HOUSEHOLD ENERGY CONSUMPTION ANALYSIS IN INDONESIA 2008-2011

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Abstract

The goal of the study is to analyze the pattern and the change of household energy consumption and determinant factors in Indonesia in 2008-2011 by using National Economic Survey (SUSENAS) data of household budget survey. The concept of energy ladder and fuel stacking (multi fuel) are used to make a model of household energy consumption. The result of study shows that there was an increase in energy consumption, both for modern and traditional energy in the period of 2008-2011. Income elasticity of energy consumption is positive, meaning that there was an increase in consumption of modern energy together with traditional energy in line with the income growth. Household income is the main determinant factor of energy consumption along with others non-economic factors.

Keywords: energy consumption, energy ladder, household energy

1. INTRODUCTION

Households use energy for various purposes including cooking, lighting, heating, cooling, and other household activities. The consumption of modern energy (electricity, LPG, kerosene, gas, renewable fuels), is preferable from traditional energy (firewood, charcoal, coal and other biomass) because of preference to for which are more convenient and easiness of availability (Alam, Sathaye & Barnes, 1998).

Household energy consumption has increased in line with rising household incomes (Ashby and Pitts, 2011; Miah et al, 2010). While the energy consumption of traditional (such as firewood and charcoal) of households has decreased in line with the increase in household income, even applies to kerosene (Ellen, 1985; ESMAP, 2003; Heltberg, 2003; Shittu, Idowu, Otunaiya and Ismail, 2004, Rajmohan & Weerahewa, 2007).

Changes in income will shift the household energy consumption of traditional energy to modern energy services in the same direction. Some studies show that if the household income increases, it will increase the consumption of modern energy, as proposed by Hosier and Dowd (1987), Pechauri & Spreng (2002), Gamtessa (2003), Lanzen, Deya & Foran (2004), Barnes, Krutilla & Hyde (2004), Shittu, Idowu, Otunaiya &

Ismail, (2004), Cohen, Lenzen & Schaeffera (2005), Atanassov (2010), Battarcharjee & Richard (2011), Foysal et al (2012) and Estiri et al (2013). The presence of positive relationship between modern energy consumption and household income indicates that modern energy is in the group of normal goods. In addition to income, other economic variables that determine energy consumption is the energy prices and the prices of household appliances (Battarcharjee & Richard, 2011).

Non-economic factors that play momentous roles in the process of shifting energy consumption are the demographic characteristics of the household (Berhanu, 1999), household size and urbanization (Lanzen, Deya & Foran, 2004) family size, access to fuel (Barnes, Krutilla & Hyde, 2004) , social and cultural factors (Atanassove, 2010), and education (Gebreegziabher, Mekonnen, Kassie & Köhlin, 2012).

The household sector in Indonesia consumes various types of energy, namely electricity, kerosene, LPG, town gas, and firewood (biomass) and charcoal briquettes. Kerosene consumption reduced a lot because of government policy and has been shifted into LPG since 2007. However kerosene is still needed for lighting, especially in rural areas or areas not yet reached by electricity. The increase of gas consumption is slow considering the low supply of gas constrained by the high cost of needed infrastructure. Biomass (firewood and charcoal briquettes) is gradually replaced by modern fuels and electricity because it is more convenient, efficient and generates less pollution (Nature, Sathaye & Barnes, 1998).

Many factors affect household energy consumption, economic and non - economic factors. This study will identify and analyze the factors that affect household energy consumption in Indonesia, and then study the impact of changes of those factors on energy consumption.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1. Energy Ladder

According to the theory of consumer behavior, the goal of consuming goods and services is to achieve maximum satisfaction with income constraints. This concept constitutes underlying hypothesis of the energy ladder. Households increase the amount of energy consumption in line with the increase in income. However, if the household income increases, not only it adds to the same energy consumption but also it move towards a better energy with higher quality and vice-versa (Hosier and Dowj, 1987; Maconachiea, Tankob and Zakariyac, 2009).

