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How Sensitivity of Energy Intake to Fuel Price Change: Evidence from Central Java

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Abstract

Because of high world oil prices during 2008-2013, the government must adjust domestic fuel price several times. One of the fuel price adjustments occurred in 2013. The increase in fuel prices caused high inflation. The purpose of this study is to analyze the impact of rising fuel prices on calorie consumption as a main source of energy intake in Central Java Province. The results of this study indicate that calorie income elasticity increased both in urban and rural areas after the increase in fuel price. However, urban households are more responsive than rural households. An increase in calorie income elasticity means that households must allocate more expenditure on food consumption in order to fulfill minimum energy intake. These findings imply that cash transfer policies such as direct cash transfer for poor households known as BLT as well as rice policy for poor households as called Raskin are very effective to maintain minimum calorie intake during price crisis.

Keyword: Fuel Price, Calorie Income Elasticity, Cash Transfer, Rice For Poor
JEL Classification: I12, O12, D12, E31

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1. Introduction

One indicator of household welfare is the adequacy of nutritional consumption both macro and micro nutrients. Adequacy of macro nutrient consumption is measured by the amount of calorie and protein intake consumed by every human being. The government has set minimum standards for the consumption of calories and protein by 2000 kcal and 52 grams per day. Central Java is one of the most populous provinces in Indonesia with a population of 32.38 million and a poverty rate of 4.5 million people (13.23%) in 2015. The average per capita calorie and protein consumption per day in Central Java were 1,936.26 kcal 53.76 grams respectively. At the national level, the average per capita calorie and protein consumption per day were 1,992.69 kcal 55.11 grams (Central Bureau of Statistics, 2016). Calorie consumption per capita per day in the Central Java Province was still below minimum calorie consumption while protein consumption was above the minimum protein consumption. In addition, the consumption of calories and protein in Central Java was also below the average calories and protein consumption at the national level.

The level of calorie and protein consumption is influenced by household expenditure. Household expenditures can be classified into two major categories, namely food and non-food expenditure. Based on data from 2014 and 2015, household expenditures in Central Java increased from Rp

591,233 in 2014 to Rp 695,856 in 2015. This total expenditure increased by Rp 72,988 (11.72%). The inflation rate at the same year in the Central Java was 8.36% so an increase in household expenditure is higher than the inflation rate in 2015. In other word, real household expenditure in Central Java increased. The average household expenditure in Indonesia was Rp 776,032 so household expenditure in Central Java was still lower than that at national level.

Based on the type of expenditure in 2015, the average food expenditure in Central Java was Rp 330,645 meanwhile non-food expenditure was Rp 365,211. This food expenditure increased nominally compared to the previous year but the percentage of food expenditure to total expenditure decreased from 50.37% to 47.52%. In other hand, non-food expenditure increased both nominal and percentage value compared to the previous year. Non-food expenditure rose from 49.63% to 52.48%. Based on Engel's theory, the decrease of food expenditure and at same time an increase in non-food expenditure indicate that generally the level of household welfare of Central Java has increased in 2015.

Expenditures have different patterns both urban and rural households. First, on average urban household expenditure was higher than that of rural households. Second, the percentage of non-food expenditure was higher than food expenditure in urban households. By contrast, food expenditure of rural households was higher than non-food expenditure. This condition shows that urban households tend to meet secondary and tertiary needs.

The average monthly per capita expenditure by food group in 2014-2015 showed that the largest food expenditure was for the expenditure of food and beverage groups. Grains as staple food was the second largest for food expenditure and then followed by Tobacco and betel. More interestingly, the expenditure of tobacco and betel per month exceeded 10% of total food expenditure per month. However, expenditure for this food group does not contribute to nutrients intake either calories or protein.

Based on living areas of households, the average urban consumption of calorie (1,932.45 kcal) was lower than in rural areas (1,939.5 kcal). The main source of calories was from staple foods (40%), followed by food and beverage (24%) and oil and fat (13%) (Central Bureau of Statistics of Central Java, 2016). The source of calories as a source of human energy differs between households living in urban and rural areas. In urban areas, the main source of household consumption of calories was from staple foods (37.3%) followed by food and beverages (26.89%) and oils and fats (11.69%). While in rural areas staple food (42.16%) was quite dominant contributing energy intake. The next sources of calorie consumption was food and beverages (21.78%) and oils and fats (13.27%). Government has raised domestic fuel prices in June 2013. The rise in fuel prices has contributed significantly to rate of inflation. Inflation in July was 3.29% while annual inflation was 8.38% in 2013. Thus, the increase in fuel price was able to contribute to inflation close to 40% in 2013. To maintain the purchasing power of households, especially poor households, the government has issued a cash transfer by 46.4 trillion Rupiah.

The increase in fuel prices affects on the consumption of food as a source of energy intake for human activities. The increase in food price will deteriorate the welfare of households due to lack of nutrient consumption such as calories. This condition causes poor health and low productivity of households. Based on the above problems, the purpose of this study analyzes the impact of the increase in fuel price in June 2013 on calorie consumption for households in Central Java.

