INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, ECONOMICS & MANAGEMENT

IJRCM

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

Indexed & Listed at:

Ulrich's Periodicals Directory ©, ProQuest, U.S.A., EBSCO Publishing, U.S.A., Cabell's Directories of Publishing Opportunities, U.S.A.,
Open J-Gage, India [link of the same is duly available at Inflibnet of University Grants Commission (U.G.C.)],
The American Economic Association's electronic bibliography, EconLit, U.S.A.,
Index Copernicus Publishers Panel, Poland with IC Value of 5.09 & number of libraries all around the world.
Circulated all over the world & Google has verified that scholars of more than **4600 Cities** in **180 countries/territories** are visiting our journal on regular basis.

Ground Floor, Building No. 1041-C-1, Devi Bhawan Bazar, JAGADHRI – 135 003, Yamunanagar, Haryana, INDIA

http://ijrcm.org.in/

CONTENTS

CHIEF PATRON

PROF. K. K. AGGARWAL

Chairman, Malaviya National Institute of Technology, Jaipur

(An institute of National Importance & fully funded by Ministry of Human Resource Development, Government of India)

Chancellor, K. R. Mangalam University, Gurgaon

Chancellor, Lingaya's University, Faridabad

Founder Vice-Chancellor (1998-2008), Guru Gobind Singh Indraprastha University, Delhi

Ex. Pro Vice-Chancellor, Guru Jambheshwar University, Hisar

FOUNDER PATRON

LATE SH. RAM BHAJAN AGGARWAL

Former State Minister for Home & Tourism, Government of Haryana

Former Vice-President, Dadri Education Society, Charkhi Dadri

Former President, Chinar Syntex Ltd. (Textile Mills), Bhiwani

CO-ORDINATOR

DR. BHAVET

Faculty, Shree Ram Institute of Engineering & Technology, Urjani

ADVISORS

PROF. M. S. SENAM RAJU

Director A. C. D., School of Management Studies, I.G.N.O.U., New Delhi

PROF. M. N. SHARMA

Chairman, M.B.A., Haryana College of Technology & Management, Kaithal

PROF. S. L. MAHANDRU

Principal (Retd.), Maharaja Agrasen College, Jagadhri

EDITOR

PROF. R. K. SHARMA

Professor, Bharti Vidyapeeth University Institute of Management & Research, New Delhi

FORMER CO-EDITOR

DR. S. GARG

Faculty, Shree Ram Institute of Business & Management, Urjani

EDITORIAL ADVISORY BOARD

DR. RAJESH MODI

Faculty, Yanbu Industrial College, Kingdom of Saudi Arabia

PROF. SIKANDER KUMAR

Chairman, Department of Economics, Himachal Pradesh University, Shimla, Himachal Pradesh

PROF. SANJIV MITTAL

University School of Management Studies, Guru Gobind Singh I. P. University, Delhi

PROF. RAJENDER GUPTA

Convener, Board of Studies in Economics, University of Jammu, Jammu

PROF. NAWAB ALI KHAN

Department of Commerce, Aligarh Muslim University, Aligarh, U.P.

PROF. S. P. TIWARI
Head, Department of Economics & Rural Development, Dr. Ram Manohar Lohia Avadh University, Faizabad
DR. ANIL CHANDHOK
Professor, Faculty of Management, Maharishi Markandeshwar University, Mullana, Ambala, Haryana
DR. ASHOK KUMAR CHAUHAN
Reader, Department of Economics, Kurukshetra University, Kurukshetra
DR. SAMBHAVNA
Faculty, I.I.T.M., Delhi
DR. MOHENDER KUMAR GUPTA
Associate Professor, P. J. L. N. Government College, Faridabad
DR. VIVEK CHAWLA
Associate Professor, Kurukshetra University, Kurukshetra
DR. SHIVAKUMAR DEENE
Asst. Professor, Dept. of Commerce, School of Business Studies, Central University of Karnataka, Gulbarga

ASSOCIATE EDITORS

PROF. ABHAY BANSAL
Head, Department of Information Technology, Amity School of Engineering & Technology, Amity University, Noida
PARVEEN KHURANA
Associate Professor, Mukand Lal National College, Yamuna Nagar
SHASHI KHURANA
Associate Professor, S. M. S. Khalsa Lubana Girls College, Barara, Ambala
SUNIL KUMAR KARWASRA
Principal, Aakash College of Education, ChanderKalan, Tohana, Fatehabad
DR. VIKAS CHOUDHARY
Asst. Professor, N.I.T. (University), Kurukshetra

FORMER TECHNICAL ADVISOR

AMITA
Faculty, Government M. S., Mohali

FINANCIAL ADVISORS

DICKIN GOYAL
Advocate & Tax Adviser, Panchkula
NEENA
Investment Consultant, Chambaghat, Solan, Himachal Pradesh

LEGAL ADVISORS

JITENDER S. CHAHAL
Advocate, Punjab & Haryana High Court, Chandigarh U.T.
CHANDER BHUSHAN SHARMA
Advocate & Consultant, District Courts, Yamunanagar at Jagadhri