The concept of energy ladder is a model selection that is widely used to determine the consumption of domestic fuel in the developing countries (Campella, Vermeulen, Mangonoc & Mabogu, 2003). Energy ladder is a concept used to describe how households consume energy to move from traditional to modern energy services in the event of an increase in economic status or vice versa (Hosier and Dowj, 1987) . The rudimentary assumption stands to the idea that household faces various choices of energy judging from technological sophistication (Campella, Vermeulen, Mangonoc & Mabogu, 2003).

Not only the increase in income that causes changes in household patterns of energy consumption but also an increase in household wealth. Such improvements can have a potential impact on the amount and type of fuel consumed, which have implications for the health and the environment. Poor households (India case study) experienced an increase in wealth shift to electricity consumption as a source of illumination in comparison with the use of kerosene. As for cooking there are no changes in fuel use towards cleaner fuel (Hanna and Oliva, 2015).

Table 1: The Energy Ladder

Sector	Energy consumption	Developing Countries			Developed Countries
		Low Income Households	Middle Income Households	High Income Households	
Household	Cooking	Wood, charcoal, briquettes agricultural residues, animal manure	Wood, residues, dung, kerosene and biogas	Wood , kerosene LPG, natural gas, electricity, coal	Electricity, natural gas

	Lighting	Candles and kerosene	Candles, kerosene , petrol, paraffin	Kerosene, electricity and gas	electricity
	Room heater	Wood , residues , livestock manure	Wood, residues, livestock manure	Wood , residues, dung, coal , electricity	Oil, natural gas , electricity
	other equipments	There is no	Electricity , batteries and accumulators	Electricity	Electricity

Source: Sovacool, B.K (2011)

Energy ladder should not start from the bottom, but depend on the level of household income itself. In other words, there is a transition in energy consumption from traditional energy to modern energy services. Furthermore, the energy ladder did not rigidly climb vertically, where rising incomes are not headed toward one kind of consumption of energy resources, but the use of multiple energy sources simultaneously (Sovacool, 2011).

2.2. Fuel Stacking (Multi Fuel Model)

Various studies identified that households do not follow the linear hypothesis and the substitution of energy ladder, but rather to approach different kinds of fuel consumption at the same time, known as stacking fuel. Empirical studies regarding current energy consumption of households show that the energy transition does not occur as a series of simple, but through diverse stages, and is often overlooked as the use of various types of fuel simultaneously. The increase in income causes households adopting new fuels and technologies that can replace partially or as a perfect replacement of traditional energy consumption. Then, shifting of fuel use occurs indirectly and people can go back to traditional energy even after adopting modern energy though. As was the case in Sri Lanka (van der Kroon et al, 2013) in which people in semi-urban re-use firewood after using LPG because of LPG price hike.

Masera et al (2000) went a step further, as quoted by van der Kroon et al (2013) and said that there was no transfer of complete fuel consumption and proposed a model use of various types of fuel at the same time. Households do not usually switch energy consumption fully from one technology to another, where households start consuming new technology energy consumption without leaving the old technology. So the pattern of household consumption by using many types of energy is the result of a complex interaction of social, cultural and economic factors.

2.3. Review of Previous Studies

Nugroho et al (2010) conducted a study of household energy consumption patterns in the four metropolitan cities; Jakarta, Tokyo, Beijing and Daka. Decisive factors leading to household energy consumption (in-home activities) in the four cities include socio-economic factors, the physical home and lifestyle. It is found Jakarta dominates the use of fuel for vehicles and behavior of using air-conditioning becomes relative dominant factor as a determinant of energy consumption. Study of household energy consumption in Bangkok showed that three factors significantly affecting consumption are; physical and structural, social and cultural as well as economic factors (Sirichotpundit, 2013). Other evidences also support that the selection of fuel and consumption decisions are sensitive to the urban community access and energy prices, and the government has used this fact in making policies (Barnes, Krutilla & Hyde, 2004). Lenzen, Deya & Foran (2004) found a clear link between energy use by income, household size, age and degree of urban areas.