Previous empirical research on calorie consumption can be classified by two approaches, namely direct and indirect approach. The direct approach is an approach using nutrient demand equations such as calories as a function of income, price and demographic and social variables. Many previous studies applied the direct approaches such as Pitt (1983), Deaton (1997) Zhong, Xiang and Zhu (2012) and Ahmed and Holloway (2017). A main goal of this approach is to measure response of calorie consumption to income changes known as calorie income elasticity. However, this direct approach results in different conclusions. First, calorie income elasticity was a quite high for example Pitt (1983). This result implies that malnutrition problem can be solved by increasing economic growth and cash transfer program to poor households. Secondly, some studies have also found that the elasticity of calorie income is a quite low such as Deaton (1997), and Skoufias et al (2009).

The presence of different results with this direct approach encourages other economists to use another approach in measuring nutrient income elasticity. The direct method is a method that has no a theoretical basis for analyzing nutrient demand. Since nutritional demand is derived from food demand, nutritional demand can be estimated by using a demand system approach. The estimated parameter of demand system then is used to calculating nutrient income elasticity such as calorie income elasticity. Estimating nutrient income elasticity by using demand system has been widely applied. Some researchers have used this approach such as Ecker and Qaim (2011) for Malawi and Zheng and Henneberry (2012) for China, Widarjono (2012) for Indonesia.

Several previous studies have been conducted to investigate the effect of an increase price on calorie consumption. Skoufias et al (2011) examined the impact of the 1998 economic crisis on calorie consumption in Indonesia using SUSENAS 1996 and 1999 for Central Java province. The method used was regression both Ordinary least Squares (OLS) and instrumental variable (IV). The result of OLS method was higher than method IV. However, both methods resulted in increased income calorie elasticity after the 1998 economic crisis. For example, calorie income elasticity of staple food for rural households with OLS method increased from 0.25 before the crisis to 0.30 after the crisis while calorie income elasticity of staple food in urban areas increased from 0.19 to 0.25. Stillman and Duncan (2008) found that households lowered high quality macronutrient such as protein and fat to fulfill calorie as energy intake in responding to economic crisis in Russia. Gibson and Kim (2013) for Vietnam showed that there has been an increase in calorie income elasticity when the price of rice increased. Dinova et al (2014) investigated the impact of rising world food prices on the elasticity of macronutrients in Bulgaria. Fat elasticity increased during the crisis while other macronutrient elasticity such as calories, proteins and carbohydrates decreased.

2. Methods

The goal of this study is to investigate the impact of rising fuel price on calorie consumption in Central Java. The impact of fuel price increase can be examined from the calorie income elasticity before and after the fuel price rise using parameter approach. The parametric approach in this study applied direct approach by using regression analysis based on Engle curve approach. This parametric approach result in calorie income elasticity which measures the response of calorie consumption due to changes in income. The magnitude of this calorie income elasticity reflects a change in household consumption patterns due to changes in income variables caused by changes in economic variables such as prices. Price increases will affect purchasing power of households and further affect the consumption of calories. The rise in fuel prices leads to inflation and then it reduces purchasing power of households.

Calorie consumption is influenced by both economic and demographic variables. Calorie consumption can be written in the form of linear regression equation as follows:

$$logY_i = \beta_0 + \beta_1 \, log\, Exp_i + \sum \alpha_i log\boldsymbol{X}_i + u_i \quad (1)$$

Where= household per capita calorie consumption, Exp = household per capita income per month and the element of vector **X** are specified to be as follows: household size, age of household head, gender of household head, the number of children 0-10 years old, the number of adult above 10 years old, level of education of household head (junior high school, senior high school and college), type of employment of household head, quarterly dummy, dummy of poor rice (Raskin), home ownership, type of roof, type of wall, type of floor, floor size, electricity, gas stove and telephone.

In Equation (1), household expenditure is used as a proxy for household income because household income data are not complete in the National Socio-Economic Survey called as SUSENAS. There is a correlation between the consumption of calories and household expenditures if total household expenditure as a proxy of total income so that OLS leads to biased estimators. Therefore to overcome the problem of biased estimators, the instrumental method of variable (IV) is the standard procedure for dealing with measurement error. OLS estimator is biased upward as using nonfood expenditure as a proxy of household income. However, using nonfood expenditure as the sole instrumental variables (IV) leads to biased downward to (Deaton,1997). The instrumental variables used in this study are household expenditures for non-food expenditure and some household assets such as cars, vehicles, refrigerators, air conditioning, television, cell phones, laptops and personal computers.

The data used in this study is from the National Socio-Economic Survey (SUSENAS). SUSENAS is a household survey of all provinces in Indonesia. This survey is a survey of socio-economic conditions. One of survey is about a household consumption expenditure survey. This household consumption survey covers both food and non-food consumption expenditure. SUSENAS surveys 215 types of commodities and classifies into 14 food groups namely (1) grains (2) tubers; (3) fish; (4) meat; (5) eggs and milk; (6) vegetables; (7) nuts; (8) fruits; (9) oils and fats; (10) beverage ingredients; (11) spices; (12) other foods; (13) prepared food and drinks; and (14) tobacco and betel. While non-food expenditure consists of 6 non food groups encompassing home and its facilities, goods and services, clothing, footwear and head accessories, durable goods, taxes and insurance and celebration. SUSENAS provides information on the amount of macro nutrient consumption such as calories, protein, fat and carbohydrate which is calculated based on household food consumption. The survey is conducted for four times a year or quarterly basis. SUSENAS data used in this research was SUSENAS 2013 data from the first quarter until the fourth quarter.