SUPERINTENDENT

SURENDER KUMAR POONIA

CALL FOR MANUSCRIPTS

We invite unpublished novel, original, empirical and high quality research work pertaining to recent developments & practices in the areas of Computer Science & Applications; Commerce; Business; Finance; Marketing; Human Resource Management; General Management; Banking; Economics; Tourism Administration & Management; Education; Law; Library & Information Science; Defence & Strategic Studies; Electronic Science; Corporate Governance; Industrial Relations; and emerging paradigms in allied subjects like Accounting; Accounting Information Systems; Accounting Theory & Practice; Auditing; Behavioral Accounting; Behavioral Economics; Corporate Finance; Cost Accounting; Econometrics; Economic Development; Economic History; Financial Institutions & Markets; Financial Services; Fiscal Policy; Government & Non Profit Accounting; Industrial Organization; International Economics & Trade; International Finance; Macro Economics; Micro Economics; Rural Economics; Co-operation; Demography: Development Planning; Development Studies; Applied Economics; Development Economics; Business Economics; Monetary Policy; Public Policy Economics; Real Estate; Regional Economics; Political Science; Continuing Education; Labour Welfare; Philosophy; Psychology; Sociology; Tax Accounting; Advertising & Promotion Management; Management Information Systems (MIS); Business Law; Public Responsibility & Ethics; Communication; Direct Marketing; E-Commerce; Global Business; Health Care Administration; Labour Relations & Human Resource Management; Marketing Research; Marketing Theory & Applications; Non-Profit Organizations; Office Administration/Management; Operations Research/Statistics; Organizational Behavior & Theory; Organizational Development; Production/Operations; International Relations; Human Rights & Duties; Public Administration; Population Studies; Purchasing/Materials Management; Retailing; Sales/Selling; Services; Small Business Entrepreneurship; Strategic Management Policy; Technology/Innovation; Tourism & Hospitality; Transportation Distribution; Algorithms; Artificial Intelligence; Compilers & Translation; Computer Aided Design (CAD); Computer Aided Manufacturing; Computer Graphics; Computer Organization & Architecture; Database Structures & Systems; Discrete Structures; Internet; Management Information Systems; Modeling & Simulation; Neural Systems/Neural Networks; Numerical Analysis/Scientific Computing; Object Oriented Programming; Operating Systems; Programming Languages; Robotics; Symbolic & Formal Logic; Web Design and emerging paradigms in allied subjects.

Anybody can submit the **soft copy** of unpublished novel; original; empirical and high quality **research work/manuscript** ***anytime*** in ***M.S. Word format*** after preparing the same as per our **GUIDELINES FOR SUBMISSION**; at our email address i.e. infoijrcm@gmail.com or online by clicking the link **online submission** as given on our website (***FOR ONLINE SUBMISSION, CLICK HERE***).

GUIDELINES FOR SUBMISSION OF MANUSCRIPT

1. **COVERING LETTER FOR SUBMISSION:**

DATED: _____________

THE EDITOR

IJRCM

Subject: **SUBMISSION OF MANUSCRIPT IN THE AREA OF ______________________.**

(e.g. Finance/Mkt./HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)

DEAR SIR/MADAM

Please find my submission of manuscript entitled '____' for possible publication in one of your journals.

I hereby affirm that the contents of this manuscript are original. Furthermore, it has neither been published elsewhere in any language fully or partly, nor is it under review for publication elsewhere.

I affirm that all the co-authors of this manuscript have seen the submitted version of the manuscript and have agreed to their inclusion of names as co-authors.

Also, if my/our manuscript is accepted, I agree to comply with the formalities as given on the website of the journal. The Journal has discretion to publish our contribution in any of its journals.

NAME OF CORRESPONDING AUTHOR :
Designation :
Institution/College/University with full address & Pin Code :
Residential address with Pin Code :
Mobile Number (s) with country ISD code :
Is WhatsApp or Viber active on your above noted Mobile Number (Yes/No) :
Landline Number (s) with country ISD code :
E-mail Address :
Alternate E-mail Address :
Nationality :

NOTES:

a) The whole manuscript has to be in ***ONE MS WORD FILE*** only, which will start from the covering letter, inside the manuscript. ***pdf. version*** ***is liable to be rejected without any consideration***.

b) The sender is required to mention the following in the **SUBJECT COLUMN of the mail**:

New Manuscript for Review in the area of (e.g. Finance/Marketing/HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)

c) There is no need to give any text in the body of mail, except the cases where the author wishes to give any **specific message** w.r.t. to the manuscript.

d) The total size of the file containing the manuscript is expected to be below **1000 KB**.

e) **Abstract alone will not be considered for review** and the author is required to submit the **complete manuscript** in the first instance.

f) ***The journal gives acknowledgement w.r.t. the receipt of every email within twenty four hours*** and in case of non-receipt of acknowledgment from the journal, w.r.t. the submission of manuscript, within two days of submission, the corresponding author is required to demand for the same by sending a separate mail to the journal.

g) The author (s) name or details should not appear anywhere on the body of the manuscript, except the covering letter and the cover page of the manuscript, in the manner as mentioned in the guidelines.

2. **MANUSCRIPT TITLE:** The title of the paper should be **bold typed**, **centered** and **fully capitalised**.

3. **AUTHOR NAME (S) & AFFILIATIONS:** Author (s) **name**, **designation**, **affiliation** (s), **address**, **mobile/landline number** (s), and **email/alternate email address** should be given underneath the title.

4. **ACKNOWLEDGMENTS:** Acknowledgements can be given to reviewers, guides, funding institutions, etc., if any.

5. **ABSTRACT:** Abstract should be in **fully italicized text**, ranging between **150** to **300 words**. The abstract must be informative and explain the background, aims, methods, results & conclusion in a **SINGLE PARA**. ***Abbreviations must be mentioned in full***.

6. **KEYWORDS:** Abstract must be followed by a list of keywords, subject to the maximum of **five**. These should be arranged in alphabetic order separated by commas and full stop at the end. All words of the keywords, including the first one should be in small letters, except special words e.g. name of the Countries, abbreviations.

7. **JEL CODE:** Provide the appropriate Journal of Economic Literature Classification System code (s). JEL codes are available at www.aeaweb.org/econlit/jelCodes.php, however, mentioning JEL Code is not mandatory.

8. **MANUSCRIPT:** Manuscript must be in ***BRITISH ENGLISH*** prepared on a standard A4 size ***PORTRAIT SETTING PAPER***. *It should be free from any errors i.e.* ***grammatical, spelling*** *or* ***punctuation.*** *It must be thoroughly edited at your end*.

9. **HEADINGS:** All the headings must be bold-faced, aligned left and fully capitalised. Leave a blank line before each heading.

10. **SUB-HEADINGS:** All the sub-headings must be bold-faced, aligned left and fully capitalised.