Shi (2011) found a strong relationship between a lifestyle (like a big house and dependence on individual transport) and household energy consumption in the United States. Furthermore, the energy consumption of households is affected by the climate, race and income homeowners at the same state (Estiri et al, 2013). Study by Poyer et al (1997) also showed patterns of consumption and household energy consumption are influenced by race such as Latino, non - Latino white and black in the United States.

Bhattacharjee and Reichard (2011) systematically examined four factors that affect household energy consumption, namely demographics, consumer behavior, economic variables, and the weather. The implication of that condition is to optimize the efficiency and control the energy consumption of households' policies by considering the four factors above. The findings of Steemer and Yun (2009) showed that behavioral and socioeconomic factors affected residents of household energy consumption.

Household energy consumption has huge variation between geographic regions in China due to differences in access to energy sources, prices, weather, income and level of urbanization, while demographic factors that play a role is the size of the household. Furthermore, the pattern of energy consumption is a function of net income compared to the total expenditure (Jiang and O'Neill, 2004).

The above tendency underlined that factors beyond income also affect household energy consumption such as socio-cultural factors. These factors are recipes, taste, cooking utensils, and the location of the cooking itself as it did in Atambe, Africa (Atanassov, 2010). Also it is evident that socioeconomic variables became stronger as predictor variables such as income, education, occupation and location (Reddy, 2004).

The use of Information Communication Technology (ICT) has increased household energy consumption for the needs of the equipment and the increased use of ICT equipment. This situation can be regarded as a negative side, like Sadorsky study (2012) which showed positive and significant relationship between ICT and electricity consumption. While the use of ICT in a positive fashion would be a great expectation with more efficient equipments such as smart electricity meter and real-time display unit (Martiskainen and Coburn, 2011). Then, the information technology is expected to improve energy efficiency in economic activity through the direct application of the reduction of energy consumption for products and processes, and through increased productivity and changes in structure (Walker, 1985).

2.4. Conceptual Framework and Methods

This study classifies energy into two groups: modern and traditional energies. Grouping of modern and traditional energies refer to production process of energy source, the level of cleanliness, comfort, safety and efficiency. Modern energy production (electricity, town gas, LPG , and kerosene) requires more advanced technology than those traditional energy production processes (charcoal briquette / coal and firewood).

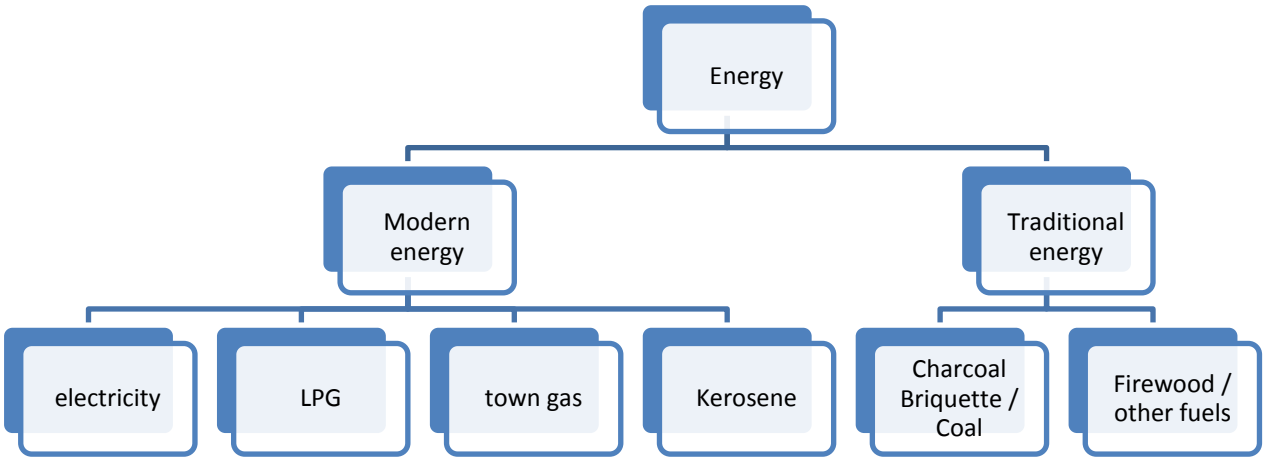

Figure 1. Distribution of Households Energy by Type of Energy

According to Swan and Ugursal (2009) there are two technical approaches to modeling household energy consumption: top -down and bottom- up. The first approach treats the household sector as a bowl / basin (sink) and does not take into account the end users to individual households. While the second approach takes into account estimates of household energy consumption as individual representatives to regional and national level, and is comprised of two different methodologies, statistical methods and engineering.