In this study, the data used are household data living in the province of Central Java. Based on data from SUSENAS 2013, there were 26,651 households. Of these households, households in urban and rural areas were 13,313 and 13,338 households respectively. To analyze the impact of the fuel price rise, this study divided the household into two periods. First group is the households surveyed before the fuel price rise and the households surveyed after the fuel price rise. The first household groups were households surveyed in the first and second quarters and the second group of households were households surveyed in the third and fourth quarters.

The propose of this study is to compares calorie income elasticity of two different period. In order to comparison of calorie income elasticity of the two cross section data with different time periods can be analyzed, the nominal income of households after the fuel price increases should be adjusted to the price before the fuel price increases. The consumer price index was used to calculate the real income of households in the Central Java. The consumer price index after the fuel price increase should be adjusted using the consumer price index before the fuel price increase as the base year. Because of an increase in fuel prices having a different impact on the price of goods, applying of the general price index thus does not reflect the increase in the price of goods (Skoufias, 2011). Thus, the consumer price index used is the average price index of the seven groups of goods, not the general price index, at province level. Central bureau of Statistics reports seven price indexes according to the type of group of goods encompassing of the price index for food, the price index of the finished food, beverages, cigarettes and tobacco, the price index for housing, water, electricity, gas and fuel, clothing price index, Price of education, recreation and sports and transport index, communication and financial services. Because of more than one city in the Central Java province reporting the price index, instead of single price index of capital city of the central Java, the price index is the city's average price index.

3. Results and Discussion

Table 4.1. shows descriptive statistics of both urban and rural households in Central Java in SUSENAS 2013 from the first quarter through the fourth quarter. The national level of calorie consumption in 2013 was 1842.75 kcal. The level of calorie consumption across country on average was still below the minimum standard for calorie consumption. Based on the SUSENAS data in 2013, household calorie consumption in Central Java was 1956.11 kcal. This level of calorie consumption in Central Java was higher with the rate of calorie consumption at national level but still below the minimum standard for calorie consumption.

Total monthly household expenditure in Central Java was Rp 2,137 million per month consisting of food expenditure by Rp 1.043 million and non-food expenditure by Rp 1.093 million. The average per capita expenditure per month was Rp 654,49 with average per capita expenditure on food and non-food items of Rp 294,000 and Rp 308,00 respectively. The average household expenditure in Central Java was under the average national household expenditure of 703,000 per month in the same year. While the average per capita expenditure on food and non-food at the national level was Rp 356,000 and Rp 347,000 respectively.

Besides household income as an economic factor, calorie consumption is also influenced by demographic factors. Table 4.1 also describes the demographic conditions of households in Central Java in the SUSENAS 2013. The demographic factors that influence the consumption of calories are the number of family members, the sex of the household head, the age of the household head and the education level of household head. The average number of family members was 4 with the lowest number of family members of 1 person and the highest of 15 people. Most of household heads were male. The average age of the household head was 51 years. Meanwhile the average level of education of the head of household was 7 years. In other word, the average level of education of the household head was junior high school.

Before examining calorie income elasticity, the first step is to explain the relationship between calorie consumption and income. The relationship between calorie consumption and income is explained by a smooth local regression through Kernel regression. Kernel regression is known as non parametric method. To illustrate the presence or absence of differences in the relationship between calorie consumption per capita and per capita expenditure, local regression is divided into two periods, before and after fuel price increases in June 2013. There are several smooth local regression. First, it is all households both urban and rural before and after fuel price rise. Second, it is urban households. Third is rural households. Separated households by geographical location is to investigate whether there is a difference in the response of urban and rural households to calorie consumption due to fuel price increases in Central Java.

Table 4.1. Descriptive Statistics, Households in Central Java, 2013

Variable	Mean	Std Dev	Minimum	Maximum
Calorie Consumption per capita (kcal)	1956.11	548.98	1000.09	4497.08
Monthly food expenditure (Rp 000)	1043.83	632.69	75.43	8390.49
Monthly non food expenditure (Rp 000)	1093.36	2245.68	24.35	85159.92
Monthly total expenditure (Rp 000)	2137.19	2567.62	145.52	88206.63
Expenditure per capita (Rp 000)	654.49	789.19	96.82	38352.88
Family size	3.54	1.51	1	15
Gender of household head *	1.16	0.37	0	1
Age of household head	50.71	13.64	13	98
Education level of household head**	7.01	4.27	0	19

Note: * 1 is for male and 0 otherwise; ** Level of education is years of schooling
Source: SUSENAS 2013