11. **MAIN TEXT:**

THE MAIN TEXT SHOULD FOLLOW THE FOLLOWING SEQUENCE:

INTRODUCTION
REVIEW OF LITERATURE
NEED/IMPORTANCE OF THE STUDY
STATEMENT OF THE PROBLEM
OBJECTIVES
HYPOTHESIS (ES)
RESEARCH METHODOLOGY
RESULTS & DISCUSSION
FINDINGS
RECOMMENDATIONS/SUGGESTIONS
CONCLUSIONS
LIMITATIONS
SCOPE FOR FURTHER RESEARCH
REFERENCES
APPENDIX/ANNEXURE

The manuscript should preferably range from ***2000 to 5000 WORDS***.

12. **FIGURES & TABLES:** These should be simple, crystal **CLEAR**, **centered**, **separately numbered** & self explained, and **titles must be above the table/figure**. **Sources of data should be mentioned below the table/figure**. *It should be ensured that the tables/figures are referred to from the main text*.

13. **EQUATIONS/FORMULAE:** These should be consecutively numbered in parenthesis, horizontally centered with equation/formulae number placed at the right. The equation editor provided with standard versions of Microsoft Word should be utilised. If any other equation editor is utilised, author must confirm that these equations may be viewed and edited in versions of Microsoft Office that does not have the editor.

14. **ACRONYMS:** These should not be used in the abstract. The use of acronyms is elsewhere is acceptable. Acronyms should be defined on its first use in each section: Reserve Bank of India (RBI). Acronyms should be redefined on first use in subsequent sections.

15. **REFERENCES:** The list of all references should be alphabetically arranged. ***The author (s) should mention only the actually utilised references in the preparation of manuscript*** and they are supposed to follow Harvard Style of Referencing. **Also check to make sure that everything that you are including in the reference section is duly cited in the paper**. The author (s) are supposed to follow the references as per the following:

- All works cited in the text (including sources for tables and figures) should be listed alphabetically.
- Use (**ed.**) for one editor, and (**ed.s)** for multiple editors.
- When listing two or more works by one author, use --- (20xx), such as after Kohl (1997), use --- (2001), etc, in chronologically ascending order.
- Indicate (opening and closing) page numbers for articles in journals and for chapters in books.
- The title of books and journals should be in italics. Double quotation marks are used for titles of journal articles, book chapters, dissertations, reports, working papers, unpublished material, etc.
- For titles in a language other than English, provide an English translation in parenthesis.
- ***Headers**, **footers**, **endnotes** and **footnotes** should **not be used** in the document.* However, **you can mention short notes to elucidate some specific point**, which may be placed in number orders after the references.

PLEASE USE THE FOLLOWING FOR STYLE AND PUNCTUATION IN REFERENCES:

BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

UNPUBLISHED DISSERTATIONS

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

WEBSITES

- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

HOUSEHOLD ENERGY CHOICE AND DEMAND IN URBAN ETHIOPIA: CASE OF WOLAITA ZONE

TADELE TAFESE HABTIE
HEAD
DEPARTMENT OF ECONOMICS
WOLAITA SODO UNIVERSITY
WOLAITA SODO TOWN

BELAYNESH TAMRE DEMBEL
LECTURER
WOLAITA SODO UNIVERSITY
WOLAITA SODO TOWN

ABSTRACT

In the context of developing economies, urban centers have long been dependent on rural areas for their fuel. This dependence of urban centers on surrounding rural areas has aggravated forest devastation and degradation. Besides, use of biomass fuels has a significant impact on health. This study looks into household energy choice and demand in selected urban areas using a survey data of 251 urban households in Wolaita zone. The survey indicated use of traditional fuels dominate households' energy consumption. Probit analysis of decision to consume fuel revealed probability of consuming modern fuels in general increases with increase in price of traditional fuels, income and household education whereas probability of consuming traditional fuels in general increases with increase in price of modern fuels, household size and house head age. Moreover, probit regression showed kerosene is substitute for both fuel wood and charcoal; and fuel wood is substitutes for saw dust. The result that kerosene is a substitute for charcoal and fuel wood indicate an effort to ensure energy transition to modern energy fuels is needed. We applied an almost-ideal demand system to analyze demand for fuels and seemingly unrelated regression is used to estimate this. This seemingly unrelated regression estimation indicated demand for charcoal and kerosene are price inelastic whereas demand for fuel wood and saw dust are price elastic. Demand for electricity was somewhat unitary elastic. Moreover, seemingly unrelated regression estimation showed income elasticities of each fuel except electricity is expected to be 1 indicating these fuels are normal goods whereas income elasticity of electricity is 3.9 implying electricity is found to be luxury good. This study recommends local governments to emphasize energy transition from the traditional to the modern ones taking income, education and household size in to consideration.

KEYWORDS

almost-ideal demand system, elasticity, probit regression, seemingly unrelated regression.

INTRODUCTION

In developing countries 2.5 billion people rely on biomass to meet their energy needs for cooking. For many of these countries, biomass fuels account for over 90% of household energy consumption. Also in Ethiopia, energy consumption per capita is estimated to be very low. This implies that only 5 percent of the modern energy source is supplied from petroleum and electricity (OECD, 2006).

Heavy reliance of urban households in sub-Saharan Africa on biomass fuels contribute to deforestation, forest degradation, and land degradation. This is partly because use of these fuels in urban areas is an important source of cash income for people in both urban and rural areas. While use of woody biomass as fuel and as construction material contributes to deforestation and forest degradation, use of dung as fuel contributes to land degradation and reduction in agricultural productivity (Mokonnen & Kohlin, 2008).

Use of biomass fuels is a major cause for health problems in developing countries due to indoor air pollution. According to World Health Organization (WHO), it is estimated that 1.5 million premature deaths per year are directly related to indoor air pollution from the use of solid fuels. More than 85% of these deaths (about 1.3 million people) are due to biomass use, the rest due to coal (OECD/IEA, 2010).

Therefore, an important way of reducing the harmful effects of biomass fuel is improving the way biomass is supplied and used for cooking. This can be achieved either through transformation of biomass into less polluting forms or through improved stoves and better ventilation (OECD, 2006).