Statistical regression method is one of several variations of techniques to study the relationship between consumption of energy by household end-users (end -used). Bottom-up approach of statistical regression method will be able to determine the total energy consumption of the household sector without depending on time series data. Then the regression results are expected to obtain relationship between the empirical findings in line with theories that have been proposed.

3. DATA, SOURCE OF DATA AND DEFINITION OF OPERATIONAL VARIABLES

3.1. Data and Source of Data

Study of household energy consumption includes all of Indonesia region. The main data used in this study are household spending and household consumption surveyed by National Economic Survey (SUSENAS) in 2008-2011. Household income data are not surveyed, yet it uses spending data because it tends to be distributed more evenly than household income (Freund and Wallich, 1995; Rao, 1998; Ragayah, 2005). The 2008-2011 data presents the average household expenditure per month. In order to calculate annual household spending figures, monthly figures are multiplied by 12.

The overall samples of households surveyed by Indonesian Bureau of Statistics (BPS) and examined in this study were 282,334 for 2008 and 284,156 in 2011. Sampling methods of households in 2008-2011 are described and listed in detail in the Code of Head of Statistics Provincial and District / City SUSENAS in 2008 -2011.

3.2. Definition of Operational Variables

The dependent variable is the energy consumption (total) which is further divided into consumption of modern and traditional energy. More details about the name, symbol and indicator variables of these studies can be seen in Table 2.

Table 2:. Name, Symbol and Indicators of Dependent and Independent Variables

No	Dependent variable	Symbol	Indicator
1.	Energy Consumption (Total)	KE	Total value of Modern and Traditional Energy Consumption per year (rupiah)
2.	Modern Energy Consumption	KEM	Total value of electricity consumption , LPG , City Gas and Kerosene per year (rupiah)
3.	Traditional Energy Consumption	KET	Total value of consumption Firewood and Charcoal / Coal / Briquettes per year (rupiah)
1.	Independent variables Household income	PRT	Total household income that is proxied by household expenditure per year (rupiah)
2.	Number of household members	ART	Everyone who normally resides in a household (person)
3.	The floor area of the house	LL	Square meters (m2)
4.	Age of head of household	UKK	Year
5.	Status mastery occupied residential buildings	PTT (D1)	Own (1) Other (0) (Contracts , Leases Non -rent property to others, free rent property of the parents / relatives / eternal happiness, Office).
6.	The sex of the head of household	JK (D2)	Men (1) Women (0)
7.	Marital status of household head	SPK (D3)	Married (1) , Other (0) (Not Married, Divorced Divorced Living and the Dead)
8.	Main source of lighting	SP (D4)	Electricity (PLN and non - PLN) (1) , Other (0) (petromax , ligh / flashlight / torch)
9.	Main Fuel / energy for cooking	B (D5)	Modern Fuel (1) (Electricity, LPG, Town Gas and Kerosene) , Others (0) (Charcoal Briquettes and Wood)
10.	Information and communication technology	TIK (D6)	At least one of the tools to master ICT (1) , Other (0), (Landline, Mobile and Computer Mastery)

Source: Adapted

3.3. Analysis Method

Regression analysis is used to study the relationship between the dependent and independent variables. Linear regression is a form that is often used because it is simple, clear and can be used for forecasting logically (IPART, 2011).