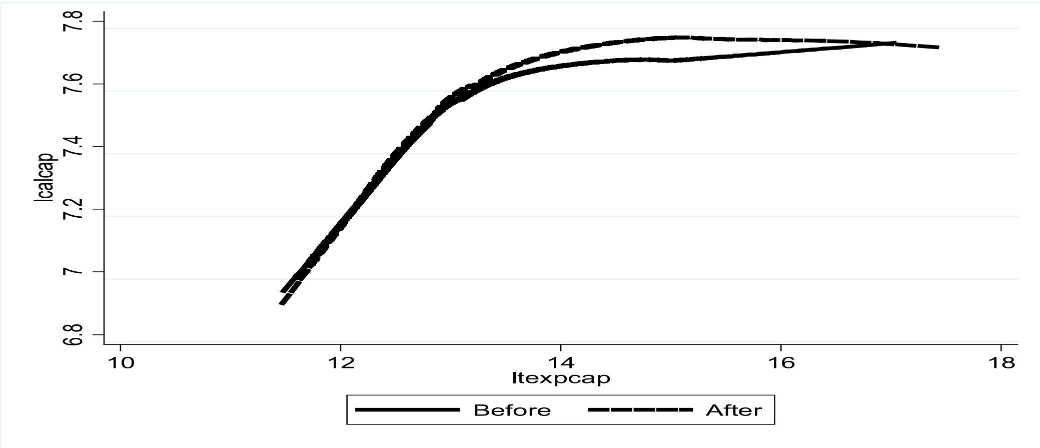

Figure 4.1. Relationship Between Calorie and Per Capita Expenditure in all Households

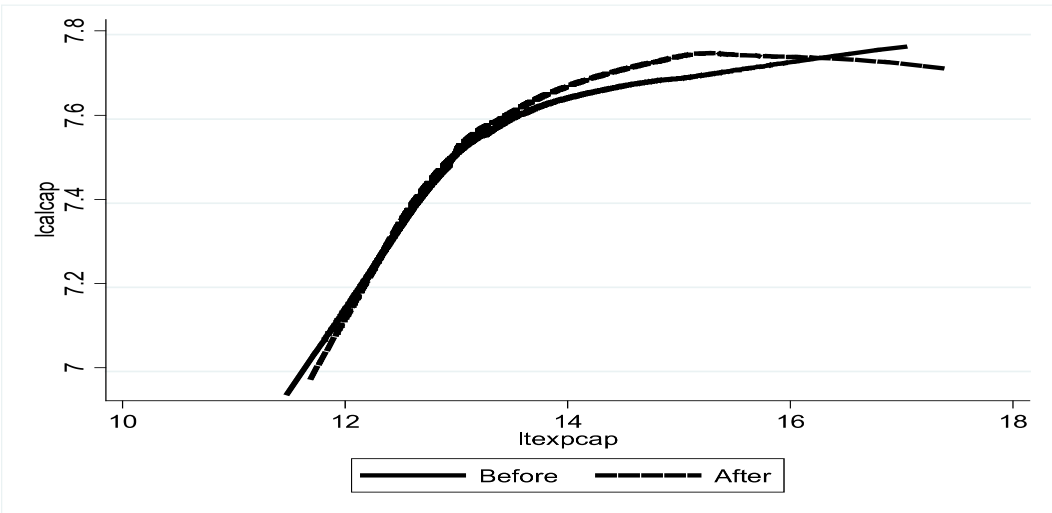

Figure 4.2. Relationship Between Calorie and Per Capita Expenditure in Urban areas

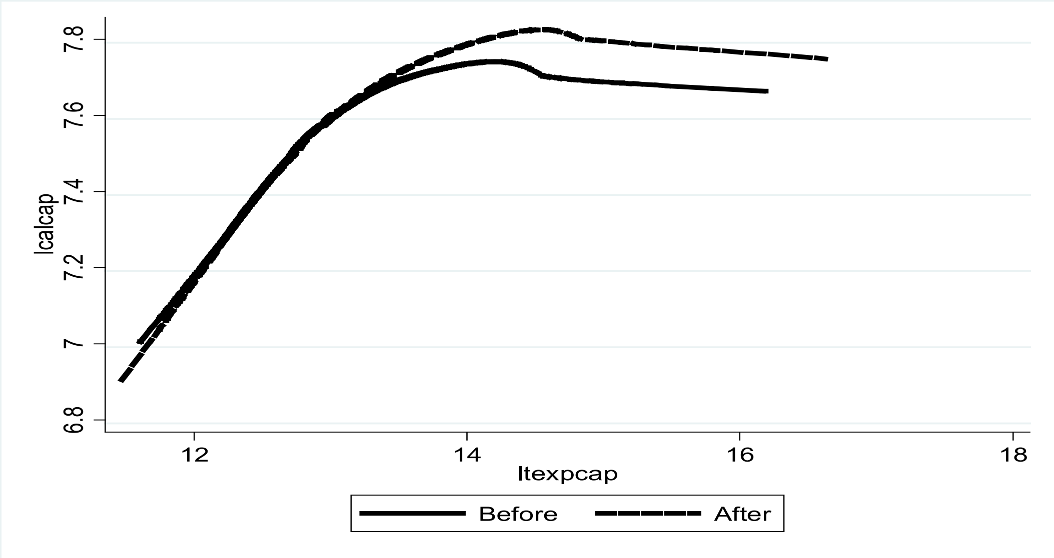

Figure 4.3. Relationship Between Calorie and Per Capita Expenditure in Rural Areas