The United Nations Millennium Project set an international target which halves the number of households using traditional biomass for cooking in the year 2015 by switching to alternative fuels and technologies (OECD, 2006). Besides, the Ethiopian government indicated its targets in the first Growth and Transformation Plan (GTP) to develop energy resources by adopting alternative energy sources to ensure environmental protection and conservation. This paper attempts to examine the choice of energy and to assess the determinants of household fuel demand in the urban areas of Wolaita zone by using cross-sectional data.

REVIEW OF LITERATURE

Consider a consumer who derives utility from consumption of a vector of n commodities denoted by q. Furthermore, assume that vector q includes broader categories of consumption goods, such as food, fuel, and other goods or services. Let u denote the utility a consumer derives from consuming these goods. Following the standard formulation of utility function of (Deaton & Muellbauer, 1980) and (Sadoulet & de Janvry, 1995), the household's utility function can be written as:

$u(q;h)$ .... (1)

where: h stands for the vector of individual characteristics of the household.

The budget constraint is given as:

$p'q = y$ .... (2)

where: p' is an n-dimensional row vector of prices; y is the amount of income that can be spent on different commodities.

The objective of the household is to maximize utility by choosing q, subject to the budget constraint given in Equation 2. Therefore, the Lagrangian of the consumer's maximization problem can be rewritten as:

$L = u(q;h) + \lambda (y - p'q)$ .... (3)

where: λ is a Lagrange multiplier.

Solving for the Lagrangian function in Equation 3, we get a set of observed demand equations:

$q_i = q_i(p, y{:}h)$ .... (4)

where: there are n commodities, i = 1… n

Upon partially differentiating Equation 4 with respect to income y and prices p_j, we get n income and n^2 price slopes. Then, multiplying the income slopes and price slopes by their respective income/quantity and price/quantity ratios, we get n income elasticities and n^2 price elasticities that are useful for comparative statics:

$\frac{\partial q_i}{\partial y}\frac{y}{q_i} = \eta_i$................................. (5)

$\frac{\partial q_i}{\partial p_j}\frac{p_j}{q_i} = \varepsilon_{ij}$.............................. (6)

In comparative-static analysis, the objective is to determine how an economic variable of interest, quantity demand in our case, responds to changes in the value of some exogenous variables.

Deaton assumed that "geographically clustered households," face the same prices (Deaton, 1990). For Wolaita zone, we do not make this assumption and allow households to face different prices. This makes sense because the markets for fuels in the study area are fragmented and far apart. Note that, if preferences are separable, the n vector of commodities q in Equation 1 can be partitioned into groups and that the utility function can be represented as:

$u = v(q_i) = f(v_i(q_i))$ .... (7)

where $f(\ )$ is an increasing function and v is sub utility function associated with food, fuel goods, and other goods or services. The idea is that, due to complexity of consumers in making choices among a large array of alternatives, first income is allocated to broad groups of goods, such as food, fuel, and other goods. In the second stage, the budget for fuel is then allocated to specific items, such as electricity, kerosene, wood and charcoal. The implication of this step-by-step budgeting process is that decisions made at each stage can be regarded as corresponding to a utility maximization problem of their own (Deaton & Muellbauer, 1980) and (Sadoulet & de Janvry, 1995).

IMPORTANCE OF THE STUDY

This research lend evidence to:

- Forecast energy fuel demand projection for the household levels
- Help decision makers how to formulate policy based on the research findings
- Recommend how to implement adoption of different energy sources

STATEMENT OF THE PROBLEM

Urbanization and economic development are bringing about changes in consumption patterns and increases in household income in developing countries, which in turn are leading to major changes in the household energy sector (Girard, 2002).

It is obvious that urban centers have long been dependent on rural areas for their fuel. This dependence of urban centers on surrounding rural has aggravated forest devastation and degradation (Gebreegziabher, et al., 2010). Besides, the use of these biomass fuels has a significant impact on health (OECD/IEA, 2010). Considering these fuel related problems government of Ethiopia has been working to switch from traditional fuel use to transitional (biogas, solar and traditional wood saving stoves) and modern fuels (FDRE, November 2010).

In line with this plan, Wolaita zone, a heavily dependent on the biomass fuel for more than 94% of traditional energy consumption, is doing alternative energy development activities like biogas (WoEM, 2012).

Studies on energy demand by Gebreegziabher revealed that household's decision to consume a particular fuel is determined not only on household income but also other household characteristics, such as family size, and age and education of household head (Gebreegziabher, et al., 2010). Other study analyzed by Samuel indicates that the use of traditional fuels dominates households' consumption pattern. The probability of consuming traditional fuels in general declines with increase in income and prices of the traditional fuels where as it increases with the increase in the prices of the modern fuels and vice versa (Samuel, 2002). Studies by Mokonnen and Kohlin suggested that as households' total expenditures rise, they increase the number of fuels used and they also spend more on the fuels they consume (Mokonnen & Kohlin, 2008).

Despite these studies at the national and regional levels, there are no studies undertaken in Wolaita zone related to energy. However, there are some studies conducted by zonal energy and mineral office focused on the household willingness of different alternative energy sources for the purpose of awareness creation on different energy sources. Therefore, this study will focus on the choice and demand for energy by using quantitative analysis techniques to help policy formulation and implementation in Wolaita zone particularly in the urban areas.

OBJECTIVES

The overall objective of the study is to assess the determinants of household energy consumption in urban areas of Wolaita zone. Specifically, the study aims at:

1. To assess the energy choice of urban Wolaita zone
2. To analyze the determinants of household energy demand in the zone

HYPOTHESIS

There is no possibility of energy transition from traditional to the modern energy sources.

RESEARCH METHODOLOGY

MODEL SPECIFICATION FOR HOUSEHOLD ENERGY DEMAND AND CHOICE

To sufficiently address its objectives, this study used an almost-ideal demand system and probit analysis. For the empirical demand analysis, an almost-ideal demand system derived from a utility function specified as a second-order approximation to any utility function is applied (Sadoulet & de Janvry, 1995). The demand functions are specified in the budget share as follows:

$w_{Fi} = a_F + \sum_J b_{FJ}\, ln p_J + c_{Fi} ln \frac{y_i}{P}$ .... (8)

where $w_{Fi} \equiv \frac{y_{Fi}}{y_i}$ is fuel F's budget share in household i's budget; y_{Fi} is household i's expenditure on the fuel F (wood, charcoal, kerosene, and electricity) consumed by the household i; p_J is price of J^{th} good; y_i is household i's total expenditure on all goods; and P is the consumer price index. This share, as specified in equation 8, is assumed to be a linear approximation of the logarithm of the price of J^{th} good, p_J and the logarithm of the ratio of total expenditure to price index, $\frac{y_i}{P}$.

