transport purposes by your household
   a. Petroleum ( )
   b. Diesel ( )

13. Specify the total average quantity of fuel use **MONTHLY** for transportation purpose

	LITRE
a. Petroleum (Litre)	……
b. Diesel (Litre)	……

14. Specify the total monthly expenditure on fuel for transport purposes by the household

	₦
a. Petroleum	……
b. Diesel	……

15. Indicate whether the main fuel cooking source for your immediate neighbour is similar to that of yours

a. Yes ( )
b. No ( )

16. If the above is 'No' please from the following options, choose the main fuel source of cooking for your immediate neighbour (i.e. other household)

a. Firewood ( )
b. Kerosene ( )
c. Electricity ( )
d. Gas ( )

17. Indicate whether the main lighting fuel sources for your immediate neighbours are similar to yours

a. Yes ( )
b. No ( )

18. If the above is 'No' please from the following available options choose the main lighting fuel source by most of your neighbours (please tick only one option)

Firewood	
Kerosene	
Electricity	
Petroleum	
Diesel	
Candle	
Traditional lamp	
Rechargeable lantern	
Battery/Dry/cell torch light	
Other (specify)	

19. Select the total number of energy consumption devices possess at home (such as; fans, televisions, AC, fridge, iron, electric cooker, gas cooker, water heater, washing machine, dryer, bulbs, cylinder, DVD, radio, exercise machines, etc.) each of these item should be counted as one and use the following options to show the aggregate number as possess by the household (e.g. if you have 6 bulbs and 3 fans in the home, the total number of your home appliance is 6 + 3 = 9)
    a. 1 – 25 ( )
    b. 26 – 50 ( )
    c. 51 – 75 ( )
    d. 76 – 100 ( )
    e. 101 and above ( )

Thank you very much for spending your valuable time to respond to my questionnaire

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(95977)