Kernel regression as a nonparametric approach shows relationship between calorie consumption per capita (lcalcap) and household expenditure (ltexpcap). The kernel regression are shown in figures 4.1- 4.3. Figure 4.1. describes for all households. Calorie Consumption per capita before the rise in fuel price was greater than after the fuel price increase for all households. However, calorie consumption was higher for higher level of household after an increase in fuel price. When separated according to household location, both urban and rural households behavior almost resembles the behavior of all households. Generally speaking, these kernel regression proved that availability of calories has increased during fuel price crisis in June 2013. Therefore an increase in fuel prices actually leads to more spending on food in order to fulfill calorie as a main source of energy intake for human being. It is expected that calorie income elasticity has increased after government increased price of domestic fuel.

Households surveyed in the third and fourth quarters were households that had adjusted food consumption due to higher fuel prices. Meanwhile households surveyed in the first and second quarter were households that had not yet adjusted to new fuel prices. The pattern of food consumption is different between households in urban and rural areas so that calorie intake is also different between both areas. Rising fuel prices will be responded differently between urban and rural households in calorie consumption. Thus, this study analyzed whether there is a difference in household responsiveness to calorie consumption between urban and rural areas due to rising fuel prices.

The first analysis begins with all households without distinguishing location of households in responding to the increase in fuel prices on calorie consumption by investigating calorie income elasticity. Table 4.2 presents estimated calorie consumption using OLS method with robust standard error and Instrumental Variable (IV) method both before and after fuel price increase. The OLS with robust standard error from White Method was chosen because the data used is cross section data so that heteroskedastisity problem will most likely occur.

The main goal of this research is to estimate calorie income elasticity. Regression shows that the total expenditure (ltexpend) is positive and statistically significant at α = 1% before the increase in fuel price . This coefficient regression of expenditure variable is calorie income elasticity. As expected, this result is in line with economic theory because the greater the expenditure is the greater the consumption of food and then it increases consumption of calorie. In addition to the total expenditure variables, there are 20 other independent variables both economic and demographic which are included in the model of calorie consumption equation. Of the 20 independent variables, 16 variables are significant at α = 10% or lower. One of the most important variables is rice policy for poor household (Raskin). Raskin is one of the government policies taken to compensate for poor household due to an increase in fuel prices so that they can fulfill their basic needs to meet minimum calorie consumption. Prior to the fuel price rise, Raskin variable was positive but not statistically significant. Regression after the fuel price increase with OLS method shows that total expenditure is also positive and statistically significant at α = 1%. Of the 20 other independent variables, there are 18 statistically significant at α = 10% or lower. Raskin variables is positive and statistically significant at α = 1%.

Calorie income elasticity is too high or biased upward if using only total household expenditure data is as proxy total income. Regression with Instrument (IV) variables before the increase in fuel prices indicates that total expenditure is also positive and statistically significant at α = 1%. Of the 20 other independent variables, there are 14 independent variable that are statistically significant at α = 10% or lower. Raskin variable is positive and but not statistically significant. The result of regression method IV after the fuel price increase shows that total expenditure is also positive and statistically significant at α = 1%. 17 independent variables of 20 variables are statistically at α = 10% or lower. Raskin variables is also positive and statistically significant at α = 1%.

Both the methods result in different calorie income elasticities where the OLS method is biased upward. However, the rise in fuel prices has led to an increase calorie income elasticity for households in Central Java. Raskin variables before the increase in fuel prices did not affect calorie consumption. After the fuel price rise, however, raskin variable is positive effect. It means that calorie consumption is higher for those households who bought raskin after the fuel price increase.

The next analysis is the responsiveness of urban households. The estimation results of OLS and IV methods both before and after the fuel price increase are shown in Table 4.3. Prior to the fuel price increase, OLS method shows that the total expenditure is positive and statistically significant at α = 1%. Of 19 (95%) independent variables are statistically significant at α = 10% or lower. The result of method IV also shows that total expenditure is positive and statistically significant at α = 1%. There are 16 (80%) independent variables which are statistically significant at α = 10% or lower. The variable of Raskin was positive and statistically significant prior to the fuel price rise. Regression after the increase in fuel price indicates that total expenditure is positive and statistically significant at α = 1% using OLS method. 18 (90%) of 20 independent variables are statistically significant at α = 10% or below. The total expenditure variable in IV method was positive and statistically significant at α = 1%. There are 15 (75%) independent variables which are statistically significant at α = 10% or lower. Like before the fuel price rise, the raskin after the fuel price rise was positive and statistically significant at α = 1% for urban households.