Having deemed the overall factors that affect household energy consumption, regression model to be used will be:

$$\ln KEit = \alpha + \beta 1 \ln PRTit + \beta 2 \ln ARTit + \beta 3 \ln LLit + \beta 4\, UKKit + \beta 5\, D1it + \beta 6\, D2it + \beta 7\, D3it + \beta 8\, D4it + \beta 9\, D5it + \beta 10\, D6it + e$$

i: type of energy (Total, Modern and Traditional), t : years (2008 and 2011)

4. ENERGY CONSUMPTION AND THE INFLUENCING FACTORS

The average energy consumption (total), modern and traditional households have increased during 2008 and 2011, with the rates of consecutive growth are 6.37 %, 8.20 % and 4.71 % . The growth rate of the average consumption of modern energy is almost twice that of consumption of traditional energy. The figure illustrates that households increase like modern energy and have been substituting traditional energy consumption by modern energy.

Table 3. Average Value and Proportion of Variables Affecting

Indonesia's Household Energy Consumption in 2008-2011

Variables	2008			2011		
	Indonesia	Urban	Rural	Indonesia	Urban	Rural
Average Expenditure of Household / Year (Rp million)	22,04	27,89	16,89	28,78	34,40	21,29
Average Number of Household Members (person)	4,00	4,03	4,05	4,00	4,04	3,98
Average Floor Area Of House (m2)	64,66	71,97	60,58	64,99	69,72	58,87
The average age of the Head Household (year)	46,30	45,78	46,59	46,53	45,32	46,18
Proportion Owned Home (%)	79,36	66,02	86,82	80,19	69,86	87,41
Proportion of Family Head Man (%)	87,10	85,35	87,20	85,63	85,04	86,64
Proportion of Family Head Mating status (%)	83,63	81,46	84,84	82,41	80,65	83,64
Proportion Main Source of Lighting (Electricity) (%)	80,42	98,32	79,51	81,79	98,77	82,14
Proportion Main Fuel (Modern) For Cooking (%)	44,12	80,41	23,81	50,89	80,67	29,71
The proportion of ICT Mastery (%)	17,21	27,82	11,27	23,78	31,90	18,11

Source: Data compiled from SUSENAS 2008-2011

Household income is a very important factor to determine the energy consumption of households. Beside income, factors that play a role in determining the level of household energy consumption are the demographic and cultural factors. This study addresses several factors in terms of the number of household members, age of heads of household, gender of household heads and marital status of household heads. Other factors that also alter energy consumption in this study involve the floor area of the home, home ownership, the main lighting source, the primary fuel for cooking, as well as mastery of information and communication technology.

Not all the variables having impacts on the household energy consumption have increased over 2008-2011. Some of the variables in decline are an average floor area of the house, the average age of head of household, the proportion of male heads of households and the proportion of married household head.

5. RESULTS AND ANALYSIS

The regression results show that there is a positive relationship and significant correlation between energy

consumption (total) or KE and household income (PRT), the number of household members (ART), the floor area of the house (LL), age of household heads (UKK) control status of residential buildings (D1), the marital status of household head (D3), main source of lighting (D4), the primary fuel for cooking (D5) and opposite (negative) relationships and significant by gender of household head (D2) and mastery of information and communication technology (D6) for both 2008 and 2011.