However, some of the households may not consume some of the fuel goods implying zero values for corresponding observations of budget shares in Equation 8. The dependent variable is thus censored; rendering ordinary least squares estimates to be biased. With censoring or zero observations, it fails to comply with the standard assumptions with respect to the disturbance term. This problem is solved by using a two-step estimation procedure that combines a probit analysis with standard seemingly unrelated regression (SUR). Therefore, we can rewrite the system of fuel demand equations to be estimated as (Sadoulet & de Janvry, 1995):

$w_{Fi} = a_F + \sum_J b_{Fj} \ln p_J + c_{Fi} \ln \frac{y_i}{P} + \mu_F \xi_{Fi} + \upsilon_{Fi}$ .... (9)

Where the additional terms ξ_{Fi} and υ_{Fi} on the right hand side of Equation *9* respectively, stand for the inverse Mill's ratio and the residual term of fuel F for household i; and μ_F is the coefficient corresponding to the inverse Mill's ratio. Once we estimated the coefficients with the restrictions imposed, then the price and income elasticities will be calculated from the coefficient estimates (Sadoulet & de Janvry, 1995):

$\varepsilon_{FF} = -1 + \frac{b_{FF}}{w_F} - c_F, \varepsilon_{FJ} = \frac{b_{FJ}}{w_F} - \frac{c_F}{w_F} w_J, \eta_F = 1 + \frac{c_F}{w_F}$ .... (10)

where ε_{FF} and ε_{FJ}, respectively, stand for own-price and cross-price elasticity; and η_F is income elasticity of demand for fuel F. The income elasticity enables us to characterize whether a specific fuel good is normal, inferior, or a luxury good, depending on the value and sign of the coefficient.

Note that the inverse Mill's ratio ξ_{Fi} comes from the first-step estimation of household i's decision to consume a specific fuel good F. For simplicity, consider a decision involving a choice between consuming and not consuming. Such dichotomous choices are best modelled as probit. Hence, we can specify the probit model as:

$Prob\left(q^*_{F_i} = 1\right) = Prob(f(F_i, p_F, y_i, h_i) + e_{F_i} > 0)$ .... (11)

where q^*_{Fi} is equal to 1 if household i consumes fuel good F, and zero otherwise; p_F, y_i, and h_i, respectively, are the prices of related fuel goods, income, and characteristics that apply to the household; and e_{Fi} is a residual term. Then, the inverse Mill's ratio is generated from the probit estimation as:

$$\xi_{F_i} = \frac{\varphi(f_{F_i})}{\psi(f_{F_i})} \quad (12)$$

where, φ is the probability density function and ψ the cumulative density function of the standard normal distribution of the residual term, e_{Fi}.

STUDY AREA, SAMPLING AND DATA DESCRIPTION

The data were obtained from a survey conducted from the residents of urban households in Wolaita zone. Wolaita zone was found in southern nations, nationalities and peoples regional (SNNPR) state of Ethiopia. The total population of the zone is estimated to be 1,796,436 (374,258 households).

Data were collected from a sample of urban households using stratified random sampling. First, all Woredas in the zone were stratified based on their urban nature (Sodo, Areka and Boditi). Then, a simple random sampling was used, based on proportional allocation, to select 251 respondents as a sample. Based on this, the sample households were 148 in Sodo, 58 in Areka and 45 in Boditi.

As showed in Table 1 mean age of the house heads is 43.1 and about 71% of these house heads are literate. Out of the total house heads about 82% are employed. Moreover, a separate house head lives for an average of 4.7 family members expending an average of ETB 4,737.45 per annum out of which ETB 2,911.81 accounts for fuel expenditure. Out of the surveyed households, 70.5% were male-headed and 29.5% female headed and 65.7% were married.

TABLE 1: DESCRIPTIVE STATISTICS OF HOUSEHOLD SOCIOECONOMIC CHARACTERISTICS

Variables	Mean	Std. Dev.	Min.	Max.
Sex of household head (%)				
Female	29.48	N/A	N/A	N/A
Male	70.52	N/A	N/A	N/A
Marital status of the household (%)				
Married	65.74	N/A	N/A	N/A
Unmarried	34.26	N/A	N/A	N/A
Education of household head (%)				
Illiterate	29.08	N/A	N/A	N/A
Literate	70.92	N/A	N/A	N/A
Occupation of household head (%)				
Unemployed	18.33	N/A	N/A	N/A
Employed	81.67	N/A	N/A	N/A
Age of household head	43.13	12.57	80.00	20.00
Household size in number	4.74	2.33	14.00	0.00
Household Expenditure in Birr	4737.45	2750.27	20178.00	611.00
Fuel Expenditure in Birr	2911.81	2356.59	19200	165
Price of Wood per *Chinet* in Birr	31.09	12.21	100.00	10.00
Price of Charcoal per *Kesha* in Birr	59.36	26.12	120.00	8.00
Price of Kerosene per Litter in Birr	12.33	7.30	118.00	5.00
Price Saw Dust per *Kesha* in Birr	10.40	3.01	20.00	5.00
Price Electricity	0.35	0.00	0.35	0.35

Source: Own Survey, 2013

In SNNPR context in general and Wolaita zone in particular traditional biomass fuels are the most important sources of households cooking energy (MEGEN Power Plc, 2011). Likewise, firewood and charcoal were most frequently used types of cooking fuels in the study area with 96.0% and 95.2% users respectively. However, the crop residue (less than 2%), dung cake (less than 6%) and saw dust (about 26%) were rarely used for cooking purposes. When we come to modern fuel energy consumption, only 15% and 14% sample households were used kerosene and electricity, respectively (Table 2). This indicates that households are still depending on the traditional biomass fuels. This preference of households to particular fuel energy may be affected by accessibility of the energy source, familiarity with the energy source, and the price of that fuel and its effectiveness. Price for a particular fuel is different across towns except for electricity for which uniform price is set throughout the country. The average price for fuel wood, charcoal, kerosene and saw dust were 31.085 per *'Chinet'*, 59.361 per '*Kesha*', 12.333 per litter and 10.403 per '*Kesha*' respectively (Table 1). Accessibility, familiarity and household's perception regarding effectiveness also vary across the towns in Wolaita zone.