The estimation results of OLS and IV methods both before and after the fuel price increase for rural households are shown in Table 4.4. Prior to the fuel price rise, the results of OLS and IV methods showed that total expenditure was positive and statistically significant at α = 1%. In the OLS method there are 10 (50%) independent variables which are statistically significant at α = 10% or lower. Meanwhile the IV method indicates that there are 10 (50%) independent variables which are statistically significant at α = 10% or lower. Prior to the rise in fuel prices in rural household cases, the variable of Raskin was positive but not statistically significant. Regression after the increase in fuel prices either OLS or IV indicates that total expenditure is positive and statistically significant at α = 1%. 14 (70%) of 20 independent variables either OLS method or IV method are statistically significant at α = 10% or lower. The Raskin variable is positive and statistically significant after the fuel price rise.

Table 4.2. Demand for Calorie, All Households, Central Java, Indonesia, 2013

	Before		After	
	OLS	**IV**	**OLS**	**IV**
Cons	4.9214***	6.2471***	4.6142***	5.7824***
	(0.0822)	(0.0753)	(0.0821)	(0.0707)
Ltexpcap	0.2064***	0.1107***	0.2173***	0.1338***
	(0.0053)	(0.0047)	(0.0053)	(0.0044)
Lsize	-0.0851***	-0.1284***	-0.0754***	-0.1113***
	(0.0162)	(0.0142)	(0.0156)	(0.0138)
Lage	0.0118	-0.0088	0.0483***	0.0272***
	(0.0093)	(0.0090)	(0.0090)	(0.0086)
Gender	-0.0037	0.0012	0.0132	0.0130***
	(0.0063)	(0.0061)	(0.0062)	(0.0060)
Child	-0.0338***	-0.0402***	-0.0349***	-0.0422***
	(0.0052)	(0.0048)	(0.0050)	(0.0048)
Adult	-0.0170***	-0.0136***	-0.0268***	-0.0248***
	(0.0048)	(0.0045)	(0.0046)	(0.0044)
Educ1	-0.0301***	-0.0178***	-0.0389***	-0.0256***
	(0.0059)	(0.0060)	(0.0057)	(0.0058)
Educ2	-0.0627***	-0.0393***	-0.0538***	-0.0329***
	(0.0063)	(0.0062)	(0.0059)	(0.0059)
Educ3	-0.0952***	-0.0471***	-0.1202***	-0.0731***
	(0.0108)	(0.0101)	(0.0096)	(0.0091)
Dwork1	0.0485***	0.0493***	0.0637***	0.0657***
	(0.0066)	(0.0064)	(0.0065)	(0.0062)
Dwork2	0.0531***	0.0522***	0.0534***	0.0537***
	(0.0062)	(0.0061)	(0.0061)	(0.0060)
Dqtr	0.0259***	0.0153***	0.0556***	0.0532***
	(0.0039)	(0.0040)	(0.0037)	(0.0038)
Poor Rice (Raskin)	0.0172	0.0126	0.0396***	0.0362***
	(0.0143)	(0.0157)	(0.0115)	(0.0135)
House	0.0555***	0.0542***	0.0401***	0.0407***
	(0.0065)	(0.0063)	(0.0064)	(0.0062)
Roof	-0.0091*	-0.0048	0.0038	0.0059
	(0.0066)	(0.0071)	(0.0063)	(0.0067)
Wall	-0.0228***	-0.0150**	-0.0091	0.0016
	(0.0082)	(0.0086)	(0.0080)	(0.0083)
Floor	-0.0107***	0.0075**	-0.0112***	0.0059*
	(0.0043)	(0.0044)	(0.0042)	(0.0043)
Floorsize	0.0001*	0.0002***	0.0001***	0.0002
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Electricity	-0.0190***	-0.0020	-0.0128***	0.0025
	(0.0048)	(0.0048)	(0.0046)	(0.0046)
Gasstove	-0.0223***	0.0097	-0.0452***	-0.0160**
	(0.0082)	(0.0079)	(0.0079)	(0.0077)
Telp	-0.0501***	-0.0254***	-0.0662***	-0.0513***
	(0.0098)	(0.0091)	(0.0094)	(0.0086)

Parentheses are standard error
***; **; * are statistically significant at 1%, 5% and 10%