Table 4. Regression Results of Energy Consumption by Type of Energy

in Indonesia years 2008-2011

Energi	Total		Modern		Traditional	
	2008	2011	2008	2011	2008	2011
lnPRT	0.520	0.539	0.632	0.626	0.365	0.340
	(245.16)**	(286.45)**	(255.68)**	(298.18)**	(87.98)**	(78.82)**
lnART	0.015	0.032	-0.071	-0.054	0.026	0.100
	(5.80)**	(13.29)**	(23.35)**	(19.92)**	(5.11)**	(19.31)**
lnLL	0.133	0.137	0.119	0.135	0.076	0.038
	(73.63)**	(76.79)**	(56.64)**	(67.73)**	(21.06)**	(9.63)**
lnUKK	0.145	0.152	0.11	0.136	0.063	0.038
	(40.03)**	(42.29)**	(26.10)**	(33.79)**	(9.45)**	(5.12)**
d1	0.066	0.051	0.034	0.017	0.056	0.082
	(23.84)**	(18.86)**	(10.55)**	(5.72)**	(9.51)**	(12.47)**
d2	-0.106	-0.099	-0.085	-0.078	-0.032	-0.057
	(22.58)**	(22.76)**	(15.49)**	(16.24)**	(3.51)**	(6.22)**
d3	0.181	0.156	0.145	0.114	0.092	0.161
	(40.16)**	(37.58)**	(27.76)**	(24.64)**	(10.43)**	(18.26)**
d4	0.282	0.089	0.373	0.188	0.169	-0.092
	(88.63)**	(25.15)**	(100.19)**	(44.74)**	(34.15)**	(16.05)**
d5	0.233	0.185	0.797	0.812	-0.827	-0.747
	(94.22)**	(79.26)**	(278.00)**	(315.36)**	(148.32)**	(123.26)**
d6	-0.032	-0.015	0.034	0.09	-0.105	-0.11
	(13.06)**	(5.59)**	(11.96)**	(29.36)**	(23.82)**	(22.54)**
cons	3.513	3.339	1.196	1.206	5.918	6.74
	(99.30)**	(103.69)**	(29.04)**	(33.61)**	(85.30)**	(91.80)**
R^2	0.46	0.46	0.61	0.65	0.16	0.14
N	282,334	284,156	280,573	274,688	174,846	158,984

** 99 percent confidence level

The coefficient of each independent variable is varied, be nominal value variable or dummy variable. Then the coefficient of each independent variable does not change (increase or decrease) significantly in 2011 compared with 2008, except for the variable of household's main source of lighting (D4).

The variable with a significant role in determining the energy consumption of households is household

income. The increase in income primarily increases the ownership of household appliances thus increasing energy consumption. The importance of the influence of income on household energy consumption is crystal clear regarding the choice of energy as proposed by Barnes (2004), Farsi et al (2006), Gamtessa (2003), Heltberg (2003), Cohen (2005), and Bhattacharjee and Reichard (2011).

The next variables contributing to the overall energy consumption is the age of the household heads, where the higher the age of the household head, the more energy consumption will be. This situation is to do with tendency of the increasing age lead time at home getting longer so that it will raise its energy needs. Meier (2010) explained that low-income households spend more time at home compared with household members who work full-time thus requiring more energy. Abrahams (2011) stated that household energy use has the most powerful relationship with socio-demographic variables such as income, household size and age. Hence Bacon (2009) discovered the importance of energy in the household budget in Indonesia and Pakistan.

Variable floor area is a third variable that influences household energy consumption. If the floor area increased by one percent, it would increase the energy consumption to 0.13 in 2008 and 2011. The increase in the energy consumption is associated with increased estimated spacious rooms that require illumination (electric or kerosene lamps). Usually the floor area of the house is positively correlated with the amount of space (room) so the larger floor area will require higher energy. Nababan study (2008) found that dealing with any household electrical strata there is a relationship between a variable amount of space and positive electricity demand as well as the number of room / significant effect on household demand for electrical energy. Household size becomes an important factor in household energy use (van der Horst, 2008) and in the decision whether choosing to use a mixture of energy (more than one) or not (Mirza and Kemp (2011).

Household head men contributed to reduce household energy consumption compared to women, which means that it can be said the head of the household is wiser men in frugality in energy consumption for 2008 and 2011. The study of Adu (2013) in Ghana found that male heads of the family have the possible opportunity of using energy cleaner and more efficient than female heads of household, also such is the case with study by Islas (2013) on the energy consumption of households in Mexico.

Substitution of energy consumption has occurred between the traditional and the modern fuel for cooking shown by the negative value of main fuel for cooking coefficient in 2008 and 2011. If the primary fuel source for cooking is electricity it will lower the consumption of traditional energy, whether charcoal, briquettes, stone coal or firewood. The main fuel source for cooking has started to shift from traditional energy (charcoal/coal/briquettes and firewood) to modern energy, especially electricity and LPG. Lodging in Java, replacing firewood with kerosene is very limited (Platchkov and Pollitt, 2011, meaning that substituting is more likely to occur with LPG in Java and other types of modern fuel outside Java.