TABLE 2: PERCENTAGE DISTRIBUTION OF SURVEY HOUSEHOLDS BY FUEL TYPE

Type of Fuel	Sodo	Areka	Boditi	All
Firewood	94.6	100	95.55	96.0
Charcoal	96.6	93.1	93.33	95.2
Kerosene	11.5	34.48	4.44	15.5
Electricity	14.2	17.24	11.11	14.3
Crop residue	2.02	1.72	2.22	1.98
Dung cake	6	1.72	10.1	5.94
Saw dust	23.7	39.66	17.78	26.3

Source: Own Survey, 2013

RESULTS AND DISCUSSIONS

Although the study considered all possible fuel types and categories, fuel use in the study area is mainly inclined to firewood, charcoal, kerosene, saw dust and electricity. Therefore, the empirical analysis focused only on five fuel goods: firewood, charcoal, kerosene, saw dust and electricity.

HOUSEHOLD FUEL CHOICE

Injera baking and general cooking are the two most common end uses of urban domestic energy consumption in Ethiopia (Gebreegziabher, et al., 2010). In most cases urban households use firewood and electricity for baking (Samuel, 2002). Likewise, households in the study area were mainly used fuel wood, saw dust and electricity for Injera baking and electricity, charcoal and kerosene for cooking purpose. Moreover, kerosene is also used for igniting wood and charcoal in both baking and cooking. Thus, we expect interdependencies among fuel choices as the types of stoves used by households are differentiated. Therefore, fuel energy choice dependencies between combinations of fuel wood, saw dust and electricity and between kerosene, charcoal and electricity are handled by the use of bivariate probit models.

We first run bivariate probit regression between combinations of fuel wood, saw dust and electricity and then between combinations of kerosene, charcoal and electricity. However, we could not reject the null hypothesis that the error correlation was zero (rho=0) for all cases except for bivariate regression of fuel wood and electricity. This suggests that only choices between fuel wood and electricity were dependent. As a result individual probit model is adopted to analyze fuel choice of charcoal, kerosene and saw dust.

According to Table 3 no price parameter significantly influenced decision to consume electricity. However, decision to consume charcoal was significantly and positively influenced by house head education but negatively affected by its own price and price of wood. Moreover, residents of Sodo town were found to incline to charcoal more as compared to residents of Areka and Boditi.

TABLE 3: BIPROBIT AND PROBIT ESTIMATES OF CHOICE TO CONSUME FUEL ENERGY

Explanatory Variables	Dependent Variable (Consume Fuel=1,0 otherwise)				
	Electricity♤	Fuel wood♤	Charcoal	Kerosene	Saw Dust
Constant	-2.81256 (0.9338471)	-0.60159 (1.486566)	1.974951 (01.264502)	-0.15056 (0.6788958)	-1.113656* (0.4825371)
Price of wood in Birr			-0.02285** (0.0127371)	-0.00628 (0.0086961)	0.0146835* (0.0074551)
Price of charcoal in Birr	0.008446 (0.0057031)	0.009674 (0.0132022)	-0.01628* (0.0072563)	0.009147** (0.0052177)	
Price kerosene in Birr	-0.01056 (0.033796)	0.177526* (0.0727607)			
Price saw dust in Birr	0.000261 (0.0366703)	-0.07956 (0.0748071)		-0.0227 (0.0348239)	
Household Expenditure in Birr	0.000125* (0.0000363)	0.000115 (0 .0001129)	0.000050 (0.00005)	0.00011* (0.0000355)	0.0001009 (0.0000737)
Charcoal Expenditure in Birr					-0.0003932* (0.0001523)
Wood Expenditure in Birr					-0.0001561 (0.0000996)
Dummy single	-0.06302 (0.1495755)	-0.39124** (0.2037641)	-0.21528 (0.2219207)		
Sex of house head	-0.20706 (0.2830576)	0.161792 (0.4032545)	-0.5453 (0.4754755)	-0.65343* (0.2509402)	
Education of house head	0.124177** (0.0699733)	-0.37301* (0.1772712)	0.254687* (0.1125494)	-0.00504 (0.0610653)	-0.0651651 (0.0490156)
Dummy Sodo	-0.2343 (0.3173097)	-0.82977 (0.794431)	0.735898** (0.38386)	-0.72149* (0.307398)	
Dummy Salaried	-0.03025 (0.3579195)	0.6575 (0.5859886)	-0.25037 (0.5337835)	0.5734** (0.3376147)	0.4058714 (0.2795627)
Age	0.009012 (0 .0097942)	0.074079* (0.0271895)	0.019573 (0.0152161)	-0.02268 (0.0102241)	0.0030828 (0.00771)
Household Size	0.017873 (0.0497299)	0.348883** (0.2023932)		0.010216 (0.0498223)	0.0479235 (0.0404515)
Sample size	251	251	251	251	251
Share of Zero (%)	85.66	3.98	4.78	84.46	73.71
Predicted Probability	0.1432382	0.9634162	0.9521677	0.1545762	0.2629827
Pseudo-R^2			0.1875	0.1525	0.0471
LR χ^2			18.07	33.08	15.68
Wald χ^2	40.78				
Prob > χ^2	0.0088		0.0344	0.0003	0.0542

Source: Own Computation

♤ Results based on Biprobit Regression with Likelihood-ratio test of rho=0: chi^2 (1) = 11.5241 Prob > chi^2 = 0.0007

*Significant at 5% and **Significant at 10%

When we look in to determinants of decision to consume kerosene, price of charcoal and household expenditure, though small in magnitude, were found to have a significant positive effect. Whereas being household headed by salaried house head, being residence of towns other than Sodo and being headed by female head made households to incline to kerosene as compared to households headed by unsalaried head, residences of Sodo and male headed households respectively. Lastly, price of wood was found to have significant positive influence on decision to consume saw dust. However, household expenditure on charcoal influenced decision to consume saw dust was negatively and significantly.