Table 4.3. Demand for Calorie, Urban Households, Central Java, Indonesia,2013

	Before		After	
	OLS	**IV**	**OLS**	**IV**
Cons	5.1483***	6.4502***	4.8419***	5.9390***
	(0.1091)	(0.1051)	(0.1137)	(0.0989)
ltexpcap	0.1873***	0.0944***	0.1940***	0.1152***
	(0.0067)	(0.0065)	(0.0072)	(0.0060)
lsize	-0.0609***	-0.1081***	-0.0431**	-0.0797***
	(0.0213)	(0.0185)	(0.0210)	(0.0186)
lage	0.0201*	-0.0012	0.0576***	0.0399***
	(0.0133)	(0.0127)	(0.0131)	(0.0124)
gender	-0.0035	0.0014	0.0098	0.0071***
	(0.0086)	(0.0083)	(0.0084)	(0.0081)
child	-0.0348***	-0.0404***	-0.0477***	-0.0540***
	(0.0068)	(0.0063)	(0.0067)	(0.0065)
adult	-0.0241***	-0.0205***	-0.0345***	-0.0326***
	(0.0063)	(0.0058)	(0.0061)	(0.0059)
educ1	-0.0389***	-0.0278***	-0.0404***	-0.0296***
	(0.0082)	(0.0084)	(0.0079)	(0.0081)
educ2	-0.0631***	-0.0424***	-0.0566***	-0.0379***
	(0.0079)	(0.0080)	(0.0076)	(0.0078)
educ3	-0.0834***	-0.0381***	-0.1164***	-0.0726***
	(0.0125)	(0.0123)	(0.0116)	(0.0115)
dwork1	0.0463***	0.0473***	0.0644***	0.0679***
	(0.0087)	(0.0085)	(0.0085)	(0.0083)
dwork2	0.0459***	0.0483***	0.0470***	0.0509***
	(0.0084)	(0.0083)	(0.0084)	(0.0083)
dqtr	0.0256***	0.0109**	0.0582***	0.0552***
	(0.0055)	(0.0056)	(0.0054)	(0.0055)
Poorrice (raskin)	0.0420**	0.0307*	0.0355**	0.0300*
	(0.0206)	(0.0238)	(0.0182)	(0.0219)
house	0.0512***	0.0516***	0.0313***	0.0324***
	(0.0078)	(0.0078)	(0.0077)	(0.0076)
roof	-0.0064	-0.0040	0.0424***	0.0448***
	(0.0102)	(0.0111)	(0.0093)	(0.0101)
wall	-0.0493**	-0.0400***	-0.0096	0.0043
	(0.0135)	(0.0144)	(0.0151)	(0.0150)
floor	-0.0155***	-0.0003	-0.0141**	0.0014
	(0.0062)	(0.0064)	(0.0062)	(0.0065)
floorsize	0.0001*	0.0002***	0.0001*	0.0002***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)
electricity	-0.0172***	-0.0007	-0.0119**	0.0018
	(0.0064)	(0.0064)	(0.0061)	(0.0063)
gasstove	-0.0152*	0.0151*	-0.0271***	-0.0013
	(0.0097)	(0.0097)	(0.0094)	(0.0095)
telp	-0.0412***	-0.0175*	-0.0565***	-0.0417***
	(0.0111)	(0.0109)	(0.0110)	(0.0104)

Parentheses are standard error

***; **; * are statistically significant at 1%, 5% and 10%

Tabel 4.4. Demand for Calorie, Rural Households, Central Java, Indonesia,2013

	Before		After	
	OLS	IV	OLS	IV
cons	4.4718***	5.8565***	4.2810***	5.5101***
	(0.1323)	(0.1091)	(0.1167)	(0.1003)
ltexpcap	0.2471***	0.1456***	0.2529***	0.1652***
	(0.0089)	(0.0069)	(0.0077)	(0.0062)
lsize	-0.1459***	-0.1790***	-0.1411***	-0.1758***
	(0.0241)	(0.0221)	(0.0225)	(0.0205)
lage	0.0005	-0.0196*	0.0337***	0.0095
	(0.0125)	(0.0127)	(0.0117)	(0.0119)
gender	-0.0091	-0.0026	0.0080	0.0134*
	(0.0092)	(0.0089)	(0.0091)	(0.0087)
child	-0.0261***	-0.0347***	-0.0154**	-0.0233***
	(0.0078)	(0.0075)	(0.0071)	(0.0070)
adult	0.0054	0.0060	-0.0063	-0.0044
	(0.0073)	(0.0071)	(0.0067)	(0.0067)
educ1	-0.0139**	-0.0029	-0.0317***	-0.0169**
	(0.0085)	(0.0086)	(0.0081)	(0.0083)
educ2	-0.0244**	-0.0038	-0.0184**	0.0022
	(0.0105)	(0.0108)	(0.0096)	(0.0097)
educ3	-0.0658***	-0.0271*	-0.0630***	-0.0157
	(0.0228)	(0.0207)	(0.0178)	(0.0168)
dwork1	0.0446***	0.0471***	0.0553***	0.0565***
	(0.0100)	(0.0097)	(0.0096)	(0.0092)
dwork2	0.0504***	0.0498***	0.0528***	0.0505***
	(0.0093)	(0.0090)	(0.0089)	(0.0086)
dqtr	0.0279***	0.0213***	0.0532***	0.0516***
	(0.0053)	(0.0054)	(0.0051)	(0.0052)
Poorrice (raskin)	-0.0059	-0.0055	0.0418***	0.0397***
	(0.0190)	(0.0204)	(0.0144)	(0.0164)
house	0.0235**	0.0273**	0.0164*	0.0198**
	(0.0116)	(0.0118)	(0.0118)	(0.0113)
roof	-0.0089	-0.0037	-0.0299***	-0.0283***
	(0.0085)	(0.0090)	(0.0080)	(0.0087)
wall	-0.0041	0.0022	-0.0095	-0.0013
	(0.0103)	(0.0104)	(0.0092)	(0.0095)
floor	-0.0005	0.0182***	-0.0025	0.0145***
	(0.0059)	(0.0059)	(0.0056)	(0.0057)
floorsize	0.0000	0.0001*	0.0001**	0.0002***
	(0.0001)	(0.0001)	(0.0000)	(0.0000)
electricity	-0.0063	0.0078	-0.0002	0.0147**
	(0.0070)	(0.0072)	(0.0069)	(0.0068)
gasstove	-0.0260**	0.0069	-0.0686***	-0.0352***
	(0.0147)	(0.0140)	(0.0144)	(0.0137)
telp	0.0021	0.0149	-0.0155	-0.0099
	(0.0208)	(0.0193)	(0.0169)	(0.0179)