Households with better understanding and use of information and communication technologies (many have no tools of ICT/home phone, cell phone and computer) consumed energy lower than households that did not control the information technology and communications in 2008 and 2011.

It is interesting to examine the relationship between a variable number of members of households and consumption of modern energy, especially electricity and kerosene, because an increase in the number of household members tends to reduce the consumption of modern energy. This situation is expected to occur because households use less energy if household has more the number of members, which basically shows less energy consumption per capita on the other side. Kerosene consumption declines significantly after the fuel subsidy reduction policies so that households tend to use more LPG for its cleaner, safer, and more comfortable and more efficient feature.

Men-headed households consume electrical energy, LPG, town gas and kerosene (modern energy) lower than women-headed households in 2008 and 2011. The head of household is dominated by men in Indonesia and expected to save more money compared to women as the household heads consume. Studies of Islas (2013) showed that the energy consumption per capita of households headed by men is lower than that of headed by women and households whose members only male consumes less energy than households whose members consist only of women. In general, consumption expenditure of man is lower than female consumption (Caglayan and Astar, 2012).

The regression results above show that households better familiar with information and communication technology consume higher energy than those with poor acquaintance with and use of information technology and communications in 2008 and 2011. This situation illustrates that the use of information and communication technologies have not been able to optimally used in obtaining means or information about

the equipment that can save energy consumption such as energy-efficient home construction, use of energy-saving lamps and custom AC-efficient. ICT Indicators of 2011 showed that households with ownership of ICT access the Internet with a percentage of 37.51 % and internet access activities were open social networking site, which is recognized by 64.43 % of respondents (Kominfo, 2011).

Traditional energy consumption, mainly firewood, is still an important source of energy, especially in rural areas, where the increase in income increases consumption. Research by Knight and Rosa (2012) showed that the countries with less average number of household members consume more wood per capita. Total expenditure is not an important factor in determining expenditures for firewood but the level of education of household head is the important factor in determining spending for firewood (Osiolo, 2009).

Interesting look at the variable main source of lighting, where the value of the variable coefficient is positive in 2008 and became negative in 2011. If the main source of lighting is electricity, fuel wood consumption rose in 2008, but it is not the case in 2011. If the main source of illumination is the electricity, it will reduce the consumption of firewood. During that period, it is estimated substitution from firewood with electricity, where the electricity is no longer used as a source of illumination but has already started to use for cooking (especially rice).

6. CONCLUSION

Household income is the most dominant variable which determine energy consumption in Indonesia. The increase in income primarily increases ownership of household appliances thus increasing energy consumption. The importance of the influence of income on household energy consumption in several studies is evident seen from researches conducted by Barnes, Krutilla & Hyde, (2004), Farsi et al (2006), Gamtessa (2003), Heltberg (2003), Cohen, Lenzen & Schaeffera (2005), as well as Bhattacharjee and Reichard (2011).

Men-headed households males consume less energy than women-headed households. In other words, the male head of the household is much wiser in frugality of energy consumption. Studies by Adu and Messiah (2013) in Ghana and Islas (2013) in Mexico showed that male head of the family has the very likely opportunity of using energy cleanly and efficiently than female household heads .

Furthermore, replacement of traditional with modern fuels for cooking is shown by the value of the main fuel coefficient, which was negative in 2008 and 2011. The primary fuel source for cooking will lower the electricity consumption of traditional energy whether charcoal, briquettes and stone coal or firewood. The main fuel source for cooking has started to shift from traditional energy (charcoal/coal/briquettes and firewood) to modern energy services, especially electricity and LPG.

Households knowledgeable about information and communication technology (at least with one ICT tool of home phone, cell phone and computer) consume lower energy than those whom did not be literate to the information and communication technology. This situation illustrates the positive contribution of information technology to the control of energy consumption.

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