HOUSEHOLD FUEL DEMAND SYSTEM

The main philosophy behind adoption of SUR estimation procedure in our AIDS specification is that error terms in different demand equations are related. To check this setting we construct correlation matrix of error terms of system of demand equations obtained from SUR and found considerable degree of correlation (Table 4). This is also approved by the rejection of Breusch - Pagan test of independence.

TABLE 4: CORRELATION MATRIX OF RESIDUALS FROM SUR ESTIMATION

Demand	*Wood*	*Charcoal*	*Kerosene*	*Saw dust*
Wood	1			
Charcoal	- 0.5030	1		
Kerosene	- 0.9777	0.5449	1	
Saw dust	0.4977	- 0.7031	- 0.4413	1
Breusch – Pagan test of independence: chi^2 = 29.314 P-value = 0.0001				

Source: Own Computation

According to results of SUR estimation in Table 5 price of fuel wood and inverse mills ratio influenced demand for fuel wood positively and significantly. Whereas, price of kerosene has negative significant influence on fuel wood demand. With regard to the charcoal demand, price of kerosene found to influence it negatively and significantly. The inverse mills ratio has also significant positive influenced on charcoal.

TABLE 5: SUR RESULTS OF AIDS

Explanatory Variables	Dependent Variable – Share of Fuel in total Expenditure				
	Fuel Wood	Charcoal	Kerosene	Saw Dust	Electricity ^
Constant	1.2260 (1.36)	-0.1157 (0.44)	-0.67494 (0.55)	-0.21455 (0.64)	-0.2208679
Ln (Price of Wood)	0.19202** (0.10)	-0.0092 (0.03)	-0.164978* (0.05)	-0.01788 (0.06)	-0.0000001
Ln (Price of Charcoal)	-0.0092 (0.03)	0.02521 (0.02)	-0.03082** (0.02)	0.01476 (0.02)	-0.0000001
Ln (Price Kerosene)	-0.16498* (0.06)	-0.03082** (0.02)	0.11671* (0.03)	0.07908* (0.03)	-0.0000001
Ln (Price Saw Dust)	-0.01788 (0.06)	0.01476 (0.02)	0.07909* (0.03)	-0.075967** (0.04)	-0.0000001
Ln (Price Electricity)	-0.0000001	-0.0000001	-0.0000001	-0.0000001	0.00000040
Ln (Real Expenditure)	-0.26242 (0.17)	0.01244 (0.05)	0.10297 (0.07)	-0.00105 (0.08)	0.1480659
Inverse Mills Ratio	1.5029* (0.15)	0.17859* (0.09)	1.2198* (0.09)	1.7996* (0.34)	
R^2	-0.3838	-0.1249	-0.1865	0.093	
χ^2	142.48	63.53	261.42	97.8	
P-Value	0.0000	0.0000	0.0000	0.0000	

Source: Own Computation

^ Results recalculated form the SUR results based on adding up restrictions

*Significant at 5% and **Significant at 10%

Table 5 also signifies both price of wood and price charcoal impacted kerosene demand negatively and significantly whereas price of kerosene, price of saw dust and inverse mills ration turned out to influence demand for kerosene positively and significantly. Moreover, saw dust demand is positively and significantly influenced by price of kerosene and inverse mills ratio but negatively and significantly influenced by its own price.

Estimation results in Table 6 also revealed that all own price elasticities were found to have the expected negative sign. Specifically, charcoal and kerosene were price inelastic whereas fuel wood and saw dust were price elastic. Demand for electricity was somewhat unitary elastic. The fact that demand for charcoal and kerosene found to be price inelastic was consistent with the finding of Gebreegziabher for urban areas of Tigray region (Gebreegziabher, et al., 2010).

TABLE 6: PRICE AND INCOME ELASTICITIES OF DEMAND FOR FUEL.

Variables	Elasticity				
	Wood	Charcoal	Kerosene	Saw Dust	Electricity
Price of Wood	-1.83483932	-0.039309723	-1.635800733	-0.456942232	-
Price of Charcoal	0.188959853	-0.947511796	-0.537384743	0.399181511	-
Price of Kerosene	-0.265683645	-0.083574632	-0.21713175	2.08475365	-
Price of Saw Dust	-0.016113439	0.036793547	0.570575137	-2.997936912	-
Price of Electricity	0.027318105	-0.001637169	-0.039933273	0.00141266	-
Income	0.465350769*	1.032036158*	1.781523056*	0.972301203*	3.897811907

Source: Own computation

*Calculated based on insignificant coefficients log of inflation adjusted income

FINDINGS

House head education has positive significant effect on decision to consume electricity and negative significant effect on decision to consume fuel wood may imply possible transition of energy consumption from fuel wood to electricity as house heads become more educated. Similarly, the positive significant effect of household expenditure on the decision to consume electricity and kerosene shows the tendency of households to shift to modern energy fuels as income (proxied by expenditure) rises.

The insignificancy of price of related fuel goods in determining decision to consume electricity shows less substitutability of other fuel goods by electricity but the significant positive effect of price of kerosene on decision to consume fuel wood implies kerosene and fuel wood are substitutes. The significant positive effect of price of fuel wood on decision to consume saw dust and significant positive effect of price of charcoal on decision to consume kerosene respectively shows fuel wood and saw dust; and charcoal and kerosene are substitutes. However, the fact that price of fuel wood has significant negative effect on decision to consume charcoal literally shows that both are complements but such relationship may be due to the fact that charcoal is the byproduct of fuel wood.