Parentheses are standard error

***; **; * are statistically significant at 1%, 5% and 10%

Table 4.5. Calorie Income Elasticity, Central Java, Indonesia, 2013

Household	Method	Calorie Income Elasticity		
		Before	After	Change
All	OLS	0.2064	0.2173	0.0109
	IV	0.1107	0.1338	0.0231
Urban	OLS	0.1873	0.1940	0.0067
	IV	0.0944	0.1152	0.0208
Rural	OLS	0.2471	0.2529	0.0058
	IV	0.1456	0.1652	0.0196

Table 4.5. shows calorie income elasticity before and after the fuel price increase both with OLS and IV method based on households area in Central Java. OLS method results in higher calorie income elasticity than that of method IV which is almost doubled. Calorie income elasticity with IV method has increased from 0.0944 to 0.1152 for urban households while rural households rose from 0.1456 to 0.1652. As predicted, the correlation between calorie consumption and expenditure results in upward bias elasticity. However, both OLS and IV methods result in higher calorie income elasticity after the fuel price increase. Based on the household locations, the calorie income elasticity of urban households is more inelastic compared to rural households. Responsiveness of both households is also different to an increase in fuel prices. This change in calorie income elasticity shows that urban households are more responsive to calorie consumption in response to fuel price change compared to rural households.

This result is consistent with previous research from Skoufias et al (2011). Calorie income elasticity of Rural households is more inelastic than urban households. The 1998 economic crisis, marked by an inflation rate close to 100%, has resulted in an increase in calorie income elasticity of household both in urban and rural in Central Java. After a crisis. urban households are also more responsive than urban households during economic crisis. This is indicated by the increase in calorie income elasticity by 0.12 for urban households while for rural households only rose by 0.07.

These findings are in line with the theory of a binding minimum subsistence constraint. These findings indicate that an increase in fuel price has led to a decrease in household purchasing power because fuel price increase have led to an increase in inflation rate. Decrease in household purchasing power causes households to consume calories that are close to or even below the standard of calorie consumption so that households will allocate more expenditure on food consumption in order to meet the needs of calorie adequacy as source of energy intake.

The rice policy for poor is as one of the policies used to maintain minimum calorie needs for poor households which is calorie as a basic need for human activity. Raskin policies can increase the consumption of calories in both urban and rural households whenever increase in fuel prices occurs. Therefore, Raskin policy is very useful for poor households to solve nutritional deficiencies problem during price crisis, for example high food price due to the policy of fuel price rise.

4. Conclusion and Policy Recommedation

The purpose of this study is to analyze calories income elasticity in Central Java and the responsiveness of household on calorie consumption due to the increase in fuel prices in June 2013. Response of households due to rising fuel prices is investigated by comparing the calorie income elasticity before and after the fuel price increase . In this study calorie elasticity was estimated using direct approach by applying regression analysis based on Engle curve approach. The independent variables in this study included both economic variables and demographic variables. In addition to the expenditure variables used to calculate calorie income elasticity, another important variable is Raskin which is rice policy for poor household. Raskin's policy is one of the compensation policies to poor households to maintain the minimum level of calorie consumption as main source of energy intake. The data used in this study was from SUSENAS.

There are several important findings in this study. First, calorie income elasticity is very inelastic under 0.3 in both urban and rural households. Second, calorie income elasticity of rural household is more elastic than urban households. Thirdly, the rise in fuel prices has increased calorie income elasticity in both urban and rural households. However, urban households are more responsive than rural households to fuel prices change. Fourth, Raskin policy is very effective to maintain the minimum calorie consumption for both urban and rural households as fuel price increases. However, this policy is more effective for rural households than urban households to fulfill minimum calorie consumption.

The results of this study have important implications related to calorie consumption as basic need of human being which is still under the standard consumption of calorie consumption. First, average consumption of calories per capita per day in Central Java in is still under the standard of calorie adequacy. The increase in fuel prices has increased the calorie income elasticity. An increase in the calorie income elasticity implies that households must allocate more expenditure on food consumption in order to fulfill minimum energy intake. Therefore, the government should be able to stabilize the prices of foods which are the main sources of calories such as rice and prepared food and drink. Second, the increase in calorie income elasticity after the increase in fuel prices also implies that cash transfer policies such as direct cash transfer for poor households as known as BLT as well as Raskin policies are needed to maintain the adequacy of calories consumption for poor households in fulfilling the minimum energy intake.

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