Demand for fuel wood and saw dust are negatively and significantly elastic. This may indicate possible transition of energy consumption from traditional energy fuels (fuel wood and saw dust) to modern energy fuels (kerosene and electricity) as price for traditional energy fuels rises. The fact that demand for kerosene is negatively price inelastic with respect to its price indicate the potential tolerance of consumers to the rise in the global kerosene price even where government subsidies are not available. Moreover, the fact that the elasticity of saw dust with respect to kerosene price was positively elastic and significant (2.085) implies saw dust and kerosene are substitutes (may be in terms of igniting).

The fact that income (proxied by expenditure) has no significant impact on demand of each fuel but electricity shows income elasticity of each fuel goods except electricity is 1 indicating these fuel goods are normal goods. On the other hand, coefficient of electricity obtained by adding up restrictions considering the insignificancy of impact of income on the rest of fuel goods may imply the income of electricity is higher than unity. This can be intensified by the case where the income elasticity of electricity is 3.9. Hence, electricity is found to be luxury fuel good.

RECOMMENDATIONS

- The long-run objective of the local government should be to emphasize the energy transition from the traditional to the modern ones taking household income, household education and household size in to consideration.
- Local government should follow substitutability patters i.e. substitutability between fuel wood and kerosene; charcoal and kerosene; and saw dust and fuel wood when they think of the fuel energy use transition.
- The study also recommends local governments to look in to household income raising mechanisms to help the transition to electricity.

CONCLUSIONS

- Besides price and income, household Characteristics plays important role in the energy consumption decisions.
- The positive significant effect of house head education on decision to consume electricity and its negative significant effect on decision to consume fuel wood shows possible transition of energy consumption from fuel wood to electricity house head become more educated.
- Similarly, positive significant effect of household expenditure on the decision to consume electricity and kerosene shows the tendency of households to shift to modern energy fuels as income rises.
- Kerosene and fuel wood, fuel wood and saw dust; and charcoal and kerosene are substitutes. Nonetheless, decision to consume electricity do not significantly depend on price of related fuel goods implies less substitutability of electricity.
- All own price elasticities were found to have the expected negative sign. Charcoal and kerosene were price inelastic whereas fuel wood and saw dust were price elastic.

- The income elasticities of each fuel goods except electricity is expected to be 1 indicating these fuel goods are normal goods but electricity is found to be luxury fuel good.

REFERENCES

1. Deaton, A., 1990. Price Elasticities from Survey Data: Extensions and Indonesian Results. Journal of Econometrics, pp. 281-309.
2. Deaton, A. & Muellbauer, J., 1980. Economics and Consumer Behavior. New York: CUP.
3. FDRE, November 2010. Growth and Transformation Plan, Addis Ababa: Ministry of Finance and Economic Development.
4. Gebreegziabher, Z., J. Oskam, A. & Ba you, D., 2010. Urban Fuel Demand: An Almost-Ideal Demand System Approach. Environment for Development: Discussion Paper Series, pp. 1-2.
5. Girard, P., 2002. Charcoal production and use in Africa: what future? Unasylva 211, Vol. 53, pp. 30-35.
6. MEGEN Power Plc, 2011. Household Energy Baseline Survey, Addis Ababa: GIZ: ECO – BIO-ENERGY DEPARTMENT.
7. Mokonnen & Kohlin, 2008. Determinants of Household Fuel Choice in Major Cities in. Environment for Development Discussion Paper Series, EfD DP, pp. 08-18.
8. OECD/IEA, 2010. Energy Poverty: How to Make Modern Energy Access Universal?", France: Iinternational Energy Agency-IEA.
9. OECD, 2006. Energy for cooking in developing countries, France: International Energy Agency (IEA).
10. Sadoulet, E. & de Janvry, A., 1995. Quantitative Development Policy Analysis. Baltimore, MD, USA: Hohns Hopkins University Press.
11. Samuel, F., 2002. Households Consumption Pattern and Demand for Energy in Urban Ethiopia. Unpublished Paper.
12. WoEM, 2012. Annual Report of Energy, Wolaita Sodo: Wolaita zone Energy and Mineral Office.

REQUEST FOR FEEDBACK

Dear Readers

At the very outset, International Journal of Research in Commerce, Economics & Management (IJRCM) acknowledges & appreciates your efforts in showing interest in our present issue under your kind perusal.

I would like to request you to supply your critical comments and suggestions about the material published in this issue as well as on the journal as a whole, on our E-mail **infoijrcm@gmail.com** for further improvements in the interest of research.

If you have any queries, please feel free to contact us on our E-mail **infoijrcm@gmail.com**.

I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward an appropriate consideration.

With sincere regards

Thanking you profoundly

Academically yours

Sd/-
Co-ordinator

DISCLAIMER

The information and opinions presented in the Journal reflect the views of the authors and not of the Journal or its Editorial Board or the Publishers/Editors. Publication does not constitute endorsement by the journal. Neither the Journal nor its publishers/Editors/Editorial Board nor anyone else involved in creating, producing or delivering the journal or the materials contained therein, assumes any liability or responsibility for the accuracy, completeness, or usefulness of any information provided in the journal, nor shall they be liable for any direct, indirect, incidental, special, consequential or punitive damages arising out of the use of information/material contained in the journal. The journal, neither its publishers/Editors/ Editorial Board, nor any other party involved in the preparation of material contained in the journal represents or warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such material. Readers are encouraged to confirm the information contained herein with other sources. The responsibility of the contents and the opinions expressed in this journal are exclusively of the author (s) concerned.

ABOUT THE JOURNAL

In this age of Commerce, Economics, Computer, I.T. & Management and cut throat competition, a group of intellectuals felt the need to have some platform, where young and budding managers and academicians could express their views and discuss the problems among their peers. This journal was conceived with this noble intention in view. This journal has been introduced to give an opportunity for expressing refined and innovative ideas in this field. It is our humble endeavour to provide a springboard to the upcoming specialists and give a chance to know about the latest in the sphere of research and knowledge. We have taken a small step and we hope that with the active co-operation of like-minded scholars, we shall be able to serve the society with our humble efforts.

Our Other